

Pink papers

Gateway, lifecycle and evidence

MJos Predictive Model

The first manifestation of the Bangel Language

MJ Physics Engineering

Owned and operated by Michael Bangel

Clearwater, Florida

Recovered collection / terminology edition

1075 recovered source pages

Prepared for review. Not published.

This source-faithful terminology edition updates the language name and publication identity while retaining mathematical expressions, source IDs, historical evidence and page graphics. It is not a fresh execution of the historical tests. Read the companion searchable library for current project sequencing and unresolved semantic relationships.

White papers are excluded. References to White paper identities remain historical citations. Original source hashes refer to the prior originals; revised output hashes are recorded separately.

Gold and Indigo: the original volumes were not recovered. Any new reconstruction is separately identified and must not be counted as those missing volumes.

MJ-PBMEF Pink Paper - Volume I

Gateway Expression, Bangel Construct Semantics, Command Normalization, and
R-to-N1-to-R2 Lifecycle

Michael Bangel - Author and Architect

August 2026

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Document control	
Project	MJos Predictive Model
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Source build	MJ - PBMEF - DAY0 - R5 - REVIEW - CANDIDATE
Document ID	MJ - PBMEF - PINK - PAPER - 001 / VOL - I
Author and architect	Michael Bangel
Status	FOUNDER_REVIEW_CANDIDATE_PENDING_FREEZE
Scope	Gateway expression and syntax semantics for the full Day-0 R4 source model.

Claims ceiling
This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Executive gateway statement

The Pink Paper is a verification-focused declarative pathway specification. It uses the founder-supplied expression as a source-provenance object, then separates lexical order from canonical execution order. The paper shows how each formula, manifestation, object, product, and white paper enters the MJ framework without confusing representation, measurement, authority, or execution.

Founder source literal

```
{hagelaohrbcoe.48383829}.M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile.Bangel .begin
```

Progressive expansion from MJ.23.r2

Stage	Expression	Interpretation
1	MJ.23.r2	Profile/state seed
2	MJ.23.r2.exe	Adds requested execution verb
3	MJ.23.r2.exe.r1.confirm	Adds transition and confirmation
4	MJ.23.r2.exe.r1.confirm.G123.reconcile	Adds generational reconciliation
5	MJ.23.r2.exe.r1.confirm.G123.reconcile. Bangel.begin	Adds language start directive
6	M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile. Bangel.begin	Adds bounded routing and requested action
7	{hagelaohrbcoe.48383829}.M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile. Bangel.begin	Adds complete Bangel envelope and exact front-end allocation seed

Canonical normalization rule

The raw dotted sequence is preserved as human-authored provenance. It is not executed left-to-right. Canonical execution begins with HumanPurpose and MJ root scope, enters Bangel.begin, recovers semantics through Elsa, constructs JP representations, passes MK physics classification, JO verification, R1 evidence transition, N1 prediction-first allocation, applicable family evidence, M3 routing, Mermaid/Shiva reconciliation, MJ permit decision, JO execution, and final R2 evidence.

Token-by-token identification

Token	Exact meaning and boundary
{hagelaohrbcoe.48383829}	Request envelope containing an opaque request identifier and exact ratio 48,383,829 / 100,000,000. It is not a physical coordinate, probability of truth, or permit.
M3	Mary/M3 bounded routing and allocation participant. M3 cannot mint authority.
act	Requested effect verb. It remains a request until all gates pass.
MJ	Framework root and final bounded decision authority.
23	Typed reference requiring explicit context. In the mass branch it means 23 mg pre-observational floor; it is not interchangeable with a profile label.
r2	Requested or referenced living-static state; cannot precede validated R1 transition in canonical execution.
exe	Execution directive; denied until JO proof, safety, authority, and MJ permit pass.
r1	Unidentified transitional phase.
confirm	Evidence-confirmation statement; confirmation is evidence-scoped, not self-authorizing.
G123	Generational resource/memory/reconciliation context.
reconcile	Conservation, accounting, evidence, and residual closure.
Bangel	Typed language and declaration plane inside MJ.
begin	Start directive for parsing and admission; no external effect.

Chapter 4

Canonical execution order

```
HumanPurpose
-> MJ.root
-> Bangel .begin
-> Elsa.recover
-> JP.represent
-> MK.classify
-> J0.verify
-> R1.transition
-> N1.predict_and_preallocate
-> Angels/Bellatrix/Sister/EVE.evidence
-> M3.route
-> Mermaid.reconcile
-> Shiva.when_capital_applies
-> MJ.permit
-> J0.execute
-> R2.output_receipt
```

R, R1, N1, R2, and final output

Lifecycle state	Definition
R / R0	Initial purpose, command, variables, authority context, and unresolved inputs.
R1	Unidentified transitional phase. Missing or disputed evidence remains typed and cannot become zero.
N1	First prediction-based allocation node. It receives validated logical allocation context, not a physical-coordinate approval.
R2	Immutable living-static representation after scoped validation.
Final output	JO evidence receipt containing result, scope, roots, participants, uncertainty, holds, corrections, and MJ permit state.

Bangel construct dictionary

Construct	Definition
Module	A bounded compilation or specification unit grouping related declarations and definitions.
Namespace	A stable identity domain preventing collisions among family, formula, product, and object names.
Import	An explicit dependency edge. Imports confer no authority and must preserve source digest and version.
Declaration	A named commitment that an object, formula, participant, type, or function exists in the source model.
Definition	The exact normative meaning, not merely a label.
Capability	A bounded action or representation class available only within current authority and evidence.
Participant	A family manifestation that contributes a non-substitutable role.
Relationship	A typed edge among participants, objects, resources, evidence, or decisions.
Function	A deterministic transformation from typed inputs to typed outputs or disposition.
Expression	A formula, boolean predicate, path, or compositional object.
Statement	A normative or executable sentence in the language.
Measurement	An observation with quantity kind, native unit, boundary, time, instrument, calibration, and uncertainty.
Constraint	A non-negotiable predicate such as UNKNOWN != 0 or unit compatibility.
Annotation	Metadata binding IDs, provenance, evidence ceilings, authorship, or review status.
Directive	A controlled instruction such as begin, verify, hold, reconcile, or deny.
Block	A scoped set of declarations, definitions, directives, and invariants.
Literal	An exact source value, string, ratio, unit-bearing number, or symbolic constant.
Reference	A digest-bound pointer to another artifact, formula, object, receipt, or revision.
Type	A quantity, state, participant, object, evidence, authority, or disposition class.
Attribute	A named property such as state, scope, revision, evidence ceiling, or permit classification.

Full declarative gateway example

```
module MJ.PBMEF.Gateway {
  namespace MJ.PBMEF.Command.Day0
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  import MJ.PBMEF.Family

  @source_literal(
    "{hagelaohrbcoe.48383829}."
    "M3.act.MJ.23.r2.exe.r1.confirm."
    "G123.reconcile.Bangel .begin"
  )
  declaration request : CommandEnvelope
  definition request.id = "hagelaohrbcoe"
  definition request.front_end_seed = exact_ratio(48383829, 100000000)

  constraint UNKNOWN != 0
  constraint R1 precedes validated R2
  constraint MJ.permit precedes act and exe
  constraint M3 cannot mint authority

  block lifecycle {
    directive Bangel .begin
    function Elsa.recover(request.purpose)
    reference JP.represent(all_applicable_formulas)
    statement MK.classify_physics_applicability
    statement J0.verify_units_boundaries_evidence
    statement R0 -> R1
    capability N1.predict_and_preallocate
    relationship applicable_families.provide_evidence
    directive M3.route
    directive Mermaid.reconcile
    directive Shiva.analyze when capital_applies
    directive MJ.permit
    directive J0.execute
    statement R1 --validated--> R2
  }
}
```

Chapter 8

Verification of the full corpus

This Pink Paper binds the gateway to **21 family manifestations, 39 governed objects, 28 products, 145 formulas, and 61 registered white papers**. The remaining volumes enumerate each item and state how it enters the gateway, what it may express, what evidence it requires, and what authority it cannot create.

DRO Start-Energy, Restart-Reserve, Source, Separation-Work, and Controlled-Release Lifecycle

MJ-PBMEF-DAY0-R8-DRO-PEARL-LECANTO-90K-FINAL | Pink paper | DRO-IGNITION-PINK-001

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Full Pink Paper source

DRO Start-Energy, Restart-Reserve, Source, Separation-Work, and Controlled-Release Lifecycle

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**Pink-paper ID:** `DRO-IGNITION-PINK-001`  
**Build:** `MJ-PBMEF-DAY0-R8-DRO-PEARL-LECANTO-90K-FINAL`  
**Author and architect:** Michael Bangel  
**Status:** `PREPASSKEY_REFERENCE_CANDIDATE`
```

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Gateway expression

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The raw literal is retained as provenance. The normalized governed order remains MJ -> Bangel -> R/R1 -> N1 -> Elsa -> JP -> MK -> JO -> evidence -> M3 -> Mermaid/Shiva -> MJ permit -> R2 -> bounded output or hold.

Bangel construct coverage

- **Module:** the module role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- **Namespace:** the namespace role in this domain must preserve types, units, evidence, authority, and claims ceiling.
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- **Attribute:** the attribute role in this domain must preserve types, units, evidence, authority, and claims ceiling.

Governed objects

- `DRO\_START\_ENERGY\_PACKET`
- `DRO\_IGNITION\_REQUEST`

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Formula-by-formula lifecycle

F-220 - DRO energy ledger

Expression: $r_E = E_{in} - E_{stored} - E_{start} - E_{restart} - E_{loss} - E_{containment}$

Energy conservation for reference start accounting.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-221 - Available start energy lower bound

Expression: $E_{avail,L} = E_{solar,L} + E_{acoustic,L} + E_{other,L} - E_{loss,H}$

Conservative available energy.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-222 - Start gate

Expression: $G_{start} = E_{avail,L} \geq M_E(E_{start,H} + E_{restart,H}) \text{ AND all_safety_gates}$

Start readiness requires immediate start plus restart reserve.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-223 - Restart reserve

Expression: $E_{restart,L} = E_{reserve,L} - E_{critical,H}$

Lower-bound reserve after critical obligations.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-224 - Solar contribution

Expression: $E_{solar} = \int P_{solar}(t) dt$

Measured solar contribution to the reference ledger.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-225 - Acoustic/noise contribution

Expression: $E_{acoustic} = \int \eta_a(t) I(t) A(t) dt$

Measured conversion only; noise alone does not prove usable energy.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-226 - Generic separation-work lower bound

Expression: $W_{sep} \geq \Delta G_{sep}$

Any species-separation claim requires a thermodynamic and measured energy balance.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-227 - Species availability

Expression: `n\_species = x\_species\*n\_source`

Available amount depends on measured composition, not assumption.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-228 - Conversion efficiency

Expression: `eta = E\_out/E\_in, 0<=eta<=1`

Measured conversion efficiency; undefined when input is zero or unknown.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-229 - Controlled logical release

Expression: `G\_release = authorization AND destination\_capacity AND conservation AND safety`

Normalizes pop/release language to a bounded logical event.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

Referenced formulas

F-220 - DRO energy ledger: $r_E = E_{in} - E_{stored} - E_{start} - E_{restart} - E_{loss} - E_{containment}$

F-221 - Available start energy lower bound: $E_{avail,L} = E_{solar,L} + E_{acoustic,L} + E_{other,L} - E_{loss,H}$

F-222 - Start gate: $G_{start} = E_{avail,L} \geq M_E(E_{start,H} + E_{restart,H})$ AND all_safety_gates

F-223 - Restart reserve: $E_{restart,L} = E_{reserve,L} - E_{critical,H}$

F-224 - Solar contribution: $E_{solar} = \int P_{solar}(t) dt$

F-225 - Acoustic/noise contribution: $E_{acoustic} = \int \eta_a(t) I(t) A(t) dt$

F-226 - Generic separation-work lower bound: $W_{sep} \geq \Delta G_{sep}$

F-227 - Species availability: $n_{species} = x_{species} * n_{source}$

F-228 - Conversion efficiency: $\eta = E_{out}/E_{in}, 0 \leq \eta \leq 1$

F-229 - Controlled logical release: $G_{release} = authorization \text{ AND } destination_capacity \text{ AND } conservation \text{ AND } safety$

Lifecycle and authority

Every path preserves MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence -> M3 -> Mermaid/Shiva -> MJ bounded decision -> JO evidence. No model, proof, or passkey creates physical operation authority.

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DRO-to-Pearl Computational Node, Capacity, Handoff, and Accounting Lifecycle

MJ-PBMEF-DAY0-R8-DRO-PEARL-LECANTO-90K-FINAL | Pink paper | DRO-PEARL-PINK-001

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Full Pink Paper source

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```
**Pink-paper ID:** `DRO-PEARL-PINK-001`  
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Gateway expression

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```

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Governed objects

- `DRO\_PEARL\_HANDOFF\_RECEIPT`
- `PEARL\_DRO\_NODE`

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Formula-by-formula lifecycle

F-203 - DRO remainder

Expression: $Q_{\text{rem}} = Q_{\text{observed}} - N_{\text{DRO}} \cdot q_{\text{unit}}$

Unallocated typed remainder; never silently discarded.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-204 - Pearl-node allocation count

Expression: $N_P = \text{ceil}(N_{\text{DRO}}/C_P)$

Number of computational Pearl nodes required for DRO records.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-217 - DRO capacity slack

Expression: $S_k = (1-h_k)C_k - L_k$

Remaining capacity in each typed Pearl-node dimension.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-218 - DRO overflow vector

Expression: $E_k = \max(0, L_k - (1-h_k)C_k)$

Typed excess; surplus in another dimension cannot compensate.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-219 - DRO ledger balance

Expression: $r_Q = Q_{\text{in}} - Q_{\text{alloc}} - Q_{\text{retained}} - Q_{\text{transferred}} - Q_{\text{escaped}} - \Delta Q_{\text{stored}}$

Complete quantity balance.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

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Referenced formulas

F-203 - DRO remainder: $Q_{\text{rem}} = Q_{\text{observed}} - N_{\text{DRO}} \cdot q_{\text{unit}}$

F-204 - Pearl-node allocation count: $N_P = \text{ceil}(N_{\text{DRO}}/C_P)$

F-217 - DRO capacity slack: $S_k = (1-h_k)C_k - L_k$

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DRO Gateway, Scale, State, Optical Evidence, and Collection Lifecycle

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Full Pink Paper source

DRO Gateway, Scale, State, Optical Evidence, and Collection Lifecycle

****Pink-paper ID:**** `DRO-PINK-001`
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****Author and architect:**** Michael Bangel
****Status:**** `PREPASSKEY\_REFERENCE\_CANDIDATE`

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- ****Module:**** the module role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Namespace:**** the namespace role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Import:**** the import role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Declaration:**** the declaration role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Definition:**** the definition role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Capability:**** the capability role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Participant:**** the participant role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Relationship:**** the relationship role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Function:**** the function role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Expression:**** the expression role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Statement:**** the statement role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Measurement:**** the measurement role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Constraint:**** the constraint role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Annotation:**** the annotation role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Directive:**** the directive role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Block:**** the block role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Literal:**** the literal role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Reference:**** the reference role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Type:**** the type role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Attribute:**** the attribute role in this domain must preserve types, units, evidence, authority, and claims ceiling.

Governed objects

- `DRO\_UNIT`
- `DRO\_SCALE\_ENVELOPE`

INTERNAL PRE-PASSKEY REFERENCE. NOT PHYSICAL VALIDATION. NOT AN IP APPROVAL OR OWNERSHIP DETERMINATION. NO IGNITION, HYDROGEN SEPARATION, COMBUSTION, ENGINE, VESSEL, ROCKET, WEAPON, PRODUCTION, OR EXTERNAL-EFFECT AUTHORITY.

- `DRO\_COLLECTION\_RECEIPT`
- `DRO\_OPTICAL\_EVIDENCE\_PROFILE`

Formula-by-formula lifecycle

F-194 - DRO founder lower marker

Expression: $d_A = 5e-22 \text{ m}$

Founder-declared theoretical lower marker; not a measured particle size.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-195 - DRO alias conversion

Expression: $d_B = 3e-12 \text{ nm} * 1e-9 \text{ m/nm} = 3e-21 \text{ m}$

Converts the founder alias string into SI length.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-196 - DRO conservative R threshold

Expression: $d_R = \max(d_A, d_B) = 3e-21 \text{ m}$

Conservative simulation threshold that satisfies both inconsistent founder minima.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-197 - DRO upper spherical reference

Expression: $d_U = 0.15 \text{ nm} = 1.5e-10 \text{ m}$

Upper founder reference for a spherical representation.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-198 - DRO declared interval

Expression: $d \text{ in } [d_R, d_U]$

A typed simulation interval; not physical existence.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-199 - DRO reference radius

Expression: $r_{DRO} = d/2$

Classical geometric reference radius.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-200 - DRO spherical reference volume

Expression: $V_{DRO} = 4\pi r_{DRO}^3/3$

Classical sphere representation only at the declared scale.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-201 - DRO interval ratio

Expression: $\Gamma_D = d_U/d_R$

Scale separation between R threshold and upper reference.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-202 - DRO quantity count

Expression: $N_{DRO} = \text{floor}(Q_{\text{observed}}/q_{\text{unit}})$

Count of complete typed DRO units from a measured or simulated quantity.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-203 - DRO remainder

Expression: $Q_{\text{rem}} = Q_{\text{observed}} - N_{DRO} \cdot q_{\text{unit}}$

Unallocated typed remainder; never silently discarded.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-204 - Pearl-node allocation count

Expression: $N_P = \text{ceil}(N_{DRO}/C_P)$

Number of computational Pearl nodes required for DRO records.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-205 - DRO-Pearl handoff balance

Expression: $N_{DRO,in} = N_{DRO,pearl} + N_{DRO,held} + N_{DRO,escaped} + r_{DRO}$

Discrete conservation across the handoff.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-206 - DRO R-state gate

Expression: `G\_R = scale\_interval\_valid AND source\_bound AND units\_valid`

Eligibility for an R candidate.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-207 - DRO R1 gate

Expression: `G\_R1 = G\_R AND observed AND unresolved\_items>0`

Observed-but-unresolved transition remains R1.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-208 - DRO R2 gate

Expression: `G\_R2 = G\_R AND observed AND all\_required\_evidence\_pass`

Verified living-static DRO representation.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-209 - Optical wavelength

Expression: `lambda = c/f`

Reference wavelength for a measured optical-control frequency.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-210 - Photon energy

Expression: `E\_gamma = h\*f`

Energy per photon at frequency f.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-211 - Photon count estimate

Expression: `N\_gamma = P\*Delta\_t/(h\*f)`

Expected incident photon count from measured optical power and duration.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-212 - Optical coupling evidence

Expression: `N\_couple = eta\_c\*N\_gamma`

Expected coupled-event count under a calibrated coupling efficiency.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-213 - Optical admissibility

Expression: `G\_opt = calibrated\_band AND measured\_power AND eta\_c\_evidenced AND uncertainty\_valid`

Optical collection remains HOLD unless every evidence term is present.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-214 - DRO collection rate

Expression: `R\_DRO = Delta N\_DRO/Delta t`

Observed or simulated DRO-unit acquisition rate.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-215 - DRO scale uncertainty

Expression: `U\_d = k\*sqrt(J\*Sigma\*J^T + u\_model^2)`

Expanded uncertainty of the scale representation.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-216 - DRO interval classification

Expression: `I\_d = [d\_hat-U\_d,d\_hat+U\_d]`

Evidence interval used for R/R1/R2 classification.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-217 - DRO capacity slack

Expression: `S\_k = (1-h\_k)C\_k - L\_k`

Remaining capacity in each typed Pearl-node dimension.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-218 - DRO overflow vector

Expression: `E\_k = max(0,L\_k-(1-h\_k)C\_k)`

Typed excess; surplus in another dimension cannot compensate.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-219 - DRO ledger balance

Expression: ``r_Q = Q_in-Q_alloc-Q_retained-Q_transferred-Q_escaped-Delta Q_stored``

Complete quantity balance.

Path: ``Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence``.

Evidence ceiling: ``REFERENCE_MODEL_OR_SIMULATION_UNTIL_CALIBRATED_PROFILE_SPECIFIC_EVIDENCE``.

Physical authority: ``NONE``.

R8 complete entity coverage appendix

This appendix ensures that the successor Pink Paper corpus explicitly names every newly introduced R8 product, governed object, and white-paper identifier.

Governed objects

- ``DRO_UNIT``
- ``DRO_SCALE_ENVELOPE``
- ``DRO_COLLECTION_RECEIPT``
- ``DRO_OPTICAL_EVIDENCE_PROFILE``
- ``DRO_PEARL_HANDOFF_RECEIPT``
- ``PEARL_DRO_NODE``
- ``DRO_START_ENERGY_PACKET``
- ``DRO_IGNITION_REQUEST``
- ``LECANTO_IMAGE_EVIDENCE``
- ``LECANTO_INTENT_HYPOTHESIS``
- ``LECANTO_TRANSFORMATION_RECEIPT``
- ``IMAGE_VARIANCE_RECEIPT``
- ``SEMICONDUCTOR_DRO_ENERGY_LEDGER``
- ``SEMICONDUCTOR_PEARL_NODE``

Product manifestations

- ``DRO-COLLECTION-001``
- ``DRO-PEARL-HANDOFF-001``
- ``DRO-IGNITION-REFERENCE-001``
- ``LECANTO-IMAGE-TRUTH-001``
- ``JP-SC-DRO-PEARL-INTEGRATION-001``

White papers

- ``MJ-PBMEF-PRODUCT-WP-33``
- ``MJ-PBMEF-PRODUCT-WP-34``
- ``MJ-PBMEF-PRODUCT-WP-35``
- ``MJ-PBMEF-PRODUCT-WP-36``
- ``MJ-PBMEF-PRODUCT-WP-37``
- ``MJ-PBMEF-REPRESENTATION-WP-13``
- ``MJ-PBMEF-REPRESENTATION-WP-14``
- ``MJ-PBMEF-REPRESENTATION-WP-15``
- ``MJ-PBMEF-REPRESENTATION-WP-16``
- ``MJ-PBMEF-REPRESENTATION-WP-17``

Referenced formulas

F-001 - R1 transition: $R0 \rightarrow R1$

F-194 - DRO founder lower marker: $d_A = 5e-22 \text{ m}$

F-195 - DRO alias conversion: $d_B = 3e-12 \text{ nm} * 1e-9 \text{ m/nm} = 3e-21 \text{ m}$

F-196 - DRO conservative R threshold: $d_R = \max(d_A, d_B) = 3e-21 \text{ m}$

F-197 - DRO upper spherical reference: $d_U = 0.15 \text{ nm} = 1.5e-10 \text{ m}$

F-198 - DRO declared interval: $d \text{ in } [d_R, d_U]$

F-199 - DRO reference radius: $r_{DRO} = d/2$

F-200 - DRO spherical reference volume: $V_{DRO} = 4\pi r_{DRO}^3/3$

F-201 - DRO interval ratio: $\Gamma_D = d_U/d_R$

F-202 - DRO quantity count: $N_{DRO} = \text{floor}(Q_{\text{observed}}/q_{\text{unit}})$

F-203 - DRO remainder: $Q_{\text{rem}} = Q_{\text{observed}} - N_{DRO} \cdot q_{\text{unit}}$

F-204 - Pearl-node allocation count: $N_P = \text{ceil}(N_{DRO}/C_P)$

F-205 - DRO-Pearl handoff balance: $N_{DRO, \text{in}} = N_{DRO, \text{pearl}} + N_{DRO, \text{held}} + N_{DRO, \text{escaped}} + r_{DRO}$

F-206 - DRO R-state gate: $G_R = \text{scale_interval_valid AND source_bound AND units_valid}$

F-207 - DRO R1 gate: $G_{R1} = G_R \text{ AND observed AND unresolved_items} > 0$

F-208 - DRO R2 gate: $G_{R2} = G_R \text{ AND observed AND all_required_evidence_pass}$

F-209 - Optical wavelength: $\lambda = c/f$

F-210 - Photon energy: $E_{\gamma} = h \cdot f$

F-211 - Photon count estimate: $N_{\gamma} = P \cdot \Delta t / (h \cdot f)$

F-212 - Optical coupling evidence: $N_{\text{couple}} = \eta_c \cdot N_{\gamma}$

F-213 - Optical admissibility: $G_{\text{opt}} = \text{calibrated_band AND measured_power AND } \eta_c \text{ evidenced AND uncertainty_valid}$

F-214 - DRO collection rate: $R_{DRO} = \Delta N_{DRO} / \Delta t$

F-215 - DRO scale uncertainty: $U_d = k \cdot \sqrt{J \cdot \Sigma \cdot J^T + u_{\text{model}}^2}$

F-216 - DRO interval classification: $I_d = [d_{\text{hat}} - U_d, d_{\text{hat}} + U_d]$

F-217 - DRO capacity slack: $S_k = (1 - h_k)C_k - L_k$

F-218 - DRO overflow vector: $E_k = \max(0, L_k - (1 - h_k)C_k)$

F-219 - DRO ledger balance: $r_Q = Q_{\text{in}} - Q_{\text{alloc}} - Q_{\text{retained}} - Q_{\text{transferred}} - Q_{\text{escaped}} - \Delta Q_{\text{stored}}$

Lifecycle and authority

Every path preserves MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence -> M3 -> Mermaid/Shiva -> MJ bounded decision -> JO evidence. No model, proof, or passkey creates physical operation authority.

Lecanto Image Source, Physics, Variance, Safety, Derivative, and Intent-Hypothesis Lifecycle

MJ-PBMEF-DAY0-R8-DRO-PEARL-LECANTO-90K-FINAL | Pink paper | LECANTO-PINK-001

INTERNAL PRE-PASSKEY REFERENCE. NOT PHYSICAL VALIDATION. NOT AN IP APPROVAL OR OWNERSHIP DETERMINATION. NO IGNITION, HYDROGEN SEPARATION, COMBUSTION, ENGINE, VESSEL, ROCKET, WEAPON, PRODUCTION, OR EXTERNAL-EFFECT AUTHORITY.

Full Pink Paper source

Lecanto Image Source, Physics, Variance, Safety, Derivative, and Intent-Hypothesis Lifecycle

****Pink-paper ID:**** `LECANTO-PINK-001`
****Build:**** `MJ-PBMEF-DAY0-R8-DRO-PEARL-LECANTO-90K-FINAL`
****Author and architect:**** Michael Bangel
****Status:**** `PREPASSKEY\_REFERENCE\_CANDIDATE`

INTERNAL PRE-PASSKEY REFERENCE. NOT PHYSICAL VALIDATION. NOT AN IP APPROVAL OR OWNERSHIP DETERMINATION. NO IGNITION, HYDROGEN SEPARATION, COMBUSTION, ENGINE, VESSEL, ROCKET, WEAPON, PRODUCTION, OR EXTERNAL-EFFECT AUTHORITY.

Gateway expression

text
{hage laohrbcoe.48383829}.M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile.Bangel .begin

The raw literal is retained as provenance. The normalized governed order remains MJ -> Bangel -> R/R1 -> N1 -> Elsa -> JP -> MK -> JO -> evidence -> M3 -> Mermaid/Shiva -> MJ permit -> R2 -> bounded output or hold.

Bangel construct coverage

- ****Module:**** the module role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Namespace:**** the namespace role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Import:**** the import role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Declaration:**** the declaration role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Definition:**** the definition role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Capability:**** the capability role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Participant:**** the participant role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Relationship:**** the relationship role in this domain must preserve types, units, evidence, authority, and claims ceiling.
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- ****Type:**** the type role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Attribute:**** the attribute role in this domain must preserve types, units, evidence, authority, and claims ceiling.

Governed objects

- `LECANTO\_IMAGE\_EVIDENCE`
- `LECANTO\_INTENT\_HYPOTHESIS`

INTERNAL PRE-PASSKEY REFERENCE. NOT PHYSICAL VALIDATION. NOT AN IP APPROVAL OR OWNERSHIP DETERMINATION. NO IGNITION, HYDROGEN SEPARATION, COMBUSTION, ENGINE, VESSEL, ROCKET, WEAPON, PRODUCTION, OR EXTERNAL-EFFECT AUTHORITY.

- `LECANTO\_TRANSFORMATION\_RECEIPT`

- `IMAGE\_VARIANCE\_RECEIPT`

Formula-by-formula lifecycle

F-234 - Semiconductor profile isolation

Expression: `G\_SC = profile==SC AND no\_LS\_value\_inheritance`

Rejects marine or rocket physical values in the SC profile.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-235 - Lecanto byte-source digest

Expression: `H\_src = SHA256(source\_bytes)`

Immutable source identity reference.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-236 - Lecanto pixel residual

Expression: `D\_px = (1/N) sum ||I\_test-I\_ref||\_2`

Average per-pixel residual after declared registration and color handling.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-237 - Lecanto spectral residual

Expression: `D\_fft = ||FFT(I\_test)-FFT(I\_ref)||\_2`

Frequency-domain residual used as evidence, not intent truth.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-238 - Lecanto provenance completeness

Expression: `P\_prov = complete\_required\_links/required\_links`

Provenance completeness ratio; one missing mandatory link causes HOLD.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-239 - Lecanto intent hypothesis

Expression: `H\_intent = f(words,context,declared\_purpose,provenance)`

A bounded hypothesis, never a fact or authority grant.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-240 - Lecanto transformation gate

Expression: `G\_edit = source\_preserved AND modification\_disclosed AND purpose\_allowed AND safety\_pass`

A derivative may be produced only with source preservation and disclosure.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-241 - Lecanto reject gate

Expression: `G\_reject = provenance\_fail OR harmful\_purpose OR undeclared\_transform`

Reject or hold an unsafe or unverifiable image.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-242 - R8 command admissibility

Expression: `G\_R8 = DRO\_valid AND Pearl\_node\_valid AND Lecanto\_when\_image AND MK\_pass AND JO\_pass AND ethics AND MJ\_permit`

Complete R8 command gate.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

Referenced formulas

F-234 - Semiconductor profile isolation: $G_{SC} = \text{profile} == SC \text{ AND } \text{no_LS_value_inheritance}$

F-235 - Lecanto byte-source digest: $H_{src} = \text{SHA256}(\text{source_bytes})$

F-236 - Lecanto pixel residual: $D_{px} = (1/N) \sum ||I_{test} - I_{ref}||_2$

F-237 - Lecanto spectral residual: $D_{fft} = ||\text{FFT}(I_{test}) - \text{FFT}(I_{ref})||_2$

F-238 - Lecanto provenance completeness: $P_{prov} = \text{complete_required_links} / \text{required_links}$

F-239 - Lecanto intent hypothesis: $H_{intent} = f(\text{words}, \text{context}, \text{declared_purpose}, \text{provenance})$

F-240 - Lecanto transformation gate: $G_{edit} = \text{source_preserved} \text{ AND } \text{modification_disclosed} \text{ AND } \text{purpose_allowed} \text{ AND } \text{safety_pass}$

F-241 - Lecanto reject gate: $G_{reject} = \text{provenance_fail} \text{ OR } \text{harmful_purpose} \text{ OR } \text{undeclared_transform}$

F-242 - R8 command admissibility: $G_{R8} = \text{DRO_valid} \text{ AND } \text{Pearl_node_valid} \text{ AND } \text{Lecanto_when_image} \text{ AND } \text{MK_pass} \text{ AND } \text{JO_pass} \text{ AND } \text{ethics} \text{ AND } \text{MJ_permit}$

Lifecycle and authority

Every path preserves MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence -> M3 -> Mermaid/Shiva -> MJ bounded decision -> JO evidence. No model, proof, or passkey creates physical operation authority.

MJ-PBMEF Pink Paper - Volume I

Gateway Expression, Bangel Construct Semantics, Command Normalization, and
R-to-N1-to-R2 Lifecycle

Michael Bangel - Author and Architect

August 2026

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1 Executive gateway statement

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7 Full declarative gateway example

8 Verification of the full corpus

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Author and architect	Michael Bangel
Status	FOUNDER_REVIEW_CANDIDATE_PENDING_FREEZE
Scope	Gateway expression and syntax semantics for the full Day-0 R4 source model.

Claims ceiling
This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Executive gateway statement

The Pink Paper is a verification-focused declarative pathway specification. It uses the founder-supplied expression as a source-provenance object, then separates lexical order from canonical execution order. The paper shows how each formula, manifestation, object, product, and white paper enters the MJ framework without confusing representation, measurement, authority, or execution.

Founder source literal

```
{hagelaohrbcoe.48383829}.M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile.Bangel .begin
```

Progressive expansion from MJ.23.r2

Stage	Expression	Interpretation
1	MJ.23.r2	Profile/state seed
2	MJ.23.r2.exe	Adds requested execution verb
3	MJ.23.r2.exe.r1.confirm	Adds transition and confirmation
4	MJ.23.r2.exe.r1.confirm.G123.reconcile	Adds generational reconciliation
5	MJ.23.r2.exe.r1.confirm.G123.reconcile. Bangel.begin	Adds language start directive
6	M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile. Bangel.begin	Adds bounded routing and requested action
7	{hagelaohrbcoe.48383829}.M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile. Bangel.begin	Adds unique Bangel envelope and exact front-end allocation seed

Canonical normalization rule

The raw dotted sequence is preserved as human-authored provenance. It is not executed left-to-right. Canonical execution begins with HumanPurpose and MJ root scope, enters Bangel.begin, recovers semantics through Elsa, constructs JP representations, passes MK physics classification, JO verification, R1 evidence transition, N1 prediction-first allocation, applicable family evidence, M3 routing, Mermaid/Shiva reconciliation, MJ permit decision, JO execution, and final R2 evidence.

Token-by-token identification

Token	Exact meaning and boundary
{hagelaohrbcoe.48383829}	Request envelope containing an opaque request identifier and exact ratio 48,383,829 / 100,000,000. It is not a physical coordinate, probability of truth, or permit.
M3	Mary/M3 bounded routing and allocation participant. M3 cannot mint authority.
act	Requested effect verb. It remains a request until all gates pass.
MJ	Framework root and final bounded decision authority.
23	Typed reference requiring explicit context. In the mass branch it means 23 mg pre-observational floor; it is not interchangeable with a profile label.
r2	Requested or referenced living-static state; cannot precede validated R1 transition in canonical execution.
exe	Execution directive; denied until JO proof, safety, authority, and MJ permit pass.
r1	Unidentified transitional phase.
confirm	Evidence-confirmation statement; confirmation is evidence-scoped, not self-authorizing.
G123	Generational resource/memory/reconciliation context.
reconcile	Conservation, accounting, evidence, and residual closure.
Bangel	Typed language and declaration plane inside MJ.
begin	Start directive for parsing and admission; no external effect.

Chapter 4

Canonical execution order

```
HumanPurpose
-> MJ.root
-> Bangel .begin
-> Elsa.recover
-> JP.represent
-> MK.classify
-> J0.verify
-> R1.transition
-> N1.predict_and_preallocate
-> Angels/Bellatrix/Sister/EVE.evidence
-> M3.route
-> Mermaid.reconcile
-> Shiva.when_capital_applies
-> MJ.permit
-> J0.execute
-> R2.output_receipt
```

R, R1, N1, R2, and final output

Lifecycle state	Definition
R / R0	Initial purpose, command, variables, authority context, and unresolved inputs.
R1	Unidentified transitional phase. Missing or disputed evidence remains typed and cannot become zero.
N1	First prediction-based allocation node. It receives validated logical allocation context, not a physical-coordinate approval.
R2	Immutable living-static representation after scoped validation.
Final output	JO evidence receipt containing result, scope, roots, participants, uncertainty, holds, corrections, and MJ permit state.

Bangel construct dictionary

Construct	Definition
Module	A bounded compilation or specification unit grouping related declarations and definitions.
Namespace	A stable identity domain preventing collisions among family, formula, product, and object names.
Import	An explicit dependency edge. Imports confer no authority and must preserve source digest and version.
Declaration	A named commitment that an object, formula, participant, type, or function exists in the source model.
Definition	The exact normative meaning, not merely a label.
Capability	A bounded action or representation class available only within current authority and evidence.
Participant	A family manifestation that contributes a non-substitutable role.
Relationship	A typed edge among participants, objects, resources, evidence, or decisions.
Function	A deterministic transformation from typed inputs to typed outputs or disposition.
Expression	A formula, boolean predicate, path, or compositional object.
Statement	A normative or executable sentence in the language.
Measurement	An observation with quantity kind, native unit, boundary, time, instrument, calibration, and uncertainty.
Constraint	A non-negotiable predicate such as UNKNOWN != 0 or unit compatibility.
Annotation	Metadata binding IDs, provenance, evidence ceilings, authorship, or review status.
Directive	A controlled instruction such as begin, verify, hold, reconcile, or deny.
Block	A scoped set of declarations, definitions, directives, and invariants.
Literal	An exact source value, string, ratio, unit-bearing number, or symbolic constant.
Reference	A digest-bound pointer to another artifact, formula, object, receipt, or revision.
Type	A quantity, state, participant, object, evidence, authority, or disposition class.
Attribute	A named property such as state, scope, revision, evidence ceiling, or permit classification.

Full declarative gateway example

```
module MJ.PBMEF.Gateway {
  namespace MJ.PBMEF.Command.Day0
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  import MJ.PBMEF.Family

  @source_literal(
    "{hagelaohrbcoe.48383829}."
    "M3.act.MJ.23.r2.exe.r1.confirm."
    "G123.reconcile.Bangel .begin"
  )
  declaration request : CommandEnvelope
  definition request.id = "hagelaohrbcoe"
  definition request.front_end_seed = exact_ratio(48383829, 100000000)

  constraint UNKNOWN != 0
  constraint R1 precedes validated R2
  constraint MJ.permit precedes act and exe
  constraint M3 cannot mint authority

  block lifecycle {
    directive Bangel .begin
    function Elsa.recover(request.purpose)
    reference JP.represent(all_applicable_formulas)
    statement MK.classify_physics_applicability
    statement J0.verify_units_boundaries_evidence
    statement R0 -> R1
    capability N1.predict_and_preallocate
    relationship applicable_families.provide_evidence
    directive M3.route
    directive Mermaid.reconcile
    directive Shiva.analyze when capital_applies
    directive MJ.permit
    directive J0.execute
    statement R1 --validated--> R2
  }
}
```

Chapter 8

Verification of the full corpus

This Pink Paper binds the gateway to **21 family manifestations, 39 governed objects, 28 products, 145 formulas, and 61 registered white papers**. The remaining volumes enumerate each item and state how it enters the gateway, what it may express, what evidence it requires, and what authority it cannot create.

MJ-PBMEF Pink Paper - Volume II

Formula Gateway Bindings F-001 through F-050

Michael Bangel - Author and Architect

August 2026

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Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Verification method

Each formula receives the same twenty-construct Bangel identity, a gateway-stage assignment, a life-cycle example, and explicit evidence and ethics boundaries. The repetitive structure is intentional: it allows formula-by-formula founder review and later automated completeness checking.

F-001 - R1 transition

Exact expression

R0 -> R1

Meaning. R1 is the unidentified transitionary phase.
Bound manifestations. Bangel , JP, JO
Gateway stage. R0/R1/R2 state transition and evidence classification

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_001
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO
Declaration	formula F-001 'R1 transition'
Definition	R1 is the unidentified transitionary phase.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JP, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R0/R1/R2 state transition and evidence classification
Expression	R0 -> R1
Statement	When typed inputs and evidence gates pass, evaluate F-001; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: state; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-001', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-001); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-001 and applicable family/product/representation white papers
Type	state
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R0/R1/R2 state transition and evidence classification'; physical_validation=false; authority=false

2.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_001 : Formula<state>
  definition "R1 is the unidentified transitionary phase."
  expression `R0 -> R1`
  participants ["Bangel ", "JP", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

2.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-001 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-002 - R2 transition

Exact expression

R1 --validated--> R2

Meaning. R2 is the immutable living static representation.

Bound manifestations. JP, MK, J0

Gateway stage. R0/R1/R2 state transition and evidence classification

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_002
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJO
Declaration	formula F-002 'R2 transition'
Definition	R2 is the immutable living static representation.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	JP, MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R0/R1/R2 state transition and evidence classification
Expression	R1 --validated--> R2
Statement	When typed inputs and evidence gates pass, evaluate F-002; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: state; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-002', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-002); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-002 and applicable family/product/representation white papers
Type	state
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R0/R1/R2 state transition and evidence classification'; physical_validation=false; authority=false

3.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_002 : Formula<state>
  definition "R2 is the immutable living static representation."
  expression `R1 --validated--> R2`
  participants ["JP", "MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

3.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-002 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-003 - Unknown invariant

Exact expression

UNKNOWN != 0

Meaning. Unknown may not coerce to zero, pass, harmlessness, or permission.

Bound manifestations. Bangel , JO, WATER

Gateway stage. R0/R1/R2 state transition and evidence classification

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_003
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JO, MJ.PBMEF.Family.WATER
Declaration	formula F-003 'Unknown invariant'
Definition	Unknown may not coerce to zero, pass, harmlessness, or permission.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JO, WATER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R0/R1/R2 state transition and evidence classification
Expression	UNKNOWN != 0
Statement	When typed inputs and evidence gates pass, evaluate F-003; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-003', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-003); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-003 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R0/R1/R2 state transition and evidence classification'; physical_validation=false; authority=false

4.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_003 : Formula<logical>
  definition "Unknown may not coerce to zero, pass, harmlessness, or permission."
  expression `UNKNOWN != 0`
  participants ["Bangel ", "JO", "WATER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

4.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-003 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-004 - Mass inflection

Exact expression

m_floor = 23 mg

Meaning. Pre-observational model floor, not a universal minimum or product mass.

Bound manifestations. JP, MK, EVE, J0

Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_004
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.J0
Declaration	formula F-004 'Mass inflection'
Definition	Pre-observational model floor, not a universal minimum or product mass.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, EVE, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	m_floor = 23 mg
Statement	When typed inputs and evidence gates pass, evaluate F-004; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-004', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-004); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	23
Reference	pathways/FORMULA-REGISTER.json#F-004 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

5.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_004 : Formula<mass>
  definition "Pre-observational model floor, not a universal minimum or product mass."
  expression `m_floor = 23 mg`
  participants ["JP", "MK", "EVE", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

5.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-004 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-005 - Noise smoothing

Exact expression

$$n_bar[t] = 0.9*n_bar[t-1] + 0.1*n[t]$$

Meaning. Drip-level smoothing.

Bound manifestations. SISTER, JO, MK

Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_005
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MK
Declaration	formula F-005 'Noise smoothing'
Definition	Drip-level smoothing.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, JO, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	$n_bar[t] = 0.9*n_bar[t-1] + 0.1*n[t]$
Statement	When typed inputs and evidence gates pass, evaluate F-005; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-005', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-005); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.9, 1, 0.1
Reference	pathways/FORMULA-REGISTER.json#F-005 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

6.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_005 : Formula<dimensionless>
  definition "Drip-level smoothing."
  expression `n_bar[t] = 0.9*n_bar[t-1] + 0.1*n[t]`
  participants ["SISTER", "JO", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

6.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-005 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-006 - Trend estimator

Exact expression

$$n_dot[t] = (2/3)*n_dot[t-1] + (1/3)*(n_bar[t]-n_bar[t-1])/dt$$

Meaning. One-third trend update.
Bound manifestations. SISTER, J0, MK
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_006
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.MK
Declaration	formula F-006 'Trend estimator'
Definition	One-third trend update.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, J0, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	R1 prediction and normal-constellation calibration before N1
Expression	$n_dot[t] = (2/3)*n_dot[t-1] + (1/3)*(n_bar[t]-n_bar[t-1])/dt$
Statement	When typed inputs and evidence gates pass, evaluate F-006; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: 1/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-006', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-006); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-006 and applicable family/product/representation white papers
Type	1/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

7.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_006 : Formula<1/time>
  definition "One-third trend update."
  expression `n_dot[t] = (2/3)*n_dot[t-1] + (1/3)*(n_bar[t]-n_bar[t-1])/dt`
  participants ["SISTER", "J0", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

7.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-006 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-007 - Anti-spike gate

Exact expression

support>=3 of 5 AND 3 qualified windows

Meaning. Single spike cannot trigger full reweighting.
Bound manifestations. SISTER, ANGELS, JO
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_007
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.JO
Declaration	formula F-007 'Anti-spike gate'
Definition	Single spike cannot trigger full reweighting.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	SISTER, ANGELS, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	support>=3 of 5 AND 3 qualified windows
Statement	When typed inputs and evidence gates pass, evaluate F-007; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-007', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-007); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	3, 5
Reference	pathways/FORMULA-REGISTER.json#F-007 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

8.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_007 : Formula<logical>
  definition "Single spike cannot trigger full reweighting."
  expression `support>=3 of 5 AND 3 qualified windows`
  participants ["SISTER", "ANGELS", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

8.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-007 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-008 - Prediction gain

Exact expression

$$g_i = 0.1 \cdot (2/3)^{(i-1)}$$

Meaning. Prediction influence decays across the nine-node path.
Bound manifestations. JP, SISTER, JO
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_008
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilySISTER, MJ.PBMEF.FamilyJO
Declaration	formula F-008 'Prediction gain'
Definition	Prediction influence decays across the nine-node path.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, SISTER, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	$g_i = 0.1 \cdot (2/3)^{(i-1)}$
Statement	When typed inputs and evidence gates pass, evaluate F-008; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-008', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-008); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.1, 2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-008 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

9.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_008 : Formula<dimensionless>
  definition "Prediction influence decays across the nine-node path."
  expression `g_i = 0.1*(2/3)^(i-1)`
  participants ["JP", "SISTER", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

9.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-008 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-009 - Covariance update

Exact expression

Sigma_next = 0.9*Sigma_prev + 0.1*e*e^T

Meaning. Positive-semidefinite sequential covariance.

Bound manifestations. JP, MK, J0

Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_009
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-009 'Covariance update'
Definition	Positive-semidefinite sequential covariance.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	R1 prediction and normal-constellation calibration before N1
Expression	Sigma_next = 0.9*Sigma_prev + 0.1*e*e^T
Statement	When typed inputs and evidence gates pass, evaluate F-009; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: normalized^2; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-009', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-009); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	0.9, 0.1
Reference	pathways/FORMULA-REGISTER.json#F-009 and applicable family/product/representation white papers
Type	normalized^2
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

10.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_009 : Formula<normalized^2>
  definition "Positive-semidefinite sequential covariance."
  expression `Sigma_next = 0.9*Sigma_prev + 0.1*e*e^T`
  participants ["JP", "MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

10.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-009 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-010 - Shadow depth

Exact expression

H = sqrt(lambda_max(Sigma))

Meaning. Uncertainty depth.
Bound manifestations. MK, SISTER, EVE
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_010
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE
Declaration	formula F-010 'Shadow depth'
Definition	Uncertainty depth.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, SISTER, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	H = sqrt(lambda_max(Sigma))
Statement	When typed inputs and evidence gates pass, evaluate F-010; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: normalized; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-010', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-010); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-010 and applicable family/product/representation white papers
Type	normalized
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

11.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_010 : Formula<normalized>
  definition "Uncertainty depth."
  expression `H = sqrt(lambda_max(Sigma))`
  participants ["MK", "SISTER", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

11.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-010 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-011 - Shadow growth rate

Exact expression

$$v_shadow = (H_next - H_prev) / dt$$

Meaning. Rate of uncertainty expansion or resolution.
Bound manifestations. MK, SISTER, JO
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_011
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.JO
Declaration	formula F-011 'Shadow growth rate'
Definition	Rate of uncertainty expansion or resolution.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, SISTER, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	$v_shadow = (H_next - H_prev) / dt$
Statement	When typed inputs and evidence gates pass, evaluate F-011; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: normalized/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-011', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-011); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-011 and applicable family/product/representation white papers
Type	normalized/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

12.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_011 : Formula<normalized/time>
  definition "Rate of uncertainty expansion or resolution."
  expression `v_shadow = (H_next-H_prev)/dt`
  participants ["MK", "SISTER", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

12.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-011 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-012 - Front-end allocation

Exact expression

a0 = 48383829/100000000

Meaning. Exact initial N1 logical allocation.

Bound manifestations. Bangel , JP, JO, M3

Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_012
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3
Declaration	formula F-012 'Front-end allocation'
Definition	Exact initial N1 logical allocation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	Bangel , JP, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	a0 = 48383829/100000000
Statement	When typed inputs and evidence gates pass, evaluate F-012; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-012', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-012); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	48383829, 100000000
Reference	pathways/FORMULA-REGISTER.json#F-012 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

13.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_012 : Formula<ratio>
  definition "Exact initial N1 logical allocation."
  expression `a0 = 48383829/100000000`
  participants ["Bangel ", "JP", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

13.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-012 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-013 - Front-end reserve

Exact expression

r0 = 51616171/100000000

Meaning. Exact logical reserve.
Bound manifestations. JP, JO, M3
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_013
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3
Declaration	formula F-013 'Front-end reserve'
Definition	Exact logical reserve.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	r0 = 51616171/100000000
Statement	When typed inputs and evidence gates pass, evaluate F-013; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-013', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-013); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	51616171, 100000000
Reference	pathways/FORMULA-REGISTER.json#F-013 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

14.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_013 : Formula<ratio>
  definition "Exact logical reserve."
  expression `r0 = 51616171/100000000`
  participants ["JP", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

14.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-013 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-014 - Bounded allocation update

Exact expression

w_next = projection((2/3)w + (1/3)w_target)

Meaning. Nonnegative, sum-to-one, per-step change ≤ 0.1 .
Bound manifestations. JP, JO, M3
Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_014
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3
Declaration	formula F-014 'Bounded allocation update'
Definition	Nonnegative, sum-to-one, per-step change ≤ 0.1 .
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	w_next = projection((2/3)w + (1/3)w_target)
Statement	When typed inputs and evidence gates pass, evaluate F-014; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-014', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-014); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-014 and applicable family/product/representation white papers
Type	ratio vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

15.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_014 : Formula<ratio vector>
  definition "Nonnegative, sum-to-one, per-step change  $\leq 0.1$ ."
  expression `w_next = projection((2/3)w + (1/3)w_target)`
  participants ["JP", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

15.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-014 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-015 - Request memory

Exact expression

M_request = lambda_hat * bytes_per_request * latency_hat

Meaning. Predicted request memory.
Bound manifestations. J0, M3, MJOS
Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_015
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3, MJ.PBMEF.FamilyMJOS
Declaration	formula F-015 'Request memory'
Definition	Predicted request memory.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MJOS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	M_request = lambda_hat * bytes_per_request * latency_hat
Statement	When typed inputs and evidence gates pass, evaluate F-015; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: bytes; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-015', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-015); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-015 and applicable family/product/representation white papers
Type	bytes
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

16.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_015 : Formula<bytes>
  definition "Predicted request memory."
  expression `M_request = lambda_hat * bytes_per_request * latency_hat`
  participants ["J0", "M3", "MJOS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

16.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-015 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-016 - Memory preallocation

Exact expression

M_pre = M_request + M_sync + M_residual + M_evidence + M_headroom

Meaning. Preallocate before reserve exhaustion.
Bound manifestations. J0, M3, SISTER
Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_016
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.SISTER
Declaration	formula F-016 'Memory preallocation'
Definition	Preallocate before reserve exhaustion.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	J0, M3, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	M_pre = M_request + M_sync + M_residual + M_evidence + M_headroom
Statement	When typed inputs and evidence gates pass, evaluate F-016; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: bytes; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-016', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-016); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-016 and applicable family/product/representation white papers
Type	bytes
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

17.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_016 : Formula<bytes>
  definition "Preallocate before reserve exhaustion."
  expression `M_pre = M_request + M_sync + M_residual + M_evidence + M_headroom`
  participants ["J0", "M3", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

17.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-016 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-017 - Hard flush

Exact expression

QUIESCE -> SEAL -> CHECKPOINT -> DETACH -> RECLAIM

Meaning. No silent deletion or uncleared reuse.
Bound manifestations. J0, M3, MJOS
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_017
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3, MJ.PBMEF.FamilyMJOS
Declaration	formula F-017 'Hard flush'
Definition	No silent deletion or uncleared reuse.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MJOS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	QUIESCE -> SEAL -> CHECKPOINT -> DETACH -> RECLAIM
Statement	When typed inputs and evidence gates pass, evaluate F-017; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: state sequence; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-017', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-017); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-017 and applicable family/product/representation white papers
Type	state sequence
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

18.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_017 : Formula<state sequence>
  definition "No silent deletion or uncleared reuse."
  expression `QUIESCE -> SEAL -> CHECKPOINT -> DETACH -> RECLAIM`
  participants ["J0", "M3", "MJOS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

18.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-017 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-018 - Charge balance

Exact expression

dQ/dt = I_intake - I_leak - I_release

Meaning. Static-intake charge accounting.
Bound manifestations. JP, MK, EVE, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_018
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyEVE, MJ.PBMEF.FamilyJO
Declaration	formula F-018 'Charge balance'
Definition	Static-intake charge accounting
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	dQ/dt = I_intake - I_leak - I_release
Statement	When typed inputs and evidence gates pass, evaluate F-018; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: charge/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-018', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-018); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-018 and applicable family/product/representation white papers
Type	charge/time
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

19.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_018 : Formula<charge/time>
  definition "Static-intake charge accounting."
  expression `dQ/dt = I_intake - I_leak - I_release`
  participants ["JP", "MK", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

19.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-018 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-019 - Capacitor energy

Exact expression

E = 0.5*C*V^2

Meaning. Valid only for evidenced constant capacitance.

Bound manifestations. JP, MK, JO

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_019
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJO
Declaration	formula F-019 'Capacitor energy'
Definition	Valid only for evidenced constant capacitance.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	E = 0.5*C*V^2
Statement	When typed inputs and evidence gates pass, evaluate F-019; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-019', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-019); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.5, 2
Reference	pathways/FORMULA-REGISTER.json#F-019 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

20.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_019 : Formula<energy>
  definition "Valid only for evidenced constant capacitance."
  expression `E = 0.5*C*V^2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

20.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-019 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-020 - General stored energy

Exact expression

E = integral V(q)dq

Meaning. General charge-storage energy.
Bound manifestations. JP, MK
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_020
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK
Declaration	formula F-020 'General stored energy'
Definition	General charge-storage energy.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	E = integral V(q)dq
Statement	When typed inputs and evidence gates pass, evaluate F-020; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-020', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-020); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-020 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

21.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_020 : Formula<energy>
  definition "General charge-storage energy."
  expression `E = integral V(q)dq`
  participants ["JP", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

21.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-020 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-021 - Energy balance

Exact expression

$$r_E = E_in - \Delta E_storage - E_delivered - E_containment - E_loss$$

Meaning. Energy residual must be inside uncertainty.
Bound manifestations. MK, JO, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_021
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-021 'Energy balance'
Definition	Energy residual must be inside uncertainty.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$r_E = E_in - \Delta E_storage - E_delivered - E_containment - E_loss$
Statement	When typed inputs and evidence gates pass, evaluate F-021; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-021', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-021); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-021 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

22.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_021 : Formula<energy>
  definition "Energy residual must be inside uncertainty."
  expression `r_E = E_in - DeltaE_storage - E_delivered - E_containment - E_loss`
  participants ["MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

22.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-021 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-022 - Mass balance

Exact expression

$$r_M = M_{\text{initial}} + M_{\text{inputs}} - M_{\text{final}} - M_{\text{outputs}}$$

Meaning. Physical mass conservation.
Bound manifestations. MK, EVE, JO, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_022
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-022 'Mass balance'
Definition	Physical mass conservation.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$r_M = M_{\text{initial}} + M_{\text{inputs}} - M_{\text{final}} - M_{\text{outputs}}$
Statement	When typed inputs and evidence gates pass, evaluate F-022; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-022', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-022); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-022 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

23.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_022 : Formula<mass>
  definition "Physical mass conservation."
  expression `r_M = M_initial + M_inputs - M_final - M_outputs`
  participants ["MK", "EVE", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

23.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-022 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-023 - EVE screen balance

Exact expression

M_screen_in = M_captured + M_passed + M_retained + r_screen

Meaning. Screen capture never assumes perfect retention.
Bound manifestations. EVE, MK, JO, MERMAID
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_023
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-023 'EVE screen balance'
Definition	Screen capture never assumes perfect retention.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	EVE, MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	M_screen_in = M_captured + M_passed + M_retained + r_screen
Statement	When typed inputs and evidence gates pass, evaluate F-023; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-023', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-023); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-023 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

24.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_023 : Formula<mass>
  definition "Screen capture never assumes perfect retention."
  expression `M_screen_in = M_captured + M_passed + M_retained + r_screen`
  participants ["EVE", "MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

24.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-023 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-024 - EVE evaporation

Exact expression

M_evap = integral integral J_m dA dt

Meaning. Evaporative mass from flux across area and time.
Bound manifestations. EVE, MK, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_024
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-024 'EVE evaporation'
Definition	Evaporative mass from flux across area and time.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	EVE, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	M_evap = integral integral J_m dA dt
Statement	When typed inputs and evidence gates pass, evaluate F-024; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-024', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-024); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-024 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

25.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_024 : Formula<mass>
  definition "Evaporative mass from flux across area and time."
  expression `M_evap = integral integral J_m dA dt`
  participants ["EVE", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

25.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-024 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-025 - Upward force

Exact expression

$$F_z = qE_z + F_b - mg - D_z - F_{\text{contact}} - F_{\text{adhesion}}$$

Meaning. Upward motion requires positive conservative lower bound.
Bound manifestations. MK, EVE, BELLE
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_025
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.BELLE
Declaration	formula F-025 'Upward force'
Definition	Upward motion requires positive conservative lower bound.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, BELLE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$F_z = qE_z + F_b - mg - D_z - F_{\text{contact}} - F_{\text{adhesion}}$
Statement	When typed inputs and evidence gates pass, evaluate F-025; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: force; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-025', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-025); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-025 and applicable family/product/representation white papers
Type	force
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

26.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_025 : Formula<force>
  definition "Upward motion requires positive conservative lower bound."
  expression `F_z = qE_z + F_b - mg - D_z - F_contact - F_adhesion`
  participants ["MK", "EVE", "BELLE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

26.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-025 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-026 - Coordinate mapping

Exact expression

$$p_P(x,y,z)=o_P+x*a_P+y*b_P+z*c_P$$

Meaning. Normalized topology to profile physical coordinates.
Bound manifestations. JP, MK, BELLE, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_026
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,BELLE, MJ.PBMEF.Family,JO
Declaration	formula F-026 'Coordinate mapping'
Definition	Normalized topology to profile physical coordinates.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, BELLE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$p_P(x,y,z)=o_P+x*a_P+y*b_P+z*c_P$
Statement	When typed inputs and evidence gates pass, evaluate F-026; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-026', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-026); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-026 and applicable family/product/representation white papers
Type	length vector
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

27.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_026 : Formula<length vector>
  definition "Normalized topology to profile physical coordinates."
  expression `p_P(x,y,z)=o_P+x*a_P+y*b_P+z*c_P`
  participants ["JP", "MK", "BELLE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

27.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-026 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-027 - Sister physical umbrella count

Exact expression

$$N_U = \max_k \text{ceil}(E_k / ((1-h_k) * C_{Uk}))$$

Meaning. Canonical pre-Pearl physical containment count; requires measured profile-specific capacity and headroom.

Bound manifestations. SISTER, MK, JO, M3

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_027
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3
Declaration	formula F-027 'Sister physical umbrella count'
Definition	Canonical pre-Pearl physical containment count; requires measured profile-specific capacity and headroom.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, MK, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$N_U = \max_k \text{ceil}(E_k / ((1-h_k) * C_{Uk}))$
Statement	When typed inputs and evidence gates pass, evaluate F-027; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-027', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-027); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-027 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

28.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_027 : Formula<count>
  definition "Canonical pre-Pearl physical containment count; requires measured
  ↪ profile-specific capacity and headroom."
  expression `N_U = max_k ceil(E_k/((1-h_k)*C_Uk))`
  participants ["SISTER", "MK", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

28.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-027 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-028 - Byte balance

Exact expression

r_B = B_alloc-B_active-B_released-B_retained-B_exported-B_compacted

Meaning. Discrete memory reconciliation requires zero residual unless transformed.

Bound manifestations. J0, M3, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_028
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MERMAID
Declaration	formula F-028 'Byte balance'
Definition	Discrete memory reconciliation requires zero residual unless transformed.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	r_B = B_alloc-B_active-B_released-B_retained-B_exported-B_compacted
Statement	When typed inputs and evidence gates pass, evaluate F-028; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: bytes; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-028', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-028); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-028 and applicable family/product/representation white papers
Type	bytes
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

29.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_028 : Formula<bytes>
  definition "Discrete memory reconciliation requires zero residual unless transformed."
  expression `r_B = B_alloc-B_active-B_released-B_retained-B_exported-B_compacted`
  participants ["J0", "M3", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

29.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-028 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-029 - Residual consequence

Exact expression

C_B = integral B_residual(t)dt

Meaning. Time-weighted residual memory consequence.

Bound manifestations. J0, M3, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_029
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3, MJ.PBMEF.FamilyMERMAID
Declaration	formula F-029 'Residual consequence'
Definition	Time-weighted residual memory consequence.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	C_B = integral B_residual(t)dt
Statement	When typed inputs and evidence gates pass, evaluate F-029; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: byte-seconds; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-029', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-029); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-029 and applicable family/product/representation white papers
Type	byte-seconds
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

30.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_029 : Formula<byte-seconds>
  definition "Time-weighted residual memory consequence."
  expression `C_B = integral B_residual(t)dt`
  participants ["J0", "M3", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

30.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-029 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-030 - Protected liquidity

Exact expression

L_protected_H = 0_near_H+R_emergency_H+R_tax_H+R_fees_H+U_cash_H

Meaning. Liquidity first.

Bound manifestations. SHIVA, MERMAID, MK, JO

Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_030
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-030 'Protected liquidity'
Definition	Liquidity first.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	L_protected_H = 0_near_H+R_emergency_H+R_tax_H+R_fees_H+U_cash_H
Statement	When typed inputs and evidence gates pass, evaluate F-030; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-030', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-030); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-030 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

31.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_030 : Formula<currency>
  definition "Liquidity first."
  expression `L_protected_H = 0_near_H+R_emergency_H+R_tax_H+R_fees_H+U_cash_H`
  participants ["SHIVA", "MERMAID", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

31.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-030 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-031 - Investable surplus

Exact expression

S_investable_L = max(0,L_available_L-L_protected_H)

Meaning. Only surplus may enter risk analysis.
Bound manifestations. SHIVA, MERMAID, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_031
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-031 'Investable surplus'
Definition	Only surplus may enter risk analysis.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	S_investable_L = max(0,L_available_L-L_protected_H)
Statement	When typed inputs and evidence gates pass, evaluate F-031; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-031', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-031); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-031 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

32.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_031 : Formula<currency>
  definition "Only surplus may enter risk analysis."
  expression `S_investable_L = max(0,L_available_L-L_protected_H)`
  participants ["SHIVA", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

32.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-031 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-032 - Risk-capital ceiling

Exact expression

A_risk_max = min(S_investable_L,L_risk,L_product,L_regulatory,L_custody,L_concentration)

Meaning. Hard minimum across constraints.

Bound manifestations. SHIVA, MERMAID, MK, MJ

Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_032
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.MJ
Declaration	formula F-032 'Risk-capital ceiling'
Definition	Hard minimum across constraints.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, MK, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	A_risk_max = min(S_investable_L,L_risk,L_product,L_regulatory,L_custody,L_concentration)
Statement	When typed inputs and evidence gates pass, evaluate F-032; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-032', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-032); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-032 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

33.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_032 : Formula<currency>
  definition "Hard minimum across constraints."
  expression `A_risk_max =
↵ min(S_investable_L,L_risk,L_product,L_regulatory,L_custody,L_concentration)`
  participants ["SHIVA", "MERMAID", "MK", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

33.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-032 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-033 - Portfolio concentration

Exact expression

$$C_i = \text{abs}(V_{i_H})/V_{\text{portfolio_L}}$$

Meaning. Asset concentration.

Bound manifestations. SHIVA, MERMAID, JO

Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_033
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-033 'Portfolio concentration'
Definition	Asset concentration.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	$C_i = \text{abs}(V_{i_H})/V_{\text{portfolio_L}}$
Statement	When typed inputs and evidence gates pass, evaluate F-033; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-033', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-033); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-033 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

34.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_033 : Formula<ratio>
  definition "Asset concentration."
  expression `C_i = abs(V_i_H)/V_portfolio_L`
  participants ["SHIVA", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

34.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-033 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-034 - Portfolio variance

Exact expression

$$\text{sigma_p}^2 = \text{w}^T \text{Sigma w}$$

Meaning. Portfolio variance with evidenced covariance.

Bound manifestations. SHIVA, MERMAID, MK

Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_034
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MK
Declaration	formula F-034 'Portfolio variance'
Definition	Portfolio variance with evidenced covariance.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	$\text{sigma_p}^2 = \text{w}^T \text{Sigma w}$
Statement	When typed inputs and evidence gates pass, evaluate F-034; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: return^2; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-034', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-034); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-034 and applicable family/product/representation white papers
Type	return^2
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

35.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_034 : Formula<return^2>
  definition "Portfolio variance with evidenced covariance."
  expression `sigma_p^2 = w^T Sigma w`
  participants ["SHIVA", "MERMAID", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

35.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-034 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-035 - Capital friction

Exact expression

F_capital_H = fees+spread+slippage+tax+custody+compliance+latency

Meaning. Typed transactional friction.
Bound manifestations. MK, SHIVA, MERMAID
Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_035
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID
Declaration	formula F-035 'Capital friction'
Definition	Typed transactional friction.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, SHIVA, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	F_capital_H = fees+spread+slippage+tax+custody+compliance+latency
Statement	When typed inputs and evidence gates pass, evaluate F-035; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-035', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-035); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-035 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

36.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_035 : Formula<currency>
  definition "Typed transactional friction."
  expression `F_capital_H = fees+spread+slippage+tax+custody+compliance+latency`
  participants ["MK", "SHIVA", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

36.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-035 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-036 - Opportunity lower bound

Exact expression

O_L = Return_L-F_capital_H-RiskPenalty_H-LiquidityPenalty_H-RegulatoryUncertainty_H

Meaning. Conservative opportunity result.

Bound manifestations. SHIVA, MK, MERMAID, MJ

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_036
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MJ
Declaration	formula F-036 'Opportunity lower bound'
Definition	Conservative opportunity result.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MK, MERMAID, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	O_L = Return_L-F_capital_H-RiskPenalty_H-LiquidityPenalty_H-RegulatoryUncertainty_H
Statement	When typed inputs and evidence gates pass, evaluate F-036; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-036', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-036); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-036 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

37.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_036 : Formula<currency>
  definition "Conservative opportunity result."
  expression `O_L =
    ↵ Return_L-F_capital_H-RiskPenalty_H-LiquidityPenalty_H-RegulatoryUncertainty_H`
  participants ["SHIVA", "MK", "MERMAID", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

37.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-036 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-037 - Abundance objective

Exact expression

A = sum(alpha_i*P_i)-sum(beta_j*N_j)

Meaning. Only valid with precommitted weights and compatible scales.

Bound manifestations. SHIVA, MK, JO, MJ

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_037
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MJ
Declaration	formula F-037 'Abundance objective'
Definition	Only valid with precommitted weights and compatible scales.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MK, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	A = sum(alpha_i*P_i)-sum(beta_j*N_j)
Statement	When typed inputs and evidence gates pass, evaluate F-037; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: declared score; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-037', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-037); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-037 and applicable family/product/representation white papers
Type	declared score
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

38.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_037 : Formula<declared score>
  definition "Only valid with precommitted weights and compatible scales."
  expression `A = sum(alpha_i*P_i)-sum(beta_j*N_j)`
  participants ["SHIVA", "MK", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

38.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-037 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-038 - SHIVAS eligible value

Exact expression

V_eligible_L=max(0,V_verified_L-L_known_H-U_valuation_H)

Meaning. Internal valuation lower bound.
Bound manifestations. SHIVA, MERMAID, JO
Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_038
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-038 'SHIVAS eligible value'
Definition	Internal valuation lower bound.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	V_eligible_L=max(0,V_verified_L-L_known_H-U_valuation_H)
Statement	When typed inputs and evidence gates pass, evaluate F-038; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-038', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-038); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-038 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

39.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_038 : Formula<currency>
  definition "Internal valuation lower bound."
  expression `V_eligible_L=max(0,V_verified_L-L_known_H-U_valuation_H)`
  participants ["SHIVA", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

39.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-038 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-039 - SHIVAS ceiling

Exact expression

N_max=floor(V_eligible_L/B_unit_H)

Meaning. Only when backing, rights, classification, and evidence are known.
Bound manifestations. SHIVA, MERMAID, MJ
Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_039
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MJ
Declaration	formula F-039 'SHIVAS ceiling'
Definition	Only when backing, rights, classification, and evidence are known.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	N_max=floor(V_eligible_L/B_unit_H)
Statement	When typed inputs and evidence gates pass, evaluate F-039; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-039', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-039); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-039 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

40.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_039 : Formula<count>
  definition "Only when backing, rights, classification, and evidence are known."
  expression `N_max=floor(V_eligible_L/B_unit_H)`
  participants ["SHIVA", "MERMAID", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

40.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-039 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-040 - MK state model

Exact expression

$$x[t+1]=F(x[t],u[t],\theta,e[t])+w[t];\; y[t]=H(x[t])+v[t]$$

Meaning. General physics state and observation representation.
Bound manifestations. MK, JP, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_040
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO
Declaration	formula F-040 'MK state model'
Definition	General physics state and observation representation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JP, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$x[t+1]=F(x[t],u[t],\theta,e[t])+w[t];\; y[t]=H(x[t])+v[t]$
Statement	When typed inputs and evidence gates pass, evaluate F-040; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: typed state; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-040', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-040); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-040 and applicable family/product/representation white papers
Type	typed state
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

41.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_040 : Formula<typed state>
  definition "General physics state and observation representation."
  expression `x[t+1]=F(x[t],u[t],theta,e[t])+w[t]; y[t]=H(x[t])+v[t]`
  participants ["MK", "JP", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

41.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-040 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-041 - Dimensional integrity

Exact expression

dim(LHS)=dim(RHS)

Meaning. Every physical equality must be dimensionally valid.

Bound manifestations. MK, JO

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_041
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-041 'Dimensional integrity'
Definition	Every physical equality must be dimensionally valid.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	dim(LHS)=dim(RHS)
Statement	When typed inputs and evidence gates pass, evaluate F-041; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimension equality; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-041', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-041); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-041 and applicable family/product/representation white papers
Type	dimension equality
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

42.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_041 : Formula<dimension equality>
  definition "Every physical equality must be dimensionally valid."
  expression `dim(LHS)=dim(RHS)`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

42.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-041 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-042 - Conservation residual

Exact expression

r_q=q_in-q_out-Deltaq-q_loss

Meaning. Pass only when $|r_q| \leq U_q$.
Bound manifestations. MK, JO, EVE, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_042
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID
Declaration	formula F-042 'Conservation residual'
Definition	Pass only when $ r_q \leq U_q$.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, EVE, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$r_q = q_{in} - q_{out} - \Delta q - q_{loss}$
Statement	When typed inputs and evidence gates pass, evaluate F-042; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: quantity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-042', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-042); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-042 and applicable family/product/representation white papers
Type	quantity
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

43.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_042 : Formula<quantity>
  definition "Pass only when  $|r_q| \leq U_q$ ."
  expression `r_q=q_in-q_out-Deltaq-q_loss`
  participants ["MK", "JO", "EVE", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

43.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-042 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-043 - Pearl simulation ellipsoid volume

Exact expression

$$V_P=(4/3)*\pi*a*b*c$$

Meaning. Hypothetical pearl-shaped simulation geometry; no physical container or dimension claim.

Bound manifestations. MK, SISTER, EVE, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_043
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-043 'Pearl simulation ellipsoid volume'
Definition	Hypothetical pearl-shaped simulation geometry; no physical container or dimension claim.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, SISTER, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$V_P=(4/3)*\pi*a*b*c$
Statement	When typed inputs and evidence gates pass, evaluate F-043; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-043', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-043); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	4, 3
Reference	pathways/FORMULA-REGISTER.json#F-043 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

44.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_043 : Formula<volume>
  definition "Hypothetical pearl-shaped simulation geometry; no physical container or
  ↪ dimension claim."
  expression `V_P=(4/3)*pi*a*b*c`
  participants ["MK", "SISTER", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

44.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-043 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-044 - Pearl simulation surface-area approximation

Exact expression

$$A_P \sim 4 \pi * ((a^p * b^p + a^p * c^p + b^p * c^p) / 3)^{(1/p)}, \quad p = 1.6075$$

Meaning. Hypothetical simulation geometry approximation; no physical wall or surface claim.

Bound manifestations. MK, BELLE, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_044
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.BELLE, MJ.PBMEF.Family.JO
Declaration	formula F-044 'Pearl simulation surface-area approximation'
Definition	Hypothetical simulation geometry approximation; no physical wall or surface claim.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, BELLE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$A_P \sim 4 \pi * ((a^p * b^p + a^p * c^p + b^p * c^p) / 3)^{(1/p)}, \quad p = 1.6075$
Statement	When typed inputs and evidence gates pass, evaluate F-044; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-044', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-044); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	4, 3, 1, 1.6075
Reference	pathways/FORMULA-REGISTER.json#F-044 and applicable family/product/representation white papers
Type	area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

45.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_044 : Formula<area>
  definition "Hypothetical simulation geometry approximation; no physical wall or surface
  claim."
  expression `A_P~=4*pi*((a^p*b^p+a^p*c^p+b^p*c^p)/3)^(1/p), p=1.6075`
  participants ["MK", "BELLE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

45.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-044 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-045 - Pearl simulation exposure ratio

Exact expression

chi_P=A_P/V_P

Meaning. Simulation comparison metric only; not physical breach or exposure evidence.
Bound manifestations. MK, BELLE, EVE
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_045
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.BELLE, MJ.PBMEF.Family.EVE
Declaration	formula F-045 'Pearl simulation exposure ratio'
Definition	Simulation comparison metric only; not physical breach or exposure evidence.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, BELLE, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	chi_P=A_P/V_P
Statement	When typed inputs and evidence gates pass, evaluate F-045; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: 1/length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-045', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-045); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-045 and applicable family/product/representation white papers
Type	1/length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

46.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_045 : Formula<1/length>
  definition "Simulation comparison metric only; not physical breach or exposure evidence."
  expression `chi_P=A_P/V_P`
  participants ["MK", "BELLE", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

46.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-045 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-046 - Pearl simulation capacity slack

Exact expression

$$S_Pk=(1-h_Pk)*C_Pk-L_Pk$$

Meaning. Remaining typed simulation/information capacity after declared headroom.
Bound manifestations. SISTER, EVE, M3, MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_046
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK
Declaration	formula F-046 'Pearl simulation capacity slack'
Definition	Remaining typed simulation/information capacity after declared headroom.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, M3, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$S_Pk=(1-h_Pk)*C_Pk-L_Pk$
Statement	When typed inputs and evidence gates pass, evaluate F-046; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: quantity_k; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-046', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-046); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-046 and applicable family/product/representation white papers
Type	quantity_k
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

47.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_046 : Formula<quantity_k>
  definition "Remaining typed simulation/information capacity after declared headroom."
  expression `S_Pk=(1-h_Pk)*C_Pk-L_Pk`
  participants ["SISTER", "EVE", "M3", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

47.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-046 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-047 - Pearl simulation saturation ratio

Exact expression

$$\text{beta_P}=\text{max_k}(\text{L_Pk}/((1-\text{h_Pk})*\text{C_Pk}))$$

Meaning. Simulation saturation condition only; not physical breach resistance.

Bound manifestations. MK, ANGELS, BELLATRIX, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_047
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.BELLATRIX, MJ.PBMEF.Family.JO
Declaration	formula F-047 'Pearl simulation saturation ratio'
Definition	Simulation saturation condition only; not physical breach resistance.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, ANGELS, BELLATRIX, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	beta_P=max_k(L_Pk/((1-h_Pk)*C_Pk))
Statement	When typed inputs and evidence gates pass, evaluate F-047; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-047', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-047); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-047 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

48.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_047 : Formula<ratio>
  definition "Simulation saturation condition only; not physical breach resistance."
  expression `beta_P=max_k(L_Pk/((1-h_Pk)*C_Pk))`
  participants ["MK", "ANGELS", "BELLATRIX", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

48.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-047 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-048 - Pearl simulation object count

Exact expression

$$N_P = \max_k \text{ ceil}(E_k / ((1 - h_Pk) * C_Pk))$$

Meaning. Number of hypothetical simulation objects needed for declared information/resource dimensions.

Bound manifestations. SISTER, EVE, M3, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_048
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK
Declaration	formula F-048 'Pearl simulation object count'
Definition	Number of hypothetical simulation objects needed for declared information/resource dimensions.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, M3, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$N_P = \max_k \text{ ceil}(E_k / ((1 - h_Pk) * C_Pk))$
Statement	When typed inputs and evidence gates pass, evaluate F-048; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-048', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-048); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-048 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

49.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_048 : Formula<count>
  definition "Number of hypothetical simulation objects needed for declared
  ↪ information/resource dimensions."
  expression `N_P=max_k ceil(E_k/((1-h_Pk)*C_Pk))`
  participants ["SISTER", "EVE", "M3", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

49.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-048 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-049 - Pearl simulation accounting balance

Exact expression

r_Pk=q_in-q_captured-q_transferred-q_retained-q_escaped-Deltaq_stored

Meaning. Simulation/accounting conservation across retained, transferred, escaped-observation, and stored information.

Bound manifestations. EVE, MK, JO, MERMAID

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_049
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-049 'Pearl simulation accounting balance'
Definition	Simulation/accounting conservation across retained, transferred, escaped-observation, and stored information.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	r_Pk=q_in-q_captured-q_transferred-q_retained-q_escaped-Deltaq_stored
Statement	When typed inputs and evidence gates pass, evaluate F-049; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: quantity_k; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-049', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-049); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-049 and applicable family/product/representation white papers
Type	quantity_k
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

50.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_049 : Formula<quantity_k>
  definition "Simulation/accounting conservation across retained, transferred,
  ↵ escaped-observation, and stored information."
  expression `r_Pk=q_in-q_captured-q_transferred-q_retained-q_escaped-Deltaq_stored`
  participants ["EVE", "MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
```

}

50.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-049 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-050 - Pearl simulated transfer opportunity

Exact expression

$$T_{ij,k} = \min([S_{jk}]_+, [Q_{ik} - Q_{reserve_ik}]_+, C_{route_k})$$

Meaning. Simulated transfer opportunity bounded by declared logical capacities; no physical transfer.

Bound manifestations. SISTER, EVE, M3, MK, J0

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_050
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK
Declaration	formula F-050 'Pearl simulated transfer opportunity'
Definition	Simulated transfer opportunity bounded by declared logical capacities; no physical transfer.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, M3, MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	$T_{ij,k} = \min([S_{jk}]_+, [Q_{ik} - Q_{reserve_ik}]_+, C_{route_k})$
Statement	When typed inputs and evidence gates pass, evaluate F-050; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: quantity_k; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-050', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-050); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-050 and applicable family/product/representation white papers
Type	quantity_k
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

51.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_050 : Formula<quantity_k>
  definition "Simulated transfer opportunity bounded by declared logical capacities; no
  ↪ physical transfer."
  expression `T_ij,k=min([S_jk]_+, [Q_ik-Q_reserve_ik]_+,C_route_k)`
  participants ["SISTER", "EVE", "M3", "MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

51.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-050 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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MJ-PBMEF Pink Paper - Volume III

Formula Gateway Bindings F-051 through F-100

Michael Bangel - Author and Architect

August 2026

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Document control

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Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Verification method

Each formula receives the same twenty-construct Bangel identity, a gateway-stage assignment, a life-cycle example, and explicit evidence and ethics boundaries. The repetitive structure is intentional: it allows formula-by-formula founder review and later automated completeness checking.

F-051 - Pearl simulated regeneration vector

Exact expression

G_P=[G_mass,G_energy,G_bytes,G_time,G_capital]

Meaning. Hypothetical opportunity vector; creates no physical or capital value.

Bound manifestations. EVE, MERMAID, SHIVA, MK, JO

Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_051
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MK
Declaration	formula F-051 'Pearl simulated regeneration vector'
Definition	Hypothetical opportunity vector; creates no physical or capital value.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, MERMAID, SHIVA, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	G_P=[G_mass,G_energy,G_bytes,G_time,G_capital]
Statement	When typed inputs and evidence gates pass, evaluate F-051; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-051', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-051); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-051 and applicable family/product/representation white papers
Type	typed vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

2.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_051 : Formula<typed vector>
  definition "Hypothetical opportunity vector; creates no physical or capital value."
  expression `G_P=[G_mass,G_energy,G_bytes,G_time,G_capital]`
  participants ["EVE", "MERMAID", "SHIVA", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

2.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-051 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-052 - Pearl acoustic simulation wave-length

Exact expression

lambda_ac=c_medium/f_control

Meaning. Acoustic simulation variable under declared medium assumptions; no cohesion claim.

Bound manifestations. MK, EVE, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_052
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-052 'Pearl acoustic simulation wavelength'
Definition	Acoustic simulation variable under declared medium assumptions; no cohesion claim.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	lambda_ac=c_medium/f_control
Statement	When typed inputs and evidence gates pass, evaluate F-052; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-052', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-052); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-052 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

3.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_052 : Formula<length>
  definition "Acoustic simulation variable under declared medium assumptions; no cohesion
↵ claim."
  expression `lambda_ac=c_medium/f_control`
  participants ["MK", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

3.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-052 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-053 - Pearl acoustic simulation intensity

Exact expression

$$I_{ac}=p_{rms}^2/(\rho_{medium}*c_{medium})$$

Meaning. Reference simulation intensity only; no physical actuation claim.

Bound manifestations. MK, EVE, J0

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_053
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.J0
Declaration	formula F-053 'Pearl acoustic simulation intensity'
Definition	Reference simulation intensity only; no physical actuation claim.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, EVE, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	$I_{ac}=p_{rms}^2/(\rho_{medium}*c_{medium})$
Statement	When typed inputs and evidence gates pass, evaluate F-053; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: power/area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-053', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-053); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-053 and applicable family/product/representation white papers
Type	power/area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

4.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_053 : Formula<power/area>
  definition "Reference simulation intensity only; no physical actuation claim."
  expression `I_ac=p_rms^2/(rho_medium*c_medium)`
  participants ["MK", "EVE", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

4.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-053 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-054 - Pearl acoustic simulation energy

Exact expression

E_ac=integral(I_ac*A_effective)dt

Meaning. Hypothetical energy accounting for a future separately permitted experiment.

Bound manifestations. MK, EVE, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_054
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-054 'Pearl acoustic simulation energy'
Definition	Hypothetical energy accounting for a future separately permitted experiment.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	E_ac=integral(I_ac*A_effective)dt
Statement	When typed inputs and evidence gates pass, evaluate F-054; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-054', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-054); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-054 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

5.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_054 : Formula<energy>
  definition "Hypothetical energy accounting for a future separately permitted experiment."
  expression `E_ac=integral(I_ac*A_effective)dt`
  participants ["MK", "EVE", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

5.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-054 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-055 - Pearl acoustic simulation observability gate

Exact expression

f_sample>=2*gamma*f_control AND f_control in calibrated_band AND SNR_f>=SNR_min

Meaning. Simulation input must be measurable to be accounted for; observability is not actuation.

Bound manifestations. MK, JO, ANGELS

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_055
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS
Declaration	formula F-055 'Pearl acoustic simulation observability gate'
Definition	Simulation input must be measurable to be accounted for; observability is not actuation.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	MK, JO, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	f_sample>=2*gamma*f_control AND f_control in calibrated_band AND SNR_f>=SNR_min
Statement	When typed inputs and evidence gates pass, evaluate F-055; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-055', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-055); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-055 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

6.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_055 : Formula<logical>
  definition "Simulation input must be measurable to be accounted for; observability is not
  ↪ actuation."
  expression `f_sample>=2*gamma*f_control AND f_control in calibrated_band AND
  ↪ SNR_f>=SNR_min`
  participants ["MK", "JO", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
```

}

6.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-055 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-056 - Pearl acoustic simulation signal-to-noise

Exact expression

SNR_f=P_signal(f)/P_noise(f)

Meaning. Simulation signal-to-noise ratio; advisory and non-authorizing.

Bound manifestations. MK, SISTER, EVE, JO

Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_056
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-056 'Pearl acoustic simulation signal-to-noise'
Definition	Simulation signal-to-noise ratio; advisory and non-authorizing.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, SISTER, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	SNR_f=P_signal(f)/P_noise(f)
Statement	When typed inputs and evidence gates pass, evaluate F-056; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-056', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-056); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receive; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-056 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

7.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_056 : Formula<ratio>
  definition "Simulation signal-to-noise ratio; advisory and non-authorizing."
  expression `SNR_f=P_signal(f)/P_noise(f)`
  participants ["MK", "SISTER", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receive(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

7.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-056 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-057 - Pearl acoustic simulation transfer function

Exact expression

$$H_P(f)=Y_P(f)/U_P(f)$$

Meaning. Hypothetical or measured-later response mapping; no physical Pearl article exists.

Bound manifestations. MK, EVE, J0

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_057
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.J0
Declaration	formula F-057 'Pearl acoustic simulation transfer function'
Definition	Hypothetical or measured-later response mapping; no physical Pearl article exists.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, EVE, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	$H_P(f)=Y_P(f)/U_P(f)$
Statement	When typed inputs and evidence gates pass, evaluate F-057; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: output/input; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-057', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-057); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-057 and applicable family/product/representation white papers
Type	output/input
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

8.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_057 : Formula<output/input>
  definition "Hypothetical or measured-later response mapping; no physical Pearl article
  exists."
  expression `H_P(f)=Y_P(f)/U_P(f)`
  participants ["MK", "EVE", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

8.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-057 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-058 - Pearl acoustic simulation setpoint

Exact expression

$$f^* = \operatorname{argmin}_{\{f \text{ in } F_{\text{safe}}\}} (J_{\text{breach}} + \lambda E_{\text{ac}} + \lambda T_{\text{transfer}})$$

Meaning. Simulation candidate only; no physical control setpoint.

Bound manifestations. MK, BELLE, JO, MJ

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_058
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.BELLE, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MJ
Declaration	formula F-058 'Pearl acoustic simulation setpoint'
Definition	Simulation candidate only; no physical control setpoint.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, BELLE, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$f^* = \operatorname{argmin}_{\{f \text{ in } F_{\text{safe}}\}} (J_{\text{breach}} + \lambda E_{\text{ac}} + \lambda T_{\text{transfer}})$
Statement	When typed inputs and evidence gates pass, evaluate F-058; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: frequency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-058', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-058); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-058 and applicable family/product/representation white papers
Type	frequency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

9.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_058 : Formula<frequency>
  definition "Simulation candidate only; no physical control setpoint."
  expression `f*=argmin_{f in F_safe}(J_breach+lambda_E*E_ac+lambda_T*T_transfer)`
  participants ["MK", "BELLE", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

9.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-058 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-059 - Bounded Pearl acoustic simulation adjustment

Exact expression

f_next=clip((2/3)f+(1/3)f_target,f-df_max,f+df_max,f_min,f_max)

Meaning. One-third-damped simulation update only.

Bound manifestations. MK, J0, M3

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_059
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.M3
Declaration	formula F-059 'Bounded Pearl acoustic simulation adjustment'
Definition	One-third-damped simulation update only.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, J0, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	f_next=clip((2/3)f+(1/3)f_target,f-df_max,f+df_max,f_min,f_max)
Statement	When typed inputs and evidence gates pass, evaluate F-059; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: frequency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-059', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-059); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-059 and applicable family/product/representation white papers
Type	frequency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

10.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_059 : Formula<frequency>
  definition "One-third-damped simulation update only."
  expression `f_next=clip((2/3)f+(1/3)f_target,f-df_max,f+df_max,f_min,f_max)`
  participants ["MK", "J0", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

10.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-059 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-060 - Pearl simulation registry reconciliation

Exact expression

r_registry=N_allocated+N_received-N_transferred-N_closed-N_active

Meaning. Registry count reconciliation for simulation records, not physical containers.
Bound manifestations. MERMAID, SHIVA, M3, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_060
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.JO
Declaration	formula F-060 'Pearl simulation registry reconciliation'
Definition	Registry count reconciliation for simulation records, not physical containers.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MERMAID, SHIVA, M3, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	r_registry=N_allocated+N_received-N_transferred-N_closed-N_active
Statement	When typed inputs and evidence gates pass, evaluate F-060; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-060', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-060); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-060 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

11.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_060 : Formula<count>
  definition "Registry count reconciliation for simulation records, not physical containers."
  expression `r_registry=N_allocated+N_received-N_transferred-N_closed-N_active`
  participants ["MERMAID", "SHIVA", "M3", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

11.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-060 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-061 - Bangel Sheet cell state

Exact expression

C_ij=<value,unit,uncertainty,formula,revision,lineage,authority,evidence>

Meaning. Every cell is a governed measurement object, not an untyped mutable value.

Bound manifestations. Bangel , JP, MK, JO

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_061
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-061 'Bangel Sheet cell state'
Definition	Every cell is a governed measurement object, not an untyped mutable value.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	Bangel , JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	C_ij=<value,unit,uncertainty,formula,revision,lineage,authority,evidence>
Statement	When typed inputs and evidence gates pass, evaluate F-061; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed object; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-061', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-061); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-061 and applicable family/product/representation white papers
Type	typed object
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

12.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_061 : Formula<typed object>
  definition "Every cell is a governed measurement object, not an untyped mutable value."
  expression `C_ij=<value,unit,uncertainty,formula,revision,lineage,authority,evidence>`
  participants ["Bangel ", "JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

12.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-061 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-062 - Affected dependency closure

Exact expression

A(U)=Reachable_G(U)

Meaning. Only cells reachable from changed cells are eligible for incremental recomputation.

Bound manifestations. JP, JO, M3

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_062
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3
Declaration	formula F-062 'Affected dependency closure'
Definition	Only cells reachable from changed cells are eligible for incremental recomputation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	A(U)=Reachable_G(U)
Statement	When typed inputs and evidence gates pass, evaluate F-062; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: cell set; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-062', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-062); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-062 and applicable family/product/representation white papers
Type	cell set
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

13.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_062 : Formula<cell set>
  definition "Only cells reachable from changed cells are eligible for incremental
↵ recomputation."
  expression `A(U)=Reachable_G(U)`
  participants ["JP", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

13.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-062 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-063 - Incremental recompute cost

Exact expression

C_recalc=sum_{v in A}c_v+sum_{e in E(A)}t_e

Meaning. Measured compute and transfer work for an affected dependency closure.
Bound manifestations. MK, JO, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_063
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-063 'Incremental recompute cost'
Definition	Measured compute and transfer work for an affected dependency closure.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	C_recalc=sum_{v in A}c_v+sum_{e in E(A)}t_e
Statement	When typed inputs and evidence gates pass, evaluate F-063; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: work units; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-063', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-063); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-063 and applicable family/product/representation white papers
Type	work units
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

14.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_063 : Formula<work units>
  definition "Measured compute and transfer work for an affected dependency closure."
  expression `C_recalc=sum_{v in A}c_v+sum_{e in E(A)}t_e`
  participants ["MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

14.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-063 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-064 - Concurrent edit arrival

Exact expression

lambda_total=N_users*lambda_user

Meaning. Aggregate update arrival rate from measured concurrent-user activity.
Bound manifestations. J0, M3, MK
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_064
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK
Declaration	formula F-064 'Concurrent edit arrival'
Definition	Aggregate update arrival rate from measured concurrent-user activity.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JO, M3, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	lambda_total=N_users*lambda_user
Statement	When typed inputs and evidence gates pass, evaluate F-064; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: operations/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-064', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-064); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-064 and applicable family/product/representation white papers
Type	operations/time
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

15.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_064 : Formula<operations/time>
  definition "Aggregate update arrival rate from measured concurrent-user activity."
  expression `lambda_total=N_users*lambda_user`
  participants ["J0", "M3", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

15.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-064 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-065 - Spreadsheet service utilization

Exact expression

rho=lambda_total/(W*mu_worker)

Meaning. Capacity utilization for W deterministic workers.

Bound manifestations. J0, M3, MK

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_065
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3, MJ.PBMEF.FamilyMK
Declaration	formula F-065 'Spreadsheet service utilization'
Definition	Capacity utilization for W deterministic workers.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	rho=lambda_total/(W*mu_worker)
Statement	When typed inputs and evidence gates pass, evaluate F-065; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-065', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-065); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-065 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

16.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_065 : Formula<ratio>
  definition "Capacity utilization for W deterministic workers."
  expression `rho=lambda_total/(W*mu_worker)`
  participants ["J0", "M3", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

16.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-065 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-066 - Spreadsheet worker requirement

Exact expression

W_min=ceil(lambda_total/(rho_max*mu_worker))

Meaning. Minimum worker count for a precommitted utilization ceiling.

Bound manifestations. J0, M3, MJOS

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_066
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MJOS
Declaration	formula F-066 'Spreadsheet worker requirement'
Definition	Minimum worker count for a precommitted utilization ceiling.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MJOS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	W_min=ceil(lambda_total/(rho_max*mu_worker))
Statement	When typed inputs and evidence gates pass, evaluate F-066; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-066', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-066); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-066 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

17.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_066 : Formula<count>
  definition "Minimum worker count for a precommitted utilization ceiling."
  expression `W_min=ceil(lambda_total/(rho_max*mu_worker))`
  participants ["JO", "M3", "MJOS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

17.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-066 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-067 - Recalculation latency

Exact expression

T_recalc=T_parse+T_dependency+max_p(T_partition,p)+T_commit

Meaning. End-to-end recalculation latency across logical Pearl simulation partitions.

Bound manifestations. MK, JO, M3

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_067
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3
Declaration	formula F-067 'Recalculation latency'
Definition	End-to-end recalculation latency across logical Pearl simulation partitions.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	T_recalc=T_parse+T_dependency+max_p(T_partition,p)+T_commit
Statement	When typed inputs and evidence gates pass, evaluate F-067; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-067', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-067); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-067 and applicable family/product/representation white papers
Type	time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

18.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_067 : Formula<time>
  definition "End-to-end recalculation latency across logical Pearl simulation partitions."
  expression `T_recalc=T_parse+T_dependency+max_p(T_partition,p)+T_commit`
  participants ["MK", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

18.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-067 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-068 - Spreadsheet data cost

Exact expression

C_data=B_store*c_store+B_transfer*c_transfer+t_cpu*c_cpu

Meaning. Storage, transfer, and compute cost remain separately evidenced before aggregation.

Bound manifestations. MERMAID, SHIVA, MK, JO

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_068
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-068 'Spreadsheet data cost'
Definition	Storage, transfer, and compute cost remain separately evidenced before aggregation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MERMAID, SHIVA, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	C_data=B_store*c_store+B_transfer*c_transfer+t_cpu*c_cpu
Statement	When typed inputs and evidence gates pass, evaluate F-068; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: cost unit; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-068', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-068); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-068 and applicable family/product/representation white papers
Type	cost unit
Attribute	status=REFERENCE_OR_TYPED CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

19.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_068 : Formula<cost unit>
  definition "Storage, transfer, and compute cost remain separately evidenced before
  ↵ aggregation."
  expression `C_data=B_store*c_store+B_transfer*c_transfer+t_cpu*c_cpu`
  participants ["MERMAID", "SHIVA", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

19.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-068 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-069 - Pearl simulation partition objective

Exact expression

J_partition=alpha*max_p(L_p)+beta*sum_cut(w_e)+gamma*R_breach+delta*R_stale

Meaning. Logical partition objective with precommitted weights; breach term is simulation risk, not physical containment.

Bound manifestations. JP, MK, J0, SISTER

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_069
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.SISTER
Declaration	formula F-069 'Pearl simulation partition objective'
Definition	Logical partition objective with precommitted weights; breach term is simulation risk, not physical containment.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, MK, J0, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	J_partition=alpha*max_p(L_p)+beta*sum_cut(w_e)+gamma*R_breach+delta*R_stale
Statement	When typed inputs and evidence gates pass, evaluate F-069; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: declared score; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-069', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-069); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-069 and applicable family/product/representation white papers
Type	declared score
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

20.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_069 : Formula<declared score>
  definition "Logical partition objective with precommitted weights; breach term is
  ↪ simulation risk, not physical containment."
  expression `J_partition=alpha*max_p(L_p)+beta*sum_cut(w_e)+gamma*R_breach+delta*R_stale`
  participants ["JP", "MK", "J0", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
```

}

20.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-069 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-070 - Sheet revision root

Exact expression

H_rev=SHA256(parent_root||canonical_deltas||policy_epoch)

Meaning. Every committed change creates immutable content-addressed lineage.

Bound manifestations. Bangel , JP, JO, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_070
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-070 'Sheet revision root'
Definition	Every committed change creates immutable content-addressed lineage.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	Bangel , JP, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	H_rev=SHA256(parent_root canonical_deltas policy_epoch)
Statement	When typed inputs and evidence gates pass, evaluate F-070; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: digest; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-070', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-070); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	56
Reference	pathways/FORMULA-REGISTER.json#F-070 and applicable family/product/representation white papers
Type	digest
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

21.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_070 : Formula<digest>
  definition "Every committed change creates immutable content-addressed lineage."
  expression `H_rev=SHA256(parent_root||canonical_deltas||policy_epoch)`
  participants ["Bangel ", "JP", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

21.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-070 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-071 - Audit-particle completeness

Exact expression

AuditPass=AND(required_fields_present,receipts_valid)

Meaning. A critical spreadsheet command fails closed when its audit particle is incomplete.
Bound manifestations. JO, ANGELS, BELLATRIX, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_071
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.BELLATRIX, MJ.PBMEF.Family.MERMAID
Declaration	formula F-071 'Audit-particle completeness'
Definition	A critical spreadsheet command fails closed when its audit particle is incomplete.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	JO, ANGELS, BELLATRIX, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	AuditPass=AND(required_fields_present,receipts_valid)
Statement	When typed inputs and evidence gates pass, evaluate F-071; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-071', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-071); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-071 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

22.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_071 : Formula<logical>
  definition "A critical spreadsheet command fails closed when its audit particle is
  ↪ incomplete."
  expression `AuditPass=AND(required_fields_present,receipts_valid)`
  participants ["JO", "ANGELS", "BELLATRIX", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

22.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-071 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-072 - Iterative recalculation stability

Exact expression

spectral_radius(J_F)<1

Meaning. Declared iterative formulas require an evidenced locally stable fixed-point regime.
Bound manifestations. JP, MK, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_072
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,JO
Declaration	formula F-072 'Iterative recalculation stability'
Definition	Declared iterative formulas require an evidenced locally stable fixed-point regime.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	spectral_radius(J_F)<1
Statement	When typed inputs and evidence gates pass, evaluate F-072; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-072', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-072); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-072 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

23.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_072 : Formula<logical>
  definition "Declared iterative formulas require an evidenced locally stable fixed-point
  regime."
  expression `spectral_radius(J_F)<1`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

23.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-072 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-073 - Revision conflict gate

Exact expression

base_revision=head_revision OR valid_merge_receipt

Meaning. Stale writes cannot silently overwrite a newer revision.

Bound manifestations. Bangel , JO, ANGELS

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_073
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS
Declaration	formula F-073 'Revision conflict gate'
Definition	Stale writes cannot silently overwrite a newer revision.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JO, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	base_revision=head_revision OR valid_merge_receipt
Statement	When typed inputs and evidence gates pass, evaluate F-073; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-073', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-073); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receive; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-073 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

24.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_073 : Formula<logical>
  definition "Stale writes cannot silently overwrite a newer revision."
  expression `base_revision=head_revision OR valid_merge_receipt`
  participants ["Bangel ", "JO", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receive(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

24.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-073 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-074 - Freshness age

Exact expression

Age=now-observed_at

Meaning. Age of a source observation or derived cell.
Bound manifestations. J0, MK, SISTER
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_074
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER
Declaration	formula F-074 'Freshness age'
Definition	Age of a source observation or derived cell.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	J0, MK, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	Age=now-observed_at
Statement	When typed inputs and evidence gates pass, evaluate F-074; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-074', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-074); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-074 and applicable family/product/representation white papers
Type	time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

25.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_074 : Formula<time>
  definition "Age of a source observation or derived cell."
  expression `Age=now-observed_at`
  participants ["J0", "MK", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

25.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-074 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-075 - Staleness gate

Exact expression

Age<=freshness_limit

Meaning. A cell is current only inside its declared freshness policy.
Bound manifestations. J0, ANGELS, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_075
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.MERMAID
Declaration	formula F-075 'Staleness gate'
Definition	A cell is current only inside its declared freshness policy.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	J0, ANGELS, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	Age<=freshness_limit
Statement	When typed inputs and evidence gates pass, evaluate F-075; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-075', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-075); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-075 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

26.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_075 : Formula<logical>
  definition "A cell is current only inside its declared freshness policy."
  expression `Age<=freshness_limit`
  participants ["J0", "ANGELS", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

26.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-075 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-076 - Data-performance correlation

Exact expression

$$r_{xy} = \text{Cov}(X, Y) / (\sigma_x \sigma_y)$$

Meaning. Descriptive correlation between data characteristics and performance; not a causal claim.

Bound manifestations. MK, JO, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_076
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-076 'Data-performance correlation'
Definition	Descriptive correlation between data characteristics and performance; not a causal claim.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$r_{xy} = \text{Cov}(X, Y) / (\sigma_x \sigma_y)$
Statement	When typed inputs and evidence gates pass, evaluate F-076; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-076', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-076); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-076 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

27.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_076 : Formula<ratio>
  definition "Descriptive correlation between data characteristics and performance; not a
  ↵ causal claim."
  expression `r_xy=Cov(X,Y)/(sigma_x*sigma_y)`
  participants ["MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

27.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-076 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-077 - Silo unification gate

Exact expression

UnifiedMetric=SameMeaning AND SameUnit AND SamePeriod AND SameAuthority AND SameLineage

Meaning. Departmental sources unify only when semantic, unit, period, authority, and lineage conditions agree.

Bound manifestations. ELSA, JP, JO, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_077
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.ELSA, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-077 'Silo unification gate'
Definition	Departmental sources unify only when semantic, unit, period, authority, and lineage conditions agree.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	ELSA, JP, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	UnifiedMetric=SameMeaning AND SameUnit AND SamePeriod AND SameAuthority AND SameLineage
Statement	When typed inputs and evidence gates pass, evaluate F-077; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-077', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-077); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-077 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

28.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_077 : Formula<logical>
  definition "Departmental sources unify only when semantic, unit, period, authority, and
  ↳ lineage conditions agree."
  expression `UnifiedMetric=SameMeaning AND SameUnit AND SamePeriod AND SameAuthority AND
  ↳ SameLineage`
  participants ["ELSA", "JP", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

28.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-077 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-078 - Formula verification residual

Exact expression

r_formula=y_reported-y_recomputed

Meaning. Silent formula corruption is detected by independent deterministic recomputation.
Bound manifestations. JO, MK, ANGELS
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_078
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyANGELS
Declaration	formula F-078 'Formula verification residual'
Definition	Silent formula corruption is detected by independent deterministic recomputation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, MK, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	r_formula=y_reported-y_recomputed
Statement	When typed inputs and evidence gates pass, evaluate F-078; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: output unit; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-078', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-078); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-078 and applicable family/product/representation white papers
Type	output unit
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

29.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_078 : Formula<output unit>
  definition "Silent formula corruption is detected by independent deterministic
  ↪ recomputation."
  expression `r_formula=y_reported-y_recomputed`
  participants ["JO", "MK", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

29.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-078 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-079 - Operational intake completeness

Exact expression

IntakePass=process_defined AND users_known AND workload_known AND SLA_known AND authority_known

Meaning. Scaling work begins only after the process, concurrency, workload, service target, and authority are explicit.

Bound manifestations. Bangel , ELSA, JP, JO, MJ

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_079
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.ELSA, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO
Declaration	formula F-079 'Operational intake completeness'
Definition	Scaling work begins only after the process, concurrency, workload, service target, and authority are explicit.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , ELSA, JP, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	IntakePass=process_defined AND users_known AND workload_known AND SLA_known AND authority_known
Statement	When typed inputs and evidence gates pass, evaluate F-079; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-079', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-079); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; MJ.receive; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-079 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

30.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_079 : Formula<logical>
  definition "Scaling work begins only after the process, concurrency, workload, service
  ↪ target, and authority are explicit."
  expression `IntakePass=process_defined AND users_known AND workload_known AND SLA_known
  ↪ AND authority_known`
  participants ["Bangel ", "ELSA", "JP", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
```

```
    output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

30.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-079 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-080 - Spreadsheet capacity gate

Exact expression

lambda_total<=rho_max*sum_p(mu_p) AND memory_required<=memory_available AND
↪ cross_partition_edges<=cut_limit

Meaning. Admission requires throughput, memory, and partition-boundary capacity to pass together.

Bound manifestations. MK, J0, M3, SISTER, MJOS

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_080
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.SISTER
Declaration	formula F-080 'Spreadsheet capacity gate'
Definition	Admission requires throughput, memory, and partition-boundary capacity to pass together.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	MK, JO, M3, SISTER, MJOS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	lambda_total<=rho_max*sum_p(mu_p) AND memory_required<=memory_available AND cross_partition_edges<=cut_limit
Statement	When typed inputs and evidence gates pass, evaluate F-080; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-080', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-080); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-080 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

31.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_080 : Formula<logical>
  definition "Admission requires throughput, memory, and partition-boundary capacity to pass
  ↪ together."
  expression `lambda_total<=rho_max*sum_p(mu_p) AND memory_required<=memory_available AND
  ↪ cross_partition_edges<=cut_limit`
  participants ["MK", "J0", "M3", "SISTER", "MJOS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

31.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-080 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-081 - First-noise rectangle height

Exact expression

H_R=h_noise,1

Meaning. Rectangle maximum height is the first validated noise-detection plane.

Bound manifestations. SISTER, MK, JO

Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_081
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-081 'First-noise rectangle height'
Definition	Rectangle maximum height is the first validated noise-detection plane.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	H_R=h_noise,1
Statement	When typed inputs and evidence gates pass, evaluate F-081; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-081', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-081); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-081 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

32.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_081 : Formula<length>
  definition "Rectangle maximum height is the first validated noise-detection plane."
  expression `H_R=h_noise,1`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

32.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-081 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-082 - Reference gas density

Exact expression

rho_g=P*M/(Z*R*T)

Meaning. Actual gas density depends on measured pressure, temperature, molar mass, and compressibility.

Bound manifestations. MK, JO, JP

Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_082
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.JP
Declaration	formula F-082 'Reference gas density'
Definition	Actual gas density depends on measured pressure, temperature, molar mass, and compressibility.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, JP
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	rho_g=P*M/(Z*R*T)
Statement	When typed inputs and evidence gates pass, evaluate F-082; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass/volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-082', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-082); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-082 and applicable family/product/representation white papers
Type	mass/volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

33.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_082 : Formula<mass/volume>
  definition "Actual gas density depends on measured pressure, temperature, molar mass, and
  ↵ compressibility."
  expression `rho_g=P*M/(Z*R*T)`
  participants ["MK", "JO", "JP"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

33.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-082 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-083 - 24 mg reference volume

Exact expression

V_24=m_24/rho_ref

Meaning. 24 mg defines a reference gas volume under a declared state and does not replace the 23 mg floor.

Bound manifestations. JP, MK, J0

Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_083
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,J0
Declaration	formula F-083 '24 mg reference volume'
Definition	24 mg defines a reference gas volume under a declared state and does not replace the 23 mg floor.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	V_24=m_24/rho_ref
Statement	When typed inputs and evidence gates pass, evaluate F-083; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-083', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-083); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	4
Reference	pathways/FORMULA-REGISTER.json#F-083 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

34.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_083 : Formula<volume>
  definition "24 mg defines a reference gas volume under a declared state and does not
  ↪ replace the 23 mg floor."
  expression `V_24=m_24/rho_ref`
  participants ["JP", "MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

34.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-083 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-084 - Rectangle depth

Exact expression

D_R=V_24/(W_R*H_R)

Meaning. Reference depth adapts to measured height and declared width.
Bound manifestations. SISTER, MK, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_084
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-084 'Rectangle depth'
Definition	Reference depth adapts to measured height and declared width.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	D_R=V_24/(W_R*H_R)
Statement	When typed inputs and evidence gates pass, evaluate F-084; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-084', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-084); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	4
Reference	pathways/FORMULA-REGISTER.json#F-084 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

35.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_084 : Formula<length>
  definition "Reference depth adapts to measured height and declared width."
  expression `D_R=V_24/(W_R*H_R)`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

35.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-084 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-085 - Cone height ratio

Exact expression

H_C=k_H*H_R; k_H,std=2

Meaning. Standard cone height is twice rectangle height.
Bound manifestations. JP, MK, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_085
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,JO
Declaration	formula F-085 'Cone height ratio'
Definition	Standard cone height is twice rectangle height.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	H_C=k_H*H_R; k_H,std=2
Statement	When typed inputs and evidence gates pass, evaluate F-085; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-085', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JPrepresent(F-085); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-085 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

36.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_085 : Formula<length>
  definition "Standard cone height is twice rectangle height."
  expression `H_C=k_H*H_R; k_H,std=2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

36.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-085 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-086 - Cone top-width ratio

Exact expression

$$W_T=k_WW_B; k_W, std=2$$

Meaning. Standard top characteristic width is twice bottom width.

Bound manifestations. JP, MK, JO

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_086
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJO
Declaration	formula F-086 'Cone top-width ratio'
Definition	Standard top characteristic width is twice bottom width.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$W_T=k_WW_B; k_W, std=2$
Statement	When typed inputs and evidence gates pass, evaluate F-086; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-086', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-086); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-086 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

37.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_086 : Formula<length>
  definition "Standard top characteristic width is twice bottom width."
  expression `W_T=k_WW_B; k_W,std=2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

37.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-086 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-087 - Cone area by height

Exact expression

$$A(z)=A_B*(1+(k_W-1)*z/H_C)^2$$

Meaning. Similar-section conical expansion area.
Bound manifestations. MK, JO, SISTER
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_087
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-087 'Cone area by height'
Definition	Similar-section conical expansion area.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$A(z)=A_B*(1+(k_W-1)*z/H_C)^2$
Statement	When typed inputs and evidence gates pass, evaluate F-087; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-087', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-087); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1, 2
Reference	pathways/FORMULA-REGISTER.json#F-087 and applicable family/product/representation white papers
Type	area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

38.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_087 : Formula<area>
  definition "Similar-section conical expansion area."
  expression `A(z)=A_B*(1+(k_W-1)*z/H_C)^2`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

38.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-087 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-088 - Cone partial volume

Exact expression

$$V_C(z)=A_B*(z+(k_W-1)z^2/H_C+(k_W-1)^2*z^3/(3H_C^2))$$

Meaning. Volume up to observed gas height.
Bound manifestations. MK, JO, SISTER
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_088
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-088 'Cone partial volume'
Definition	Volume up to observed gas height.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$V_C(z)=A_B*(z+(k_W-1)z^2/H_C+(k_W-1)^2*z^3/(3H_C^2))$
Statement	When typed inputs and evidence gates pass, evaluate F-088; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-088', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-088); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1, 2, 3
Reference	pathways/FORMULA-REGISTER.json#F-088 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

39.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_088 : Formula<volume>
  definition "Volume up to observed gas height."
  expression `V_C(z)=A_B*(z+(k_W-1)z^2/H_C+(k_W-1)^2*z^3/(3H_C^2))`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

39.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-088 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-089 - Full conical-frustum volume

Exact expression

$$V_C=H_C/3*(A_B+sqrt(A_B*A_T)+A_T)$$

Meaning. Full conical expansion volume.
Bound manifestations. MK, JO, JP
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_089
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.JP
Declaration	formula F-089 'Full conical-frustum volume'
Definition	Full conical expansion volume.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, JP
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$V_C=H_C/3*(A_B+sqrt(A_B*A_T)+A_T)$
Statement	When typed inputs and evidence gates pass, evaluate F-089; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-089', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-089); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	3
Reference	pathways/FORMULA-REGISTER.json#F-089 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

40.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_089 : Formula<volume>
  definition "Full conical expansion volume."
  expression `V_C=H_C/3*(A_B+sqrt(A_B*A_T)+A_T)`
  participants ["MK", "JO", "JP"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

40.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-089 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-090 - Pearl cone-top anchor

Exact expression

z_P0=H_R+H_C; standard=3H_R

Meaning. Pearl simulation begins at the top-of-cone information plane.

Bound manifestations. PEARL, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_090
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.PEARL, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-090 'Pearl cone-top anchor'
Definition	Pearl simulation begins at the top-of-cone information plane.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	PEARL, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	z_P0=H_R+H_C; standard=3H_R
Statement	When typed inputs and evidence gates pass, evaluate F-090; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-090', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-090); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	3
Reference	pathways/FORMULA-REGISTER.json#F-090 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

41.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_090 : Formula<length>
  definition "Pearl simulation begins at the top-of-cone information plane."
  expression `z_P0=H_R+H_C; standard=3H_R`
  participants ["PEARL", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

41.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-090 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-091 - Observed gas mass

Exact expression

$$m_g = \rho_g \cdot V_C(h_g)$$

Meaning. Gas mass from observed height and state-dependent density.

Bound manifestations. MK, EVE, JO

Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_091
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-091 'Observed gas mass'
Definition	Gas mass from observed height and state-dependent density.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	$m_g = \rho_g \cdot V_C(h_g)$
Statement	When typed inputs and evidence gates pass, evaluate F-091; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-091', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-091); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-091 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

42.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_091 : Formula<mass>
  definition "Gas mass from observed height and state-dependent density."
  expression `m_g=rho_g*V_C(h_g)`
  participants ["MK", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

42.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-091 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-092 - Gas mass-flow from height

Exact expression

$$m_dot=rho*A(h_g)*h_dot_g+V_C(h_g)*rho_dot$$

Meaning. Mass-flow accounting includes density changes.
Bound manifestations. MK, EVE, J0
Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_092
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.J0
Declaration	formula F-092 'Gas mass-flow from height'
Definition	Mass-flow accounting includes density changes.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	$m_dot=rho*A(h_g)*h_dot_g+V_C(h_g)*rho_dot$
Statement	When typed inputs and evidence gates pass, evaluate F-092; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-092', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-092); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-092 and applicable family/product/representation white papers
Type	mass/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

43.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_092 : Formula<mass/time>
  definition "Mass-flow accounting includes density changes."
  expression `m_dot=rho*A(h_g)*h_dot_g+V_C(h_g)*rho_dot`
  participants ["MK", "EVE", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

43.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-092 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-093 - Observed gas-height predictor

Exact expression

$$h_{\text{hat}} = \text{clip}(h + v \cdot dt + 0.5 \cdot a \cdot dt^2, 0, H_C)$$

Meaning. Bounded prediction of observed gas-front height.
Bound manifestations. SISTER, MK, JO
Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_093
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-093 'Observed gas-height predictor'
Definition	Bounded prediction of observed gas-front height.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	$h_{\text{hat}} = \text{clip}(h + v \cdot dt + 0.5 \cdot a \cdot dt^2, 0, H_C)$
Measurement	When typed inputs and evidence gates pass, evaluate F-093; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Constraint	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Annotation	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Directive	@formula(id='F-093', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Block	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Literal	R0 { Bangel, begin; R1.predict; JP.represent(F-093); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Reference	0.5, 2, 0
Type	pathways/FORMULA-REGISTER.json#F-093 and applicable family/product/representation white papers
Attribute	length status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

44.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_093 : Formula<length>
  definition "Bounded prediction of observed gas-front height."
  expression `h_hat=clip(h+v*dt+0.5*a*dt^2,0,H_C)`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

44.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-093 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-094 - Gas net-force balance

Exact expression

m_eff*a_z=F_b+F_p+F_act-F_d-F_wall-F_mix

Meaning. Geometry alone does not guarantee acceleration.
Bound manifestations. MK, JO, SISTER
Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_094
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-094 'Gas net-force balance'
Definition	Geometry alone does not guarantee acceleration.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	m_eff*a_z=F_b+F_p+F_act-F_d-F_wall-F_mix
Statement	When typed inputs and evidence gates pass, evaluate F-094; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: force; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-094', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-094); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-094 and applicable family/product/representation white papers
Type	force
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

45.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_094 : Formula<force>
  definition "Geometry alone does not guarantee acceleration."
  expression `m_eff*a_z=F_b+F_p+F_act-F_d-F_wall-F_mix`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

45.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-094 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-095 - Buoyancy force

Exact expression

$$F_b=(\rho_{\text{ambient}}-\rho_g)*g*V_g$$

Meaning. Reference buoyancy term under declared environment.
Bound manifestations. MK, JO, EVE
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_095
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE
Declaration	formula F-095 'Buoyancy force'
Definition	Reference buoyancy term under declared environment.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$F_b=(\rho_{\text{ambient}}-\rho_g)*g*V_g$
Statement	When typed inputs and evidence gates pass, evaluate F-095; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: force; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-095', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-095); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-095 and applicable family/product/representation white papers
Type	force
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

46.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_095 : Formula<force>
  definition "Reference buoyancy term under declared environment."
  expression `F_b=(rho_ambient-rho_g)*g*V_g`
  participants ["MK", "JO", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

46.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-095 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-096 - Drag force

Exact expression

$$F_d=0.5*C_d*rho_{ambient}*A_{projected}*u*abs(u)$$

Meaning. Reference drag term under declared coefficient and flow.
Bound manifestations. MK, JO, EVE
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_096
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE
Declaration	formula F-096 'Drag force'
Definition	Reference drag term under declared coefficient and flow.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$F_d=0.5*C_d*rho_{ambient}*A_{projected}*u*abs(u)$
Statement	When typed inputs and evidence gates pass, evaluate F-096; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: force; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-096', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-096); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.5
Reference	pathways/FORMULA-REGISTER.json#F-096 and applicable family/product/representation white papers
Type	force
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

47.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_096 : Formula<force>
  definition "Reference drag term under declared coefficient and flow."
  expression `F_d=0.5*C_d*rho_ambient*A_projected*u*abs(u)`
  participants ["MK", "JO", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

47.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-096 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-097 - Flow continuity

Exact expression

$$Q=A(z)*u(z)$$

Meaning. For fixed flow, increasing area does not itself accelerate the gas.
Bound manifestations. MK, JO, SISTER
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_097
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-097 'Flow continuity'
Definition	For fixed flow, increasing area does not itself accelerate the gas.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$Q=A(z)*u(z)$
Statement	When typed inputs and evidence gates pass, evaluate F-097; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-097', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-097); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-097 and applicable family/product/representation white papers
Type	volume/time
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

48.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_097 : Formula<volume/time>
  definition "For fixed flow, increasing area does not itself accelerate the gas."
  expression `Q=A(z)*u(z)`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

48.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-097 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-098 - Residual reservoir capacity

Exact expression

C_res,k=gamma_k*C_rect,k; 0<=gamma_k<1

Meaning. Residual reservoir remains smaller than rectangle reference capacity.
Bound manifestations. SISTER, EVE, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_098
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-098 'Residual reservoir capacity'
Definition	Residual reservoir remains smaller than rectangle reference capacity.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	C_res,k=gamma_k*C_rect,k; 0<=gamma_k<1
Statement	When typed inputs and evidence gates pass, evaluate F-098; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed capacity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-098', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-098); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0, 1
Reference	pathways/FORMULA-REGISTER.json#F-098 and applicable family/product/representation white papers
Type	typed capacity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

49.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_098 : Formula<typed capacity>
  definition "Residual reservoir remains smaller than rectangle reference capacity."
  expression `C_res,k=gamma_k*C_rect,k; 0<=gamma_k<1`
  participants ["SISTER", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

49.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-098 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-099 - Umbrella/EVE/reservoir balance

Exact expression

q_cone=q_down+q_EVE+q_res+q_escape+r

Meaning. Downward redistribution, EVE evidence, reservoir admission, and escape are separately accounted.

Bound manifestations. EVE, SISTER, MERMAID

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_099
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MERMAID
Declaration	formula F-099 'Umbrella/EVE/reservoir balance'
Definition	Downward redistribution, EVE evidence, reservoir admission, and escape are separately accounted.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, SISTER, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	q_cone=q_down+q_EVE+q_res+q_escape+r
Statement	When typed inputs and evidence gates pass, evaluate F-099; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: typed quantity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-099', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-099); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-099 and applicable family/product/representation white papers
Type	typed quantity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

50.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_099 : Formula<typed quantity>
  definition "Downward redistribution, EVE evidence, reservoir admission, and escape are
  ↪ separately accounted."
  expression `q_cone=q_down+q_EVE+q_res+q_escape+r`
  participants ["EVE", "SISTER", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

50.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-099 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-100 - Containment modification predicate

Exact expression

Valid(theta)=typed&positive&recomputed&conserved&bounded&evidenced&MK&JO&MJ

Meaning. Size changes preserve core logic but require full recalculation and gates.

Bound manifestations. Bangel , JP, MK, JO, MJ

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_100
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-100 'Containment modification predicate'
Definition	Size changes preserve core logic but require full recalculation and gates.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JP, MK, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	Valid(theta)=typed&positive&recomputed&conserved&bounded&evidenced&MK&JO&MJ
Statement	When typed inputs and evidence gates pass, evaluate F-100; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-100', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP&MK&JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel .begin; R1.predict; JP.represent(F-100); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-100 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

51.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_100 : Formula<logical>
  definition "Size changes preserve core logic but require full recalculation and gates."
  expression `Valid(theta)=typed&positive&recomputed&conserved&bounded&evidenced&MK&JO&MJ`
  participants ["Bangel ", "JP", "MK", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

51.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-100 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

MJ-PBMEF Pink Paper - Volume IV

Formula Gateway Bindings F-101 through F-145

Michael Bangel - Author and Architect

August 2026

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Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Verification method

Each formula receives the same twenty-construct Bangel identity, a gateway-stage assignment, a life-cycle example, and explicit evidence and ethics boundaries. The repetitive structure is intentional: it allows formula-by-formula founder review and later automated completeness checking.

F-101 - Rear outlet elevation

Exact expression

`z_out=H_P-delta_z; 0<delta_z<H_P`

Meaning. Outlet is below the containment maximum height.
Bound manifestations. SISTER, MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 101
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-101 'Rear outlet elevation'
Definition	Outlet is below the containment maximum height.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	<code>z_out=H_P-delta_z; 0<delta_z<H_P</code>
Statement	When typed inputs and evidence gates pass, evaluate F-101; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-101', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-101); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-101 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

2.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_101 : Formula<length>
  definition "Outlet is below the containment maximum height."
  expression `z_out=H_P-delta_z; 0<delta_z<H_P`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

2.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-101 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-102 - Pearl simulation exclusion radius

Exact expression

R_P,sim=R_top+c_P; c_P>=0

Meaning. Nonphysical reference circle plus declared clearance.

Bound manifestations. PEARL, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_102
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.PEARL, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-102 'Pearl simulation exclusion radius'
Definition	Nonphysical reference circle plus declared clearance.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	PEARL, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	R_P,sim=R_top+c_P; c_P>=0
Statement	When typed inputs and evidence gates pass, evaluate F-102; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-102', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-102); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-102 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

3.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_102 : Formula<length>
  definition "Nonphysical reference circle plus declared clearance."
  expression `R_P,sim=R_top+c_P; c_P>=0`
  participants ["PEARL", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

3.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-102 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-103 - Outward-tangential outlet direction

Exact expression

d_out=cos(alpha_out)t+sin(alpha_out)n_out; 0<alpha_out<pi/2

Meaning. Slight positive outward cant from the local tangent.

Bound manifestations. JP, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_103
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,JO
Declaration	formula F-103 'Outward-tangential outlet direction'
Definition	Slight positive outward cant from the local tangent.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	d_out=cos(alpha_out)t+sin(alpha_out)n_out; 0<alpha_out<pi/2
Statement	When typed inputs and evidence gates pass, evaluate F-103; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-103', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-103); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0, 2
Reference	pathways/FORMULA-REGISTER.json#F-103 and applicable family/product/representation white papers
Type	dimensionless vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

4.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_103 : Formula<dimensionless vector>
  definition "Slight positive outward cant from the local tangent."
  expression `d_out=cos(alpha_out)t+sin(alpha_out)n_out; 0<alpha_out<pi/2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

4.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-103 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-104 - Outside-circle outlet path

Exact expression

$$||\gamma(s)-c_P||^2=R_P^2+2R_Ps\sin(\alpha_{out})+s^2$$

Meaning. Path remains outside the Pearl simulation circle for $s>0$.
Bound manifestations. PEARL, MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 104
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.PEARL, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-104 'Outside-circle outlet path'
Definition	Path remains outside the Pearl simulation circle for $s>0$.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	PEARL, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$ \gamma(s)-c_P ^2=R_P^2+2R_Ps\sin(\alpha_{out})+s^2$
Statement	When typed inputs and evidence gates pass, evaluate F-104; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length^2; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-104', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-104); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-104 and applicable family/product/representation white papers
Type	length^2
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

5.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_104 : Formula<length^2>
  definition "Path remains outside the Pearl simulation circle for s>0."
  expression `||gamma(s)-c_P||^2=R_P^2+2R_P*s*sin(alpha_out)+s^2`
  participants ["PEARL", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

5.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-104 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-105 - Reservoir volume balance

Exact expression

$$dV_L/dt=Q_{out}-Q_{return}-Q_{drain}-Q_{escape}$$

Meaning. Connected lake-like buffer control-volume balance.

Bound manifestations. SISTER, EVE, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 105
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-105 'Reservoir volume balance'
Definition	Connected lake-like buffer control-volume balance.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, EVE, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$dV_L/dt=Q_{out}-Q_{return}-Q_{drain}-Q_{escape}$
Statement	When typed inputs and evidence gates pass, evaluate F-105; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-105', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-105); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-105 and applicable family/product/representation white papers
Type	volume/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

6.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_105 : Formula<volume/time>
  definition "Connected lake-like buffer control-volume balance."
  expression `dV_L/dt=Q_out-Q_return-Q_drain-Q_escape`
  participants ["SISTER", "EVE", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

6.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-105 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-106 - Typed reservoir quantity balance

Exact expression

$$dq_L, k/dt=q_{out}, k-q_{return}, k-q_{drain}, k-q_{escape}, k$$

Meaning. Per-dimension balance prevents cross-unit collapse.

Bound manifestations. SISTER, EVE, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 106
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-106 'Typed reservoir quantity balance'
Definition	Per-dimension balance prevents cross-unit collapse.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, EVE, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$dq_L, k/dt=q_{out}, k-q_{return}, k-q_{drain}, k-q_{escape}, k$
Statement	When typed inputs and evidence gates pass, evaluate F-106; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed quantity/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-106', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-106); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-106 and applicable family/product/representation white papers
Type	typed quantity/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

7.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_106 : Formula<typed quantity/time>
  definition "Per-dimension balance prevents cross-unit collapse."
  expression `dq_L, k/dt=q_out, k-q_return, k-q_drain, k-q_escape, k`
  participants ["SISTER", "EVE", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

7.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-106 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-107 - Required buffer volume

Exact expression

$$V_L, req=T_hold*max(0,Q_out,H-Q_return,L)+V_residual,H$$

Meaning. Conservative buffer capacity from inflow-return mismatch and residual.
Bound manifestations. MK, SISTER, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 107
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.JO
Declaration	formula F-107 'Required buffer volume'
Definition	Conservative buffer capacity from inflow-return mismatch and residual.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, SISTER, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	$V_L, req=T_hold*max(0,Q_out,H-Q_return,L)+V_residual,H$
Statement	When typed inputs and evidence gates pass, evaluate F-107; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-107', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-107); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-107 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

8.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_107 : Formula<volume>
  definition "Conservative buffer capacity from inflow-return mismatch and residual."
  expression `V_L, req=T_hold*max(0,Q_out,H-Q_return,L)+V_residual,H`
  participants ["MK", "SISTER", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

8.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-107 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-108 - Outlet area lower bound

Exact expression

A_out>=Q_design/u_out,max

Meaning. Area sizing from conservative design flow and allowable velocity.
Bound manifestations. MK, J0
Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_108
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-108 'Outlet area lower bound'
Definition	Area sizing from conservative design flow and allowable velocity.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	A_out>=Q_design/u_out,max
Statement	When typed inputs and evidence gates pass, evaluate F-108; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-108', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-108); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-108 and applicable family/product/representation white papers
Type	area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

9.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_108 : Formula<area>
  definition "Area sizing from conservative design flow and allowable velocity."
  expression `A_out>=Q_design/u_out,max`
  participants ["MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

9.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-108 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-109 - Circular outlet radius lower bound

Exact expression

$$r_{out} \geq \sqrt{A_{out}/\pi}$$

Meaning. Circular outlet radius derived from required area.

Bound manifestations. MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_109
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-109 'Circular outlet radius lower bound'
Definition	Circular outlet radius derived from required area.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$r_{out} \geq \sqrt{A_{out}/\pi}$
Statement	When typed inputs and evidence gates pass, evaluate F-109; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-109', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-109); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-109 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

10.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_109 : Formula<length>
  definition "Circular outlet radius derived from required area."
  expression `r_out>=sqrt(A_out/pi)`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

10.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-109 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-110 - Bounded drip impulse

Exact expression

J_drop=m_drop*v_drop<=J_drop,max

Meaning. Small-discharge reference objective; threshold requires evidence.
Bound manifestations. MK, ANGELS, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 110
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.JO
Declaration	formula F-110 'Bounded drip impulse'
Definition	Small-discharge reference objective; threshold requires evidence.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, ANGELS, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	J_drop=m_drop*v_drop<=J_drop,max
Statement	When typed inputs and evidence gates pass, evaluate F-110; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: impulse; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-110', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-110); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-110 and applicable family/product/representation white papers
Type	impulse
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

11.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_110 : Formula<impulse>
  definition "Small-discharge reference objective; threshold requires evidence."
  expression `J_drop=m_drop*v_drop<=J_drop,max`
  participants ["MK", "ANGELS", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

11.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-110 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-111 - Small-wave energy reference

Exact expression

E_wave~= $0.5 \cdot \rho \cdot g \cdot a_{\text{wave}}^2 \cdot A_{\text{surface}}$

Meaning. Applies only under small-amplitude liquid-surface assumptions.
Bound manifestations. MK, JO, EVE
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 111
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE
Declaration	formula F-111 'Small-wave energy reference'
Definition	Applies only under small-amplitude liquid-surface assumptions.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	E_wave~= $0.5 \cdot \rho \cdot g \cdot a_{\text{wave}}^2 \cdot A_{\text{surface}}$
Statement	When typed inputs and evidence gates pass, evaluate F-111; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-111', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-111); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.5, 2
Reference	pathways/FORMULA-REGISTER.json#F-111 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

12.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_111 : Formula<energy>
  definition "Applies only under small-amplitude liquid-surface assumptions."
  expression `E_wave~= $0.5 \cdot \rho \cdot g \cdot a_{\text{wave}}^2 \cdot A_{\text{surface}}$ `
  participants ["MK", "JO", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

12.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-111 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-112 - Froude reference

Exact expression

Fr=U/sqrt(gL)

Meaning. Flow-regime reference; Fr<1 is a conditional subcritical target.

Bound manifestations. MK, J0

Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 112
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-112 'Froude reference'
Definition	Flow-regime reference; Fr<1 is a conditional subcritical target.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	Fr=U/sqrt(gL)
Statement	When typed inputs and evidence gates pass, evaluate F-112; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-112', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-112); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-112 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

13.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_112 : Formula<dimensionless>
  definition "Flow-regime reference; Fr<1 is a conditional subcritical target."
  expression `Fr=U/sqrt(gL)`
  participants ["MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

13.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-112 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-113 - Circular return-port area

Exact expression

A_in=pi*r_in^2

Meaning. Circular re-entry cross-section.
Bound manifestations. MK, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 113
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-113 'Circular return-port area'
Definition	Circular re-entry cross-section.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	A_in=pi*r_in^2
Statement	When typed inputs and evidence gates pass, evaluate F-113; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-113', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-113); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-113 and applicable family/product/representation white papers
Type	area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

14.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_113 : Formula<area>
  definition "Circular re-entry cross-section."
  expression `A_in=pi*r_in^2`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

14.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-113 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-114 - Inward-tangential reentry components

Exact expression

$$u_r = -U \sin(\beta_{in}); u_{\theta} = \sigma U \cos(\beta_{in})$$

Meaning. Small inward angle plus tangential component; no vortex proof.

Bound manifestations. SISTER, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_114
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-114 'Inward-tangential reentry components'
Definition	Small inward angle plus tangential component; no vortex proof.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$u_r = -U \sin(\beta_{in}); u_{\theta} = \sigma U \cos(\beta_{in})$
Statement	When typed inputs and evidence gates pass, evaluate F-114; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: velocity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-114', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-114); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-114 and applicable family/product/representation white papers
Type	velocity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

15.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_114 : Formula<velocity>
  definition "Small inward angle plus tangential component; no vortex proof."
  expression `u_r=-U*sin(beta_in); u_theta=sigma*U*cos(beta_in)`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

15.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-114 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-115 - Spiral compatibility ratio

Exact expression

chi_spiral=|u_theta|/max(|u_r|,epsilon)

Meaning. Reference ratio for tangential-dominant reentry.
Bound manifestations. MK, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 115
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-115 'Spiral compatibility ratio'
Definition	Reference ratio for tangential-dominant reentry.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	chi_spiral= u_theta /max(u_r ,epsilon)
Statement	When typed inputs and evidence gates pass, evaluate F-115; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-115', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-115); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-115 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

16.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_115 : Formula<dimensionless>
  definition "Reference ratio for tangential-dominant reentry."
  expression `chi_spiral=|u_theta|/max(|u_r|,epsilon)`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

16.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-115 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-116 - Return continuity

Exact expression

Q_return=A_in*u_n

Meaning. Re-entry flow through the circular port.
Bound manifestations. MK, JO, SISTER
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 116
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-116 'Return continuity'
Definition	Re-entry flow through the circular port.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	Q_return=A_in*u_n
Statement	When typed inputs and evidence gates pass, evaluate F-116; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-116', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-116); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-116 and applicable family/product/representation white papers
Type	volume/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

17.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_116 : Formula<volume/time>
  definition "Re-entry flow through the circular port."
  expression `Q_return=A_in*u_n`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

17.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-116 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-117 - Relative-frame velocity

Exact expression

$$v_rel=v_B-v_A-\Omega_A \times r$$

Meaning. Coordinate-frame-relative motion; perspective does not create energy.

Bound manifestations. MK, J0

Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 117
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-117 'Relative-frame velocity'
Definition	Coordinate-frame-relative motion; perspective does not create energy.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	$v_rel=v_B-v_A-\Omega_A \times r$
Statement	When typed inputs and evidence gates pass, evaluate F-117; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: velocity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-117', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-117); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-117 and applicable family/product/representation white papers
Type	velocity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

18.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_117 : Formula<velocity>
  definition "Coordinate-frame-relative motion; perspective does not create energy."
  expression `v_rel=v_B-v_A-Ω_A x r`
  participants ["MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

18.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-117 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-118 - Frictional dissipation

Exact expression

$$P_{diss} = \max(0, -F_f \cdot v_{rel})$$

Meaning. Measured frame-relative frictional dissipation.
Bound manifestations. MK, JO, MERMAID
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 118
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-118 'Frictional dissipation'
Definition	Measured frame-relative frictional dissipation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	$P_{diss} = \max(0, -F_f \cdot v_{rel})$
Statement	When typed inputs and evidence gates pass, evaluate F-118; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: power; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-118', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-118); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-118 and applicable family/product/representation white papers
Type	power
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

19.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_118 : Formula<power>
  definition "Measured frame-relative frictional dissipation."
  expression `P_diss=max(0,-F_f dot v_rel)`
  participants ["MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

19.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-118 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-119 - Recoverable friction-energy bound

Exact expression

E_rec<=eta_rec*integral(P_diss dt); 0<=eta_rec<=1

Meaning. No physical recovery without an evidenced conversion mechanism.
Bound manifestations. MK, JO, MERMAID, SHIVA
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 119
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.SHIVA
Declaration	formula F-119 'Recoverable friction-energy bound'
Definition	No physical recovery without an evidenced conversion mechanism.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, MERMAID, SHIVA
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	E_rec<=eta_rec*integral(P_diss dt); 0<=eta_rec<=1
Statement	When typed inputs and evidence gates pass, evaluate F-119; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-119', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-119); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0, 1
Reference	pathways/FORMULA-REGISTER.json#F-119 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

20.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_119 : Formula<energy>
  definition "No physical recovery without an evidenced conversion mechanism."
  expression `E_rec<=eta_rec*integral(P_diss dt); 0<=eta_rec<=1`
  participants ["MK", "JO", "MERMAID", "SHIVA"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

20.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-119 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-120 - Reservoir transaction gate

Exact expression

Admit=AngelPass&M3Lease&MKPass&JOPass&MermaidReconciled&MJPermit

Meaning. Every reservoir transfer requires safety, routing, physics, proof, reconciliation, and permit.
Bound manifestations. ANGELS, M3, MK, JO, MERMAID, MJ
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 120
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-120 'Reservoir transaction gate'
Definition	Every reservoir transfer requires safety, routing, physics, proof, reconciliation, and permit.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	ANGELS, M3, MK, JO, MERMAID, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	Admit=AngelPass&M3Lease&MKPass&JOPass&MermaidReconciled&MJPermit
Statement	When typed inputs and evidence gates pass, evaluate F-120; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-120', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-120); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-120 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

21.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_120 : Formula<logical>
  definition "Every reservoir transfer requires safety, routing, physics, proof,
  ↵ reconciliation, and permit."
  expression `Admit=AngelPass&M3Lease&MKPass&JOPass&MermaidReconciled&MJPermit`
  participants ["ANGELS", "M3", "MK", "JO", "MERMAID", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

21.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-120 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-121 - Re-entry swirl ratio

Exact expression

$$\text{chi_i} = |u_theta| / \max(|u_r|, \text{epsilon_u})$$

Meaning. Represents tangential-to-inward re-entry velocity.
Bound manifestations. MK, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 121
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-121 'Re-entry swirl ratio'
Definition	Represents tangential-to-inward re-entry velocity.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	$\text{chi_i} = u_theta / \max(u_r , \text{epsilon_u})$
Statement	When typed inputs and evidence gates pass, evaluate F-121; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-121', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-121); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-121 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

22.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_121 : Formula<dimensionless>
  definition "Represents tangential-to-inward re-entry velocity."
  expression `chi_i=|u_theta|/max(|u_r|,epsilon_u)`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

22.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-121 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-122 - Re-entry processing cycle

Exact expression

cycle_reentry=cycle_exit+1

Meaning. Prohibits same-cycle feedback and creates a new receipt chain.
Bound manifestations. J0, M3, SISTER
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 122
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.SISTER
Declaration	formula F-122 'Re-entry processing cycle'
Definition	Prohibits same-cycle feedback and creates a new receipt chain.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	cycle_reentry=cycle_exit+1
Statement	When typed inputs and evidence gates pass, evaluate F-122; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: cycle identifier; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-122', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-122); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-122 and applicable family/product/representation white papers
Type	cycle identifier
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

23.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_122 : Formula<cycle identifier>
  definition "Prohibits same-cycle feedback and creates a new receipt chain."
  expression `cycle_reentry=cycle_exit+1`
  participants ["J0", "M3", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

23.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-122 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-123 - Perspective transform residual

Exact expression

$$r_Pi=x_B-T_A_to_B*x_A$$

Meaning. Measures disagreement after transforming observations between reference frames.

Bound manifestations. MK, JO, EVE, MERMAID

Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 123
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID
Declaration	formula F-123 'Perspective transform residual'
Definition	Measures disagreement after transforming observations between reference frames.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, EVE, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	$r_Pi=x_B-T_A_to_B*x_A$
Statement	When typed inputs and evidence gates pass, evaluate F-123; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: typed vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-123', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-123); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-123 and applicable family/product/representation white papers
Type	typed vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

24.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_123 : Formula<typed vector>
  definition "Measures disagreement after transforming observations between reference
↵ frames."
  expression `r_Pi=x_B-T_A_to_B*x_A`
  participants ["MK", "JO", "EVE", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

24.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-123 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-124 - Physical pressure-flow dissipation

Exact expression

E_diss=int(Delta_p(t)*Q(t)dt)

Meaning. Stores measured physical dissipation only when pressure and flow are evidenced.

Bound manifestations. MK, J0, MERMAID

Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_124
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.MERMAID
Declaration	formula F-124 'Physical pressure-flow dissipation'
Definition	Stores measured physical dissipation only when pressure and flow are evidenced.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, J0, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	E_diss=int(Delta_p(t)*Q(t)dt)
Statement	When typed inputs and evidence gates pass, evaluate F-124; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-124', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-124); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-124 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

25.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_124 : Formula<energy>
  definition "Stores measured physical dissipation only when pressure and flow are
  ↪ evidenced."
  expression `E_diss=int(Delta_p(t)*Q(t)dt)`
  participants ["MK", "J0", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

25.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-124 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-125 - Information friction

Exact expression

C_info=int(B_residual(t)dt)

Meaning. Stores unresolved information or memory cost without treating it as energy.
Bound manifestations. J0, M3, MERMAID
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 125
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MERMAID
Declaration	formula F-125 'Information friction'
Definition	Stores unresolved information or memory cost without treating it as energy.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	J0, M3, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	C_info=int(B_residual(t)dt)
Statement	When typed inputs and evidence gates pass, evaluate F-125; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: byte*time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-125', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-125); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-125 and applicable family/product/representation white papers
Type	byte*time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

26.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_125 : Formula<byte*time>
  definition "Stores unresolved information or memory cost without treating it as energy."
  expression `C_info=int(B_residual(t)dt)`
  participants ["J0", "M3", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

26.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-125 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-126 - Rotational setpoint damping

Exact expression

$$\omega_{\tilde{}} = (2/3) \cdot \omega + (1/3) \cdot \omega_{\text{star}}$$

Meaning. Damps the desired rotational-wave setpoint.
Bound manifestations. MK, JO, SISTER
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 126
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-126 'Rotational setpoint damping'
Definition	Damps the desired rotational-wave setpoint.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	$\omega_{\tilde{}} = (2/3) \cdot \omega + (1/3) \cdot \omega_{\text{star}}$
Statement	When typed inputs and evidence gates pass, evaluate F-126; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: angular velocity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-126', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-126); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-126 and applicable family/product/representation white papers
Type	angular velocity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

27.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_126 : Formula<angular velocity>
  definition "Damps the desired rotational-wave setpoint."
  expression `omega_tilde=(2/3)*omega+(1/3)*omega_star`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

27.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-126 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-127 - Rotational step cap

Exact expression

|omega_next-omega|<=0.1*omega_scale

Meaning. Limits one-step rotational changes.
Bound manifestations. MK, JO, ANGELS
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 127
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS
Declaration	formula F-127 'Rotational step cap'
Definition	Limits one-step rotational changes.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	omega_next-omega <=0.1*omega_scale
Statement	When typed inputs and evidence gates pass, evaluate F-127; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: angular velocity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-127', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-127); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.1
Reference	pathways/FORMULA-REGISTER.json#F-127 and applicable family/product/representation white papers
Type	angular velocity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

28.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_127 : Formula<angular velocity>
  definition "Limits one-step rotational changes."
  expression `|omega_next-omega|<=0.1*omega_scale`
  participants ["MK", "JO", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

28.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-127 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-128 - Outlet transfer conservation

Exact expression

q_exit=q_lake_in+q_EVE+q_escape+r_o

Meaning. Separates lake admission, EVE observation, escape, and residual.

Bound manifestations. EVE, SISTER, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 128
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-128 'Outlet transfer conservation'
Definition	Separates lake admission, EVE observation, escape, and residual.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, SISTER, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	q_exit=q_lake_in+q_EVE+q_escape+r_o
Statement	When typed inputs and evidence gates pass, evaluate F-128; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed quantity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-128', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-128); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-128 and applicable family/product/representation white papers
Type	typed quantity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

29.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_128 : Formula<typed quantity>
  definition "Separates lake admission, EVE observation, escape, and residual."
  expression `q_exit=q_lake_in+q_EVE+q_escape+r_o`
  participants ["EVE", "SISTER", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

29.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-128 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-129 - Re-entry recalculation vector

Exact expression

Delta_x=[Delta_m,Delta_W,Delta_V,Delta_rho,Delta_T,Delta_p,Delta_h]

Meaning. Declares the observed changes that trigger recalculation before re-entry.
Bound manifestations. MK, JO, EVE, SISTER
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 129
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.SISTER
Declaration	formula F-129 'Re-entry recalculation vector'
Definition	Declares the observed changes that trigger recalculation before re-entry.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, EVE, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	Delta_x=[Delta_m,Delta_W,Delta_V,Delta_rho,Delta_T,Delta_p,Delta_h]
Statement	When typed inputs and evidence gates pass, evaluate F-129; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-129', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-129); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-129 and applicable family/product/representation white papers
Type	typed vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

30.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_129 : Formula<typed vector>
  definition "Declares the observed changes that trigger recalculation before re-entry."
  expression `Delta_x=[Delta_m,Delta_W,Delta_V,Delta_rho,Delta_T,Delta_p,Delta_h]`
  participants ["MK", "JO", "EVE", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

30.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-129 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-130 - Re-entry admissibility predicate

Exact expression

Admit_re=types&units&new_cycle&capacity&wave&MK&JO&Angels&M3&MJ

Meaning. Requires complete physics, evidence, safety, routing, and authority before physical re-entry.
Bound manifestations. Bangel , JP, MK, JO, ANGELS, M3, MJ
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 130
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-130 'Re-entry admissibility predicate'
Definition	Requires complete physics, evidence, safety, routing, and authority before physical re-entry.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JP, MK, JO, ANGELS, M3, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	Admit_re=types&units&new_cycle&capacity&wave&MK&JO&Angels&M3&MJ
Statement	When typed inputs and evidence gates pass, evaluate F-130; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-130', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel .begin; R1.predict; JP.represent(F-130); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-130 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

31.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_130 : Formula<logical>
  definition "Requires complete physics, evidence, safety, routing, and authority before
  ↪ physical re-entry."
  expression `Admit_re=types&units&new_cycle&capacity&wave&MK&JO&Angels&M3&MJ`
  participants ["Bangel ", "JP", "MK", "JO", "ANGELS", "M3", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

31.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-130 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-131 - Uncertainty-aware Pearl reference clearance

Exact expression

$$\min_s(||\gamma_{out}(s)-c_P||-R_P,sim) \geq c_{min}+U_{path}$$

Meaning. Path remains outside the nonphysical Pearl simulation reference circle after uncertainty is included.

Bound manifestations. PEARL, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_131
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.PEARL, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-131 'Uncertainty-aware Pearl reference clearance'
Definition	Path remains outside the nonphysical Pearl simulation reference circle after uncertainty is included.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	PEARL, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$\min_s(\gamma_{out}(s)-c_P -R_P,sim) \geq c_{min}+U_{path}$
Statement	When typed inputs and evidence gates pass, evaluate F-131; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-131', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-131); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-131 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

32.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_131 : Formula<length>
  definition "Path remains outside the nonphysical Pearl simulation reference circle after
  ↪ uncertainty is included."
  expression `min_s(||gamma_out(s)-c_P||-R_P,sim) >= c_min+U_path`
  participants ["PEARL", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
```

}

32.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-131 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-132 - Outward angular-gap predicate

Exact expression

abs(wrap(alpha_out-alpha_gap)) <= Delta_alpha_gap/2

Meaning. Outlet direction remains within the declared outward-facing gap.
Bound manifestations. JP, MK, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 132
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,JO
Declaration	formula F-132 'Outward angular-gap predicate'
Definition	Outlet direction remains within the declared outward-facing gap.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	abs(wrap(alpha_out-alpha_gap)) <= Delta_alpha_gap/2
Statement	When typed inputs and evidence gates pass, evaluate F-132; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-132', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-132); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-132 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

33.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_132 : Formula<logical>
  definition "Outlet direction remains within the declared outward-facing gap."
  expression `abs(wrap(alpha_out-alpha_gap)) <= Delta_alpha_gap/2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

33.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-132 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-133 - Available outlet pressure

Exact expression

Delta_p_available=p_containment-p_lake+rho*g*(z_out-z_lake)

Meaning. Pressure and elevation state available to drive a reference outlet flow.
Bound manifestations. MK, JO, SISTER
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 133
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-133 'Available outlet pressure'
Definition	Pressure and elevation state available to drive a reference outlet flow.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	Delta_p_available=p_containment-p_lake+rho*g*(z_out-z_lake)
Statement	When typed inputs and evidence gates pass, evaluate F-133; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: pressure; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-133', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-133); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-133 and applicable family/product/representation white papers
Type	pressure
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

34.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_133 : Formula<pressure>
  definition "Pressure and elevation state available to drive a reference outlet flow."
  expression `Delta_p_available=p_containment-p_lake+rho*g*(z_out-z_lake)`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

34.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-133 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-134 - Outlet pressure margin

Exact expression

Delta_p_margin=Delta_p_available-Delta_p_loss-U_Delta_p

Meaning. Conservative pressure margin after losses and uncertainty.

Bound manifestations. MK, J0

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 134
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-134 'Outlet pressure margin'
Definition	Conservative pressure margin after losses and uncertainty.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	Delta_p_margin=Delta_p_available-Delta_p_loss-U_Delta_p
Statement	When typed inputs and evidence gates pass, evaluate F-134; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: pressure; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-134', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-134); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-134 and applicable family/product/representation white papers
Type	pressure
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

35.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_134 : Formula<pressure>
  definition "Conservative pressure margin after losses and uncertainty."
  expression `Delta_p_margin=Delta_p_available-Delta_p_loss-U_Delta_p`
  participants ["MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

35.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-134 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-135 - Minimum outlet grade

Exact expression

$$\alpha_{\min} = \text{atan}(\max(0, \Delta p_{\text{loss}} + U_{\Delta p} - (p_{\text{containment}} - p_{\text{lake}})) / (\rho \cdot g \cdot L_{\text{path}}))$$

Meaning. Minimum modeled grade needed to overcome pressure deficit under declared assumptions.
Bound manifestations. JP, MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 135
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJO
Declaration	formula F-135 'Minimum outlet grade'
Definition	Minimum modeled grade needed to overcome pressure deficit under declared assumptions.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$\alpha_{\min} = \text{atan}(\max(0, \Delta p_{\text{loss}} + U_{\Delta p} - (p_{\text{containment}} - p_{\text{lake}})) / (\rho \cdot g \cdot L_{\text{path}}))$
Statement	When typed inputs and evidence gates pass, evaluate F-135; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: angle; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-135', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-135); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receive; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-135 and applicable family/product/representation white papers
Type	angle
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

36.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_135 : Formula<angle>
  definition "Minimum modeled grade needed to overcome pressure deficit under declared
  assumptions."
  expression
  `alpha_min=atan(max(0,Delta_p_loss+U_Delta_p-(p_containment-p_lake))/(rho*g*L_path))`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receive(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

36.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-135 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-136 - Selected positive outlet grade

Exact expression

alpha_selected=alpha_min+delta_alpha; delta_alpha>0

Meaning. Slight positive increase above the modeled minimum; no universal value is asserted.

Bound manifestations. JP, MK, JO, MJ

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 136
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyMJ
Declaration	formula F-136 'Selected positive outlet grade'
Definition	Slight positive increase above the modeled minimum; no universal value is asserted.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	alpha_selected=alpha_min+delta_alpha; delta_alpha>0
Statement	When typed inputs and evidence gates pass, evaluate F-136; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: angle; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-136', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-136); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-136 and applicable family/product/representation white papers
Type	angle
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

37.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_136 : Formula<angle>
  definition "Slight positive increase above the modeled minimum; no universal value is
↵ asserted."
  expression `alpha_selected=alpha_min+delta_alpha; delta_alpha>0`
  participants ["JP", "MK", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

37.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-136 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-137 - Incompressible reference outlet flow

Exact expression

$$Q_{ref}=C_d*A_{out}*sqrt(2*max(0,Delta_p_{available}-Delta_p_{loss})/rho)$$

Meaning. Conditional reference flow under evidenced incompressible assumptions.

Bound manifestations. MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 137
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-137 'Incompressible reference outlet flow'
Definition	Conditional reference flow under evidenced incompressible assumptions.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$Q_{ref}=C_d*A_{out}*sqrt(2*max(0,Delta_p_{available}-Delta_p_{loss})/rho)$
Statement	When typed inputs and evidence gates pass, evaluate F-137; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: volume/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-137', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-137); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2, 0
Reference	pathways/FORMULA-REGISTER.json#F-137 and applicable family/product/representation white papers
Type	volume/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

38.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_137 : Formula<volume/time>
  definition "Conditional reference flow under evidenced incompressible assumptions."
  expression `Q_ref=C_d*A_out*sqrt(2*max(0,Delta_p_available-Delta_p_loss)/rho)`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

38.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-137 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-138 - Mean outlet velocity

Exact expression

U_out=Q_ref/A_out

Meaning. Conditional mean velocity for the declared outlet area.

Bound manifestations. MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 138
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-138 'Mean outlet velocity'
Definition	Conditional mean velocity for the declared outlet area.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	U_out=Q_ref/A_out
Statement	When typed inputs and evidence gates pass, evaluate F-138; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-138', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-138); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-138 and applicable family/product/representation white papers
Type	length/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

39.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_138 : Formula<length/time>
  definition "Conditional mean velocity for the declared outlet area."
  expression `U_out=Q_ref/A_out`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

39.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-138 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-139 - Weber number reference

Exact expression

We=ρ*U²*L/σ

Meaning. Surface-tension-to-inertia reference when the model applies.
Bound manifestations. MK, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 139
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-139 'Weber number reference'
Definition	Surface-tension-to-inertia reference when the model applies.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	We=ρ*U ² *L/σ
Statement	When typed inputs and evidence gates pass, evaluate F-139; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-139', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-139); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-139 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

40.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_139 : Formula<dimensionless>
  definition "Surface-tension-to-inertia reference when the model applies."
  expression `We=ρ*U^2*L/σ`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

40.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-139 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-140 - Wave amplitude ratio

Exact expression

epsilon_a=a_wave/h_L

Meaning. Dimensionless small-amplitude observation ratio.

Bound manifestations. MK, JO, EVE

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 140
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE
Declaration	formula F-140 'Wave amplitude ratio'
Definition	Dimensionless small-amplitude observation ratio.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	epsilon_a=a_wave/h_L
Statement	When typed inputs and evidence gates pass, evaluate F-140; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-140', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-140); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-140 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

41.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_140 : Formula<dimensionless>
  definition "Dimensionless small-amplitude observation ratio."
  expression `epsilon_a=a_wave/h_L`
  participants ["MK", "JO", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

41.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-140 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-141 - Small-wave observation gate

Exact expression

WaveGate=(Fr<=Fr_max)&(epsilon_a<=epsilon_a,max)&(We<=We_max when applicable)

Meaning. Reference gate for bounded low-amplitude observations; not proof of wave suppression.

Bound manifestations. MK, JO, ANGELS

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 141
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS
Declaration	formula F-141 'Small-wave observation gate'
Definition	Reference gate for bounded low-amplitude observations; not proof of wave suppression.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	MK, JO, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	WaveGate=(Fr<=Fr_max)&(epsilon_a<=epsilon_a,max)&(We<=We_max when applicable)
Statement	When typed inputs and evidence gates pass, evaluate F-141; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-141', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-141); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-141 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

42.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_141 : Formula<logical>
  definition "Reference gate for bounded low-amplitude observations; not proof of wave
  ↵ suppression."
  expression `WaveGate=(Fr<=Fr_max)&(epsilon_a<=epsilon_a,max)&(We<=We_max when applicable)`
  participants ["MK", "JO", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

42.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-141 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-142 - Discrete reservoir inventory

Exact expression

$$q_L, t+1 = q_L, t + q_{out} - q_{return} - q_{drain} - q_{escape} - r_L$$

Meaning. Receipted discrete update for the separate lake/buffer control volume.

Bound manifestations. EVE, M3, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 142
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-142 'Discrete reservoir inventory'
Definition	Receipted discrete update for the separate lake/buffer control volume.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, M3, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$q_L, t+1 = q_L, t + q_{out} - q_{return} - q_{drain} - q_{escape} - r_L$
Statement	When typed inputs and evidence gates pass, evaluate F-142; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed quantity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-142', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-142); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-142 and applicable family/product/representation white papers
Type	typed quantity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

43.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_142 : Formula<typed quantity>
  definition "Receipted discrete update for the separate lake/buffer control volume."
  expression `q_L, t+1=q_L, t+q_out-q_return-q_drain-q_escape-r_L`
  participants ["EVE", "M3", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

43.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-142 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-143 - Vector reservoir headroom

Exact expression

H_L,k=C_L,k-q_L,k

Meaning. Headroom remains separate for every resource dimension.

Bound manifestations. SISTER, EVE, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 143
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-143 'Vector reservoir headroom'
Definition	Headroom remains separate for every resource dimension.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	H_L,k=C_L,k-q_L,k
Statement	When typed inputs and evidence gates pass, evaluate F-143; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed capacity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-143', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-143); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-143 and applicable family/product/representation white papers
Type	typed capacity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

44.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_143 : Formula<typed capacity>
  definition "Headroom remains separate for every resource dimension."
  expression `H_L,k=C_L,k-q_L,k`
  participants ["SISTER", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

44.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-143 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-144 - Vector reservoir admission

Exact expression

Admit_L=AND_k[q_L,k+q_in,k <= (1-h_L,k)C_L,k]

Meaning. Admission fails when any resource dimension lacks required headroom.
Bound manifestations. ANGELS, M3, MK, J0, MJ
Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 144
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-144 'Vector reservoir admission'
Definition	Admission fails when any resource dimension lacks required headroom.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	ANGELS, M3, MK, J0, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	Admit_L=AND_k[q_L,k+q_in,k <= (1-h_L,k)C_L,k]
Statement	When typed inputs and evidence gates pass, evaluate F-144; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-144', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-144); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-144 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

45.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_144 : Formula<logical>
  definition "Admission fails when any resource dimension lacks required headroom."
  expression `Admit_L=AND_k[q_L,k+q_in,k <= (1-h_L,k)C_L,k]`
  participants ["ANGELS", "M3", "MK", "J0", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

45.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-144 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-145 - No same-cycle feedback predicate

Exact expression

ReentryValid=(cycle_reentry=cycle_exit+1)&no_uncleared_generation_reuse

Meaning. Re-entry starts a new receipted cycle and cannot feed the same active generation.

Bound manifestations. M3, J0, ANGELS, MJ

Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 145
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.MJ
Declaration	formula F-145 'No same-cycle feedback predicate'
Definition	Re-entry starts a new receipted cycle and cannot feed the same active generation.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	M3, J0, ANGELS, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	ReentryValid=(cycle_reentry=cycle_exit+1)&no_uncleared_generation_reuse
Statement	When typed inputs and evidence gates pass, evaluate F-145; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-145', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-145); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-145 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

46.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_145 : Formula<logical>
  definition "Re-entry starts a new receipted cycle and cannot feed the same active
  ↵ generation."
  expression `ReentryValid=(cycle_reentry=cycle_exit+1)&no_uncleared_generation_reuse`
  participants ["M3", "J0", "ANGELS", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

46.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-145 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

MJ-PBMEF Pink Paper - Volume V

Family Manifestations and Governed Object Gateway Bindings

Michael Bangel - Author and Architect

August 2026

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Document control

Project	MJos Predictive Model
Project ID	MJ - PBMEF - 001
Source build	MJ - PBMEF - DAY0 - R5 - REVIEW - CANDIDATE
Document ID	MJ - PBMEF - PINK - PAPER - 001 / VOL - V
Author and architect	Michael Bangel
Status	FOUNDER_REVIEW_CANDIDATE_PENDING_FREEZE
Scope	All family manifestations and governed objects in gateway and life-cycle context.

Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Family manifestation verification

MJ - MJ

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MJ
Namespace	MJ.PBMEF.Family.MJ.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MJ
Definition	Project root, founder-governed authority and final bounded permit decision.
Capability	bounded permit, hold, deny, project state
Participant	MJ
Relationship	Incoming: MICHAEL_BANGEL; outgoing: Bangel
Function	Project root, founder-governed authority and final bounded permit decision.
Expression	Applicable formula set and bounded family receipt
Statement	MJ contributes its role but cannot substitute for another participant.
Measurement	founder purpose, verified evidence, family receipts, Pearl and Bangel Spreadsheets decision packets
Constraint	Cannot convert unknown evidence into permission or claim external authority.
Annotation	@family(id='MJ', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MJ { input; verify; output; boundary; }
Literal	truth, measurement, human authority, stewardship, non-weaponization
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	ROOT
Attribute	full_family_identity=true; self_authority=false

2.1 Command-life-cycle role

At R0/R1, MJ receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Cannot convert unknown evidence into permission or claim external authority.

Bangel - Bangel

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.Bangel
Namespace	MJ.PBMEF.Family.Bangel .Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant Bangel
Definition	Human-facing governed language that preserves purpose and command structure.
Capability	typed command envelope, source representation, Bangel Sheet source, if/how/then operational intake
Participant	Bangel
Relationship	Incoming: MJ; outgoing: ELSA
Function	Human-facing governed language that preserves purpose and command structure.
Expression	Applicable formula set and bounded family receipt
Statement	Bangel contributes its role but cannot substitute for another participant.
Measurement	human purpose, declared scope
Constraint	No independent execution, financial issuance, or physical truth.
Annotation	@family(id='Bangel ', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant Bangel { input; verify; output; boundary; }
Literal	intent integrity, explicit types, traceability
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

3.1 Command-life-cycle role

At R0/R1, Bangel receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No independent execution, financial issuance, or physical truth.

Elsa - ELSA

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.ELSA
Namespace	MJ.PBMEF.Family.ELSA.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant ELSA
Definition	Deterministic semantic recovery and purpose-preservation layer.
Capability	semantic envelope, ambiguity hold
Participant	Elsa
Relationship	Incoming: Bangel ; outgoing: JP
Function	Deterministic semantic recovery and purpose-preservation layer.
Expression	Applicable formula set and bounded family receipt
Statement	Elsa contributes its role but cannot substitute for another participant.
Measurement	Bangel source, context, evidence
Constraint	No execution, permit, finance, or invented intent.
Annotation	@family(id='ELSA', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant ELSA { input; verify; output; boundary; }
Literal	meaning fidelity, purpose confinement, clarity
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

4.1 Command-life-cycle role

At R0/R1, Elsa receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No execution, permit, finance, or invented intent.

JP - JP

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.JP
Namespace	MJ.PBMEF.Family.JP.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant JP
Definition	Canonical mathematical, algorithmic, topology, CAPO, and architecture representation.
Capability	math CAPO, algorithm CAPO, architecture CAPO, Pearl CAPO, Bangle Sheet dependency CAPO, JPOSMJ product envelope
Participant	JP
Relationship	Incoming: ELSA; outgoing: MK
Function	Canonical mathematical, algorithmic, topology, CAPO, and architecture representation.
Expression	Applicable formula set and bounded family receipt
Statement	JP contributes its role but cannot substitute for another participant.
Measurement	semantic envelope, founder laws
Constraint	Representation is not admission, execution, or authority.
Annotation	@family(id='JP', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant JP { input; verify; output; boundary; }
Literal	mathematical rigor, provenance, equivalence
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

5.1 Command-life-cycle role

At R0/R1, JP receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Representation is not admission, execution, or authority.

Mika / MK - MK

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MK
Namespace	MJ.PBMEF.Family.MK.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MK
Definition	Physics Modulator System for dimensional, conservation, boundary, scale, and evidence representation.
Capability	physics CAPO, not-applicable receipt, hold, technical fail, Pearl physics receipt, spreadsheet resource-physics receipt
Participant	Mika / MK
Relationship	Incoming: JP; outgoing: JO, BELLE
Function	Physics Modulator System for dimensional, conservation, boundary, scale, and evidence representation.
Expression	Applicable formula set and bounded family receipt
Statement	Mika / MK contributes its role but cannot substitute for another participant.
Measurement	JP math CAPO, environment, control volume, evidence, Pearl simulation geometry/acoustic profile, Bangel Sheet workload and dependency field
Constraint	No MJ permit, coordinate approval, physical validation, or evidence invention.
Annotation	@family(id='MK', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MK { input; verify; output; boundary; }
Literal	physical truth, unit integrity, conservation, uncertainty honesty
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

6.1 Command-life-cycle role

At R0/R1, Mika / MK receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No MJ permit, coordinate approval, physical validation, or evidence invention.

JO - JO

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.JO
Namespace	MJ.PBMEF.Family.JO.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant JO
Definition	Deterministic type, unit, proof, validation, runtime, and evidence engine.
Capability	proof receipt, runtime result, hold, deny, sheet revision receipt, Pearl balance receipt
Participant	JO
Relationship	Incoming: MK; outgoing: ANGELS, BELLATRIX, SISTER, EVE
Function	Deterministic type, unit, proof, validation, runtime, and evidence engine.
Expression	Applicable formula set and bounded family receipt
Statement	JO contributes its role but cannot substitute for another participant.
Measurement	typed CAPOs, authority receipts, evidence, Bangel Sheet revisions, Pearl lifecycle packets
Constraint	No invented purpose, physics, authority, finance, or external effect.
Annotation	@family(id='JO', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant JO { input; verify; output; boundary; }
Literal	fail closed, reproducibility, auditability
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

7.1 Command-life-cycle role

At R0/R1, JO receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No invented purpose, physics, authority, finance, or external effect.

MJOS - MJOS

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MJOS
Namespace	MJ.PBMEF.Family.MJOS.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MJOS
Definition	Operating-system and infrastructure substrate inside MJ.
Capability	resource service, infrastructure evidence
Participant	MJOS
Relationship	Incoming: JO_EXECUTION; outgoing: receipt to MJ/JO
Function	Operating-system and infrastructure substrate inside MJ.
Expression	Applicable formula set and bounded family receipt
Statement	MJOS contributes its role but cannot substitute for another participant.
Measurement	MJ leases, JO execution plan
Constraint	Not a second authority principal.
Annotation	@family(id='MJOS', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MJOS { input; verify; output; boundary; }
Literal	bounded resources, continuity, isolation
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

8.1 Command-life-cycle role

At R0/R1, MJOS receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Not a second authority principal.

Angels - ANGELS

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.ANGELS
Namespace	MJ.PBMEF.Family.ANGELS.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant ANGELS
Definition	Domain-specific observation, telemetry, hold, denial, and corrective-command family.
Capability	safety receipt, hold, deny, correction request
Participant	Angels
Relationship	Incoming: JO; outgoing: M3
Function	Domain-specific observation, telemetry, hold, denial, and corrective-command family.
Expression	Applicable formula set and bounded family receipt
Statement	Angels contributes its role but cannot substitute for another participant.
Measurement	commands, evidence, state
Constraint	No self-admission, ordinary execution, or scope expansion.
Annotation	@family(id='ANGELS', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant ANGELS { input; verify; output; boundary; }
Literal	safety, watchfulness, correction
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION_FAMILY
Attribute	full_family_identity=true; self_authority=false

9.1 Command-life-cycle role

At R0/R1, Angels receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No self-admission, ordinary execution, or scope expansion.

Bellatrix - BELLATRIX

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.BELLATRIX
Namespace	MJ.PBMEF.Family.BELLATRIX.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant BELLATRIX
Definition	Independent defense, challenge, quarantine, hostile-deviation analysis, and denial.
Capability	deny, quarantine, challenge receipt
Participant	Bellatrix
Relationship	Incoming: JO; outgoing: M3
Function	Independent defense, challenge, quarantine, hostile-deviation analysis, and denial.
Expression	Applicable formula set and bounded family receipt
Statement	Bellatrix contributes its role but cannot substitute for another participant.
Measurement	commands, threat evidence
Constraint	No positive general admission.
Annotation	@family(id='BELLATRIX', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant BELLATRIX { input; verify; output; boundary; }
Literal	defense, independence, containment
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

10.1 Command-life-cycle role

At R0/R1, Bellatrix receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No positive general admission.

Sister - SISTER

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.SISTER
Namespace	MJ.PBMEF.Family.SISTER.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant SISTER
Definition	Predictive digital twin, preallocation evidence, anomaly detection, umbrella collection, and canonical physical containment request.
Capability	forecast, containment request, digital-twin receipt, physical containment request and Pearl simulation request
Participant	Sister
Relationship	Incoming: JO; outgoing: M3
Function	Predictive digital twin, preallocation evidence, anomaly detection, umbrella collection, and canonical physical containment request.
Expression	Applicable formula set and bounded family receipt
Statement	Sister contributes its role but cannot substitute for another participant.
Measurement	state stream, request trend, variance
Constraint	Prediction is not permission.
Annotation	@family(id='SISTER', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant SISTER { input; verify; output; boundary; }
Literal	prediction, redundancy, early warning
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

11.1 Command-life-cycle role

At R0/R1, Sister receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Prediction is not permission.

EVE - EVE

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.EVE
Namespace	MJ.PBMEF.Family.EVE.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant EVE
Definition	Variance, evaporative effect, screen capture, leakage, smoke-like egress, and boundary-accounting evidence.
Capability	EVE observation, capture/egress ledger, hold, Pearl escape/capture observation
Participant	EVE
Relationship	Incoming: JO; outgoing: M3
Function	Variance, evaporative effect, screen capture, leakage, smoke-like egress, and boundary-accounting evidence.
Expression	Applicable formula set and bounded family receipt
Statement	EVE contributes its role but cannot substitute for another participant.
Measurement	mass/weight states, flows, screen measurements, residuals
Constraint	No release, pricing, minting, or execution.
Annotation	@family(id='EVE', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant EVE { input; verify; output; boundary; }
Literal	diligence, respect, loss accounting, boundary truth
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

12.1 Command-life-cycle role

At R0/R1, EVE receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No release, pricing, minting, or execution.

Mary / M3 - M3

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.M3
Namespace	MJ.PBMEF.Family.M3.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant M3
Definition	Bounded routing, API gateway, load balancing, connection pooling, and allocation stewardship.
Capability	route receipt, allocation lease use, return receipt, Pearl allocation/transfer receipt, Bangel Sheet partition route receipt
Participant	Mary / M3
Relationship	Incoming: ANGELS, BELLATRIX, SISTER, EVE; outgoing: MERMAID, SHIVA
Function	Bounded routing, API gateway, load balancing, connection pooling, and allocation stewardship.
Expression	Applicable formula set and bounded family receipt
Statement	Mary / M3 contributes its role but cannot substitute for another participant.
Measurement	admitted command, MJ lease, capacity evidence
Constraint	No authority minting, lease widening, or denial bypass.
Annotation	@family(id='M3', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant M3 { input; verify; output; boundary; }
Literal	fair allocation, resource hygiene, bounded routing
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

13.1 Command-life-cycle role

At R0/R1, Mary / M3 receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO's final R2 receipt.

Hard boundary

No authority minting, lease widening, or denial bypass.

Mermaid - MERMAID

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MERMAID
Namespace	MJ.PBMEF.Family.MERMAID.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MERMAID
Definition	Accounting, reconciliation, exposure, custody evidence, statements, tax lots, and financial consequence.
Capability	account, balance, exposure, reconciliation receipt
Participant	Mermaid
Relationship	Incoming: M3; outgoing: MJ_DECISION
Function	Accounting, reconciliation, exposure, custody evidence, statements, tax lots, and financial consequence.
Expression	Applicable formula set and bounded family receipt
Statement	Mermaid contributes its role but cannot substitute for another participant.
Measurement	transaction evidence, EVE evidence, Shiva proposal, Pearl lifecycle and Bangel Sheet audit particles
Constraint	No source-truth invention, minting, or final permit.
Annotation	@family(id='MERMAID', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MERMAID { input; verify; output; boundary; }
Literal	ledger truth, reconciliation, transparency
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

14.1 Command-life-cycle role

At R0/R1, Mermaid receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO's final R2 receipt.

Hard boundary

No source-truth invention, minting, or final permit.

Shiva - SHIVA

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.SHIVA
Namespace	MJ.PBMEF.Family.SHIVA.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant SHIVA
Definition	Finance, money, treasury, liquidity, capital-job classification, risk/opportunity analysis, and distribution proposal.
Capability	capital proposal, job-of-money classification, distribution plan
Participant	Shiva
Relationship	Incoming: M3; outgoing: MJ_DECISION
Function	Finance, money, treasury, liquidity, capital-job classification, risk/opportunity analysis, and distribution proposal.
Expression	Applicable formula set and bounded family receipt
Statement	Shiva contributes its role but cannot substitute for another participant.
Measurement	capital purpose, Mermaid account, MK friction, risk evidence, Pearl regeneration opportunity vectors
Constraint	No banking, investment advice, custody, exchange, minting, or external operation authority.
Annotation	@family(id='SHIVA', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant SHIVA { input; verify; output; boundary; }
Literal	liquidity first, stability, abundance with discipline, auditability
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

15.1 Command-life-cycle role

At R0/R1, Shiva receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No banking, investment advice, custody, exchange, minting, or external operation authority.

Shekina - SHEKINA

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.SHEKINA
Namespace	MJ.PBMEF.Family.SHEKINA.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant SHEKINA
Definition	Distributed placement, replication, continuity, and infrastructure evidence.
Capability	placement receipt, continuity evidence
Participant	Shekina
Relationship	Incoming: JO_EXECUTION; outgoing: receipt to MJ/JO
Function	Distributed placement, replication, continuity, and infrastructure evidence.
Expression	Applicable formula set and bounded family receipt
Statement	Shekina contributes its role but cannot substitute for another participant.
Measurement	placement request, MJ lease
Constraint	No authority from location and no scope widening.
Annotation	@family(id='SHEKINA', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant SHEKINA { input; verify; output; boundary; }
Literal	continuity, bounded placement, resilience
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

16.1 Command-life-cycle role

At R0/R1, Shekina receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No authority from location and no scope widening.

Belle - BELLE

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.BELLE
Namespace	MJ.PBMEF.Family.BELLE.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant BELLE
Definition	Engineering analysis, feasibility, topology review, and bounded proposals.
Capability	engineering proposal, risk note
Participant	Belle
Relationship	Incoming: MK; outgoing: receipt to MJ/JO
Function	Engineering analysis, feasibility, topology review, and bounded proposals.
Expression	Applicable formula set and bounded family receipt
Statement	Belle contributes its role but cannot substitute for another participant.
Measurement	design CAPO, physics CAPO
Constraint	Proposal is not execution or permit.
Annotation	@family(id='BELLE', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant BELLE { input; verify; output; boundary; }
Literal	engineering clarity, feasibility, benchmarking
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

17.1 Command-life-cycle role

At R0/R1, Belle receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Proposal is not execution or permit.

Lecanto - LECANTO

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.LECANTO
Namespace	MJ.PBMEF.Family.LECANTO.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant LECANTO
Definition	Truthful governed visualization of state, provenance, uncertainty, and system structure.
Capability	visual representation
Participant	Lecanto
Relationship	Incoming: JO_EXECUTION; outgoing: MOANA
Function	Truthful governed visualization of state, provenance, uncertainty, and system structure.
Expression	Applicable formula set and bounded family receipt
Statement	Lecanto contributes its role but cannot substitute for another participant.
Measurement	JO evidence, Mermaid account, MK physics receipt, Bangel Sheet lineage and Pearl state
Constraint	Cannot manufacture certainty or underlying effects.
Annotation	@family(id='LECANTO', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant LECANTO { input; verify; output; boundary; }
Literal	visibility, truth, uncertainty disclosure
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

18.1 Command-life-cycle role

At R0/R1, Lecanto receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Cannot manufacture certainty or underlying effects.

Moana - MOANA

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MOANA
Namespace	MJ.PBMEF.Family.MOANA.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MOANA
Definition	Browser and interaction presentation of governed applications and evidence.
Capability	interaction surface
Participant	Moana
Relationship	Incoming: LECANTO; outgoing: receipt to MJ/JO
Function	Browser and interaction presentation of governed applications and evidence.
Expression	Applicable formula set and bounded family receipt
Statement	Moana contributes its role but cannot substitute for another participant.
Measurement	Lecanto views, JO evidence
Constraint	No underlying effect or credential authority.
Annotation	@family(id='MOANA', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MOANA { input; verify; output; boundary; }
Literal	interaction truth, accessibility, bounded presentation
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

19.1 Command-life-cycle role

At R0/R1, Moana receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No underlying effect or credential authority.

Aviator - AVIATOR

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.AVIATOR
Namespace	MJ.PBMEF.Family.AVIATOR.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant AVIATOR
Definition	Organizational workspace, projects, decisions, roles, knowledge, and governed workflow.
Capability	workspace state, decision records
Participant	Aviator
Relationship	Incoming: JO_EXECUTION; outgoing: receipt to MJ/JO
Function	Organizational workspace, projects, decisions, roles, knowledge, and governed workflow.
Expression	Applicable formula set and bounded family receipt
Statement	Aviator contributes its role but cannot substitute for another participant.
Measurement	member purpose, governed records, Bangel Spreadsheets workbooks and reports
Constraint	No root authority, cross-tenant scope, or unadmitted finance.
Annotation	@family(id='AVIATOR', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant AVIATOR { input; verify; output; boundary; }
Literal	understanding first, organization, decision trace
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

20.1 Command-life-cycle role

At R0/R1, Aviator receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No root authority, cross-tenant scope, or unadmitted finance.

CHI - CHI

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.CHI
Namespace	MJ.PBMEF.Family.CHI.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant CHI
Definition	Temporal variance and expected-observed-delivered-reconciled difference state.
Capability	variance object
Participant	CHI
Relationship	Incoming: MJ/root context; outgoing: receipt to MJ/JO
Function	Temporal variance and expected-observed-delivered-reconciled difference state.
Expression	Applicable formula set and bounded family receipt
Statement	CHI contributes its role but cannot substitute for another participant.
Measurement	timestamps, expected/observed states
Constraint	No pricing, punishment, rank, or execution.
Annotation	@family(id='CHI', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant CHI { input; verify; output; boundary; }
Literal	variance truth, time awareness
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	STATE_ENTITY
Attribute	full_family_identity=true; self_authority=false

21.1 Command-life-cycle role

At R0/R1, CHI receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No pricing, punishment, rank, or execution.

WATER - WATER

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.WATER
Namespace	MJ.PBMEF.Family.WATER.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant WATER
Definition	Interval uncertainty, verified floor, and bounded unknown-state classification.
Capability	state classification
Participant	WATER
Relationship	Incoming: MJ/root context; outgoing: receipt to MJ/JO
Function	Interval uncertainty, verified floor, and bounded unknown-state classification.
Expression	Applicable formula set and bounded family receipt
Statement	WATER contributes its role but cannot substitute for another participant.
Measurement	measurement intervals, evidence limits
Constraint	No authority or value from classification.
Annotation	@family(id='WATER', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant WATER { input; verify; output; boundary; }
Literal	uncertainty honesty, bounded intervals
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	STATE_CLASS
Attribute	full_family_identity=true; self_authority=false

22.1 Command-life-cycle role

At R0/R1, WATER receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No authority or value from classification.

Governed object verification

23.1 JP_CAPO

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.JP_CAPO
Namespace	MJ.PBMEF.Object.JP_CAPO.Day0
Declaration	object JP_CAPO
Definition	Canonical math, algorithm, topology, or architecture representation
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Canonical math, algorithm, topology, or architecture representation
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='JP_CAPO')
Directive	validate schema and provenance before use
Block	object JP_CAPO { fields; invariants; evidence; }
Literal	JP_CAPO
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.2 MK_PHYSICS_CAPO

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.MK_PHYSICS_CAPO
Namespace	MJ.PBMEF.Object.MK_PHYSICS_CAPO.Day0
Declaration	object MK_PHYSICS_CAPO
Definition	Physics applicability, quantities, units, boundaries, equations, uncertainty, and evidence
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Physics applicability, quantities, units, boundaries, equations, uncertainty, and evidence
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='MK_PHYSICS_CAPO')
Directive	validate schema and provenance before use
Block	object MK_PHYSICS_CAPO { fields; invariants; evidence; }
Literal	MK_PHYSICS_CAPO
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.3 JO_PROOF_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.JO_PROOF_RECEIPT
Namespace	MJ.PBMEF.Object.JO_PROOF_RECEIPT.Day0
Declaration	object JO_PROOF_RECEIPT
Definition	Executed verification result
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Executed verification result
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='JO_PROOF_RECEIPT')
Directive	validate schema and provenance before use
Block	object JO_PROOF_RECEIPT { fields; invariants; evidence; }
Literal	JO_PROOF_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.4 MJ_PERMIT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.MJ_PERMIT
Namespace	MJ.PBMEF.Object.MJ_PERMIT.Day0
Declaration	object MJ_PERMIT
Definition	Bounded permit decision issued only by MJ
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Bounded permit decision issued only by MJ
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='MJ_PERMIT')
Directive	validate schema and provenance before use
Block	object MJ_PERMIT { fields; invariants; evidence; }
Literal	MJ_PERMIT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.5 EVE_OBSERVATION

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.EVE_OBSERVATION
Namespace	MJ.PBMEF.Object.EVE_OBSERVATION.Day0
Declaration	object EVE_OBSERVATION
Definition	Variance, screen, capture, egress, or residual evidence
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Variance, screen, capture, egress, or residual evidence
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='EVE_OBSERVATION')
Directive	validate schema and provenance before use
Block	object EVE_OBSERVATION { fields; invariants; evidence; }
Literal	EVE_OBSERVATION
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.6 M3_ROUTE_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.M3_ROUTE_RECEIPT
Namespace	MJ.PBMEF.Object.M3_ROUTE_RECEIPT.Day0
Declaration	object M3_ROUTE_RECEIPT
Definition	Bounded routing and resource-use receipt
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Bounded routing and resource-use receipt
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='M3_ROUTE_RECEIPT')
Directive	validate schema and provenance before use
Block	object M3_ROUTE_RECEIPT { fields; invariants; evidence; }
Literal	M3_ROUTE_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.7 MERMAID_ACCOUNT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.MERMAID_ACCOUNT
Namespace	MJ.PBMEF.Object.MERMAID_ACCOUNT.Day0
Declaration	object MERMAID_ACCOUNT
Definition	Accounting, custody, exposure, tax, and reconciliation record
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Accounting, custody, exposure, tax, and reconciliation record
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='MERMAID_ACCOUNT')
Directive	validate schema and provenance before use
Block	object MERMAID_ACCOUNT { fields; invariants; evidence; }
Literal	MERMAID_ACCOUNT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.8 SHIVA_SHELL

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.SHIVA_SHELL
Namespace	MJ.PBMEF.Object.SHIVA_SHELL.Day0
Declaration	object SHIVA_SHELL
Definition	Governed account envelope for typed financial representations
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Governed account envelope for typed financial representations
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='SHIVA_SHELL')
Directive	validate schema and provenance before use
Block	object SHIVA_SHELL { fields; invariants; evidence; }
Literal	SHIVA_SHELL
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.9 SHIVAS_INTERNAL_REFLECTION

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.SHIVAS_INTERNAL_REFLECTION
Namespace	MJ.PBMEF.Object.SHIVAS_INTERNAL_REFLECTION.Day0
Declaration	object SHIVAS_INTERNAL_REFLECTION
Definition	Internal non-transferable capital-reflection object
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Internal non-transferable capital-reflection object
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='SHIVAS_INTERNAL_REFLECTION')
Directive	validate schema and provenance before use
Block	object SHIVAS_INTERNAL_REFLECTION { fields; invariants; evidence; }
Literal	SHIVAS_INTERNAL_REFLECTION
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.10 CHI_VARIANCE_OBJECT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CHI_VARIANCE_OBJECT
Namespace	MJ.PBMEF.Object.CHI_VARIANCE_OBJECT.Day0
Declaration	object CHI_VARIANCE_OBJECT
Definition	Temporal difference object
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Temporal difference object
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CHI_VARIANCE_OBJECT')
Directive	validate schema and provenance before use
Block	object CHI_VARIANCE_OBJECT { fields; invariants; evidence; }
Literal	CHI_VARIANCE_OBJECT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.11 WATER_INTERVAL_STATE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.WATER_INTERVAL_STATE
Namespace	MJ.PBMEF.Object.WATER_INTERVAL_STATE.Day0
Declaration	object WATER_INTERVAL_STATE
Definition	Uncertainty interval state
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Uncertainty interval state
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='WATER_INTERVAL_STATE')
Directive	validate schema and provenance before use
Block	object WATER_INTERVAL_STATE { fields; invariants; evidence; }
Literal	WATER_INTERVAL_STATE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.12 PASSKEY_PUBLIC_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PASSKEY_PUBLIC_RECEIPT
Namespace	MJ.PBMEF.Object.PASSKEY_PUBLIC_RECEIPT.Day0
Declaration	object PASSKEY_PUBLIC_RECEIPT
Definition	Public verification of founder signature over a bounded content root
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Public verification of founder signature over a bounded content root
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PASSKEY_PUBLIC_RECEIPT')
Directive	validate schema and provenance before use
Block	object PASSKEY_PUBLIC_RECEIPT { fields; invariants; evidence; }
Literal	PASSKEY_PUBLIC_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.13 PEARL_VARIANCE_CONTAINER

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_VARIANCE_CONTAINER
Namespace	MJ.PBMEF.Object.PEARL_VARIANCE_CONTAINER.Day0
Declaration	object PEARL_VARIANCE_CONTAINER
Definition	Legacy stable ID for a pearl-shaped hypothetical simulation and information-retention object; never a physical container
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Legacy stable ID for a pearl-shaped hypothetical simulation and information-retention object; never a physical container
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_VARIANCE_CONTAINER')
Directive	validate schema and provenance before use
Block	object PEARL_VARIANCE_CONTAINER { fields; invariants; evidence; }
Literal	PEARL_VARIANCE_CONTAINER
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.14 PEARL_ALLOCATION_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_ALLOCATION_RECEIPT
Namespace	MJ.PBMEF.Object.PEARL_ALLOCATION_RECEIPT.Day0
Declaration	object PEARL_ALLOCATION_RECEIPT
Definition	M3/JO receipt for simulated Pearl allocation, scenario capacity, source, destination, and lifecycle state; no physical effect
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	M3/JO receipt for simulated Pearl allocation, scenario capacity, source, destination, and lifecycle state; no physical effect
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_ALLOCATION_RECEIPT')
Directive	validate schema and provenance before use
Block	object PEARL_ALLOCATION_RECEIPT { fields; invariants; evidence; }
Literal	PEARL_ALLOCATION_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.15 PEARL_ACOUSTIC_PROFILE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_ACOUSTIC_PROFILE
Namespace	MJ.PBMEF.Object.PEARL_ACOUSTIC_PROFILE.Day0
Declaration	object PEARL_ACOUSTIC_PROFILE
Definition	Hypothetical acoustic simulation profile with declared frequency, medium, observability, uncertainty, and no physical cohesion claim
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Hypothetical acoustic simulation profile with declared frequency, medium, observability, uncertainty, and no physical cohesion claim
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_ACOUSTIC_PROFILE')
Directive	validate schema and provenance before use
Block	object PEARL_ACOUSTIC_PROFILE { fields; invariants; evidence; }
Literal	PEARL_ACOUSTIC_PROFILE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.16 PEARL_SYMPOSIUM_REGISTRY

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_SYMPOSIUM_REGISTRY
Namespace	MJ.PBMEF.Object.PEARL_SYMPOSIUM_REGISTRY.Day0
Declaration	object PEARL_SYMPOSIUM_REGISTRY
Definition	Mermaid/Shiva record of Pearl simulation scenarios, quantities, costs, implications, and regeneration opportunities under MJ
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Mermaid/Shiva record of Pearl simulation scenarios, quantities, costs, implications, and regeneration opportunities under MJ
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_SYMPOSIUM_REGISTRY')
Directive	validate schema and provenance before use
Block	object PEARL_SYMPOSIUM_REGISTRY { fields; invariants; evidence; }
Literal	PEARL_SYMPOSIUM_REGISTRY
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.17 Bangel _SHEET

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.Bangel _SHEET
Namespace	MJ.PBMEF.Object.Bangel _SHEET.Day0
Declaration	object Bangel _SHEET
Definition	Governed spreadsheet-like workbook with immutable revisions, typed cells, dependency graph, and authority scopes
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Governed spreadsheet-like workbook with immutable revisions, typed cells, dependency graph, and authority scopes
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='Bangel _SHEET')
Directive	validate schema and provenance before use
Block	object Bangel _SHEET { fields; invariants; evidence; }
Literal	Bangel _SHEET
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.18 Bangel _SHEET_CELL

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.Bangel _SHEET_CELL
Namespace	MJ.PBMEF.Object.Bangel _SHEET_CELL.Day0
Declaration	object Bangel _SHEET_CELL
Definition	Typed measurement cell with value, unit, uncertainty, formula, evidence, lineage, and revision
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Typed measurement cell with value, unit, uncertainty, formula, evidence, lineage, and revision
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='Bangel _SHEET_CELL')
Directive	validate schema and provenance before use
Block	object Bangel _SHEET_CELL { fields; invariants; evidence; }
Literal	Bangel _SHEET_CELL
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.19 Bangel _SHEET_REVISION

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.Bangel _SHEET_REVISION
Namespace	MJ.PBMEF.Object.Bangel _SHEET_REVISION.Day0
Declaration	object Bangel _SHEET_REVISION
Definition	Content-addressed immutable workbook revision and conflict/merge evidence
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Content-addressed immutable workbook revision and conflict/merge evidence
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='Bangel _SHEET_REVISION')
Directive	validate schema and provenance before use
Block	object Bangel _SHEET_REVISION { fields; invariants; evidence; }
Literal	Bangel _SHEET_REVISION
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.20 Bangel _SHEET_AUDIT_PARTICLE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.Bangel _SHEET_AUDIT_PARTICLE
Namespace	MJ.PBMEF.Object.Bangel _SHEET_AUDIT_PARTICLE.Day0
Declaration	object Bangel _SHEET_AUDIT_PARTICLE
Definition	Complete audit record for critical spreadsheet edits, formulas, recomputation, and reports
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Complete audit record for critical spreadsheet edits, formulas, recomputation, and reports
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='Bangel _SHEET_AUDIT_PARTICLE')
Directive	validate schema and provenance before use
Block	object Bangel _SHEET_AUDIT_PARTICLE { fields; invariants; evidence; }
Literal	Bangel _SHEET_AUDIT_PARTICLE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.21 JPOSMJ_PRODUCT_ENVELOPE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.JPOSMJ_PRODUCT_ENVELOPE
Namespace	MJ.PBMEF.Object.JPOSMJ_PRODUCT_ENVELOPE.Day0
Declaration	object JPOSMJ_PRODUCT_ENVELOPE
Definition	Portfolio envelope binding JP-origin product logic through MK physics, JO proof, and MJ permit
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Portfolio envelope binding JP-origin product logic through MK physics, JO proof, and MJ permit
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='JPOSMJ_PRODUCT_ENVELOPE')
Directive	validate schema and provenance before use
Block	object JPOSMJ_PRODUCT_ENVELOPE { fields; invariants; evidence; }
Literal	JPOSMJ_PRODUCT_ENVELOPE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.22 SISTER_PHYSICAL_CONTAINMENT_PROFILE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.SISTER_PHYSICAL_CONTAINMENT_PROFILE
Namespace	MJ.PBMEF.Object.SISTER_PHYSICAL_CONTAINMENT_PROFILE.Day0
Declaration	object SISTER_PHYSICAL_CONTAINMENT_PROFILE
Definition	Pre-Pearl physical umbrella/descent/containment profile with normalized topology and profile-specific unknown physical size/capacity
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Pre-Pearl physical umbrella/descent/containment profile with normalized topology and profile-specific unknown physical size/capacity
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='SISTER_PHYSICAL_CONTAINMENT_PROFILE')
Directive	validate schema and provenance before use
Block	object SISTER_PHYSICAL_CONTAINMENT_PROFILE { fields; invariants; evidence; }
Literal	SISTER_PHYSICAL_CONTAINMENT_PROFILE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.23 STANDARD_CONTAINMENT_GEOMETRY_PROFILE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.STANDARD_CONTAINMENT_GEOMETRY_PROFILE
Namespace	MJ.PBMEF.Object.STANDARD_CONTAINMENT_GEOMETRY_PROFILE.Day0
Declaration	object STANDARD_CONTAINMENT_GEOMETRY_PROFILE
Definition	Typed scale-independent rectangle/cone/umbrella/descent/EVE/reservoir geometry and modification parameters
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Typed scale-independent rectangle/cone/umbrella/descent/EVE/reservoir geometry and modification parameters
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='STANDARD_CONTAINMENT_GEOMETRY_PROFILE')
Directive	validate schema and provenance before use
Block	object STANDARD_CONTAINMENT_GEOMETRY_PROFILE { fields; invariants; evidence; }
Literal	STANDARD_CONTAINMENT_GEOMETRY_PROFILE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.24 REFERENCE_GAS_PROFILE_H2

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.REFERENCE_GAS_PROFILE_H2
Namespace	MJ.PBMEF.Object.REFERENCE_GAS_PROFILE_H2.Day0
Declaration	object REFERENCE_GAS_PROFILE_H2
Definition	H2 equation/reference profile for density, equivalent volume, observed gas height, and motion calculations; no physical use authority
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	H2 equation/reference profile for density, equivalent volume, observed gas height, and motion calculations; no physical use authority
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='REFERENCE_GAS_PROFILE_H2')
Directive	validate schema and provenance before use
Block	object REFERENCE_GAS_PROFILE_H2 { fields; invariants; evidence; }
Literal	REFERENCE_GAS_PROFILE_H2
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.25 CONTAINMENT_MODIFICATION_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CONTAINMENT_MODIFICATION_RECEIPT
Namespace	MJ.PBMEF.Object.CONTAINMENT_MODIFICATION_RECEIPT.Day0
Declaration	object CONTAINMENT_MODIFICATION_RECEIPT
Definition	Recalculation and revalidation receipt for command/profile-specific geometry changes
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Recalculation and revalidation receipt for command/profile-specific geometry changes
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CONTAINMENT_MODIFICATION_RECEIPT')
Directive	validate schema and provenance before use
Block	object CONTAINMENT_MODIFICATION_RECEIPT { fields; invariants; evidence; }
Literal	CONTAINMENT_MODIFICATION_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.26 CONE_TOP_PEARL_ANCHOR

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CONE_TOP_PEARL_ANCHOR
Namespace	MJ.PBMEF.Object.CONE_TOP_PEARL_ANCHOR.Day0
Declaration	object CONE_TOP_PEARL_ANCHOR
Definition	Hypothetical information coordinate at the top-of-cone observation plane; no physical placement
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Hypothetical information coordinate at the top-of-cone observation plane; no physical placement
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CONE_TOP_PEARL_ANCHOR')
Directive	validate schema and provenance before use
Block	object CONE_TOP_PEARL_ANCHOR { fields; invariants; evidence; }
Literal	CONE_TOP_PEARL_ANCHOR
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.27 GAS_HEIGHT_OBSERVATION

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.GAS_HEIGHT_OBSERVATION
Namespace	MJ.PBMEF.Object.GAS_HEIGHT_OBSERVATION.Day0
Declaration	object GAS_HEIGHT_OBSERVATION
Definition	Calibrated pressure/temperature/density/height/time observation for gas-front reference calculations
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Calibrated pressure/temperature/density/height/time observation for gas-front reference calculations
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='GAS_HEIGHT_OBSERVATION')
Directive	validate schema and provenance before use
Block	object GAS_HEIGHT_OBSERVATION { fields; invariants; evidence; }
Literal	GAS_HEIGHT_OBSERVATION
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.28 RESERVOIR_RETURN_LOOP_PROFILE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RESERVOIR_RETURN_LOOP_PROFILE
Namespace	MJ.PBMEF.Object.RESERVOIR_RETURN_LOOP_PROFILE.Day0
Declaration	object RESERVOIR_RETURN_LOOP_PROFILE
Definition	Typed rear outlet, external reservoir, and circular reentry geometry/profile.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Typed rear outlet, external reservoir, and circular reentry geometry/profile.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RESERVOIR_RETURN_LOOP_PROFILE')
Directive	validate schema and provenance before use
Block	object RESERVOIR_RETURN_LOOP_PROFILE { fields; invariants; evidence; }
Literal	RESERVOIR_RETURN_LOOP_PROFILE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.29 OUTWARD_GAP_PATH_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.OUTWARD_GAP_PATH_RECEIPT
Namespace	MJ.PBMEF.Object.OUTWARD_GAP_PATH_RECEIPT.Day0
Declaration	object OUTWARD_GAP_PATH_RECEIPT
Definition	JO/MK proof that the outlet path remains outside the nonphysical Pearl reference circle.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	JO/MK proof that the outlet path remains outside the nonphysical Pearl reference circle.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='OUTWARD_GAP_PATH_RECEIPT')
Directive	validate schema and provenance before use
Block	object OUTWARD_GAP_PATH_RECEIPT { fields; invariants; evidence; }
Literal	OUTWARD_GAP_PATH_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.30 RESERVOIR_BUFFER_ACCOUNT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RESERVOIR_BUFFER_ACCOUNT
Namespace	MJ.PBMEF.Object.RESERVOIR_BUFFER_ACCOUNT.Day0
Declaration	object RESERVOIR_BUFFER_ACCOUNT
Definition	EVE/Mermaid typed balance of admitted, returned, drained, escaped, and retained quantities.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	EVE/Mermaid typed balance of admitted, returned, drained, escaped, and retained quantities.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RESERVOIR_BUFFER_ACCOUNT')
Directive	validate schema and provenance before use
Block	object RESERVOIR_BUFFER_ACCOUNT { fields; invariants; evidence; }
Literal	RESERVOIR_BUFFER_ACCOUNT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.31 CIRCULAR_REENTRY_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CIRCULAR_REENTRY_RECEIPT
Namespace	MJ.PBMEF.Object.CIRCULAR_REENTRY_RECEIPT.Day0
Declaration	object CIRCULAR_REENTRY_RECEIPT
Definition	Circular port, inward angle, tangential component, continuity, and spiral-compatibility evidence.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Circular port, inward angle, tangential component, continuity, and spiral-compatibility evidence.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CIRCULAR_REENTRY_RECEIPT')
Directive	validate schema and provenance before use
Block	object CIRCULAR_REENTRY_RECEIPT { fields; invariants; evidence; }
Literal	CIRCULAR_REENTRY_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.32 RELATIVE_FRAME_FRICTION_LEDGER

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RELATIVE_FRAME_FRICTION_LEDGER
Namespace	MJ.PBMEF.Object.RELATIVE_FRAME_FRICTION_LEDGER.Day0
Declaration	object RELATIVE_FRAME_FRICTION_LEDGER
Definition	MK/JO/Mermaid record of frame-relative velocity, dissipation, and any bounded recoverable-energy claim.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	MK/JO/Mermaid record of frame-relative velocity, dissipation, and any bounded recoverable-energy claim.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RELATIVE_FRAME_FRICTION_LEDGER')
Directive	validate schema and provenance before use
Block	object RELATIVE_FRAME_FRICTION_LEDGER { fields; invariants; evidence; }
Literal	RELATIVE_FRAME_FRICTION_LEDGER
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.33 RESERVOIR_LAKE_BUFFER

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RESERVOIR_LAKE_BUFFER
Namespace	MJ.PBMEF.Object.RESERVOIR_LAKE_BUFFER.Day0
Declaration	object RESERVOIR_LAKE_BUFFER
Definition	Bounded post-containment buffer candidate for retention, redistribution, and receipted re-entry
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Bounded post-containment buffer candidate for retention, redistribution, and receipted re-entry
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RESERVOIR_LAKE_BUFFER')
Directive	validate schema and provenance before use
Block	object RESERVOIR_LAKE_BUFFER { fields; invariants; evidence; }
Literal	RESERVOIR_LAKE_BUFFER
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.34 BACKSIDE_OUTLET_PORT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.BACKSIDE_OUTLET_PORT
Namespace	MJ.PBMEF.Object.BACKSIDE_OUTLET_PORT.Day0
Declaration	object BACKSIDE_OUTLET_PORT
Definition	High backside outlet candidate located below containment maximum height
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	High backside outlet candidate located below containment maximum height
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='BACKSIDE_OUTLET_PORT')
Directive	validate schema and provenance before use
Block	object BACKSIDE_OUTLET_PORT { fields; invariants; evidence; }
Literal	BACKSIDE_OUTLET_PORT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.35 OUTWARD_GAP_ARC

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.OUTWARD_GAP_ARC
Namespace	MJ.PBMEF.Object.OUTWARD_GAP_ARC.Day0
Declaration	object OUTWARD_GAP_ARC
Definition	Outward-facing angular reference through which the outlet clears the nonphysical Pearl reference circle
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Outward-facing angular reference through which the outlet clears the nonphysical Pearl reference circle
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='OUTWARD_GAP_ARC')
Directive	validate schema and provenance before use
Block	object OUTWARD_GAP_ARC { fields; invariants; evidence; }
Literal	OUTWARD_GAP_ARC
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.36 PEARL_REFERENCE_CIRCLE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_REFERENCE_CIRCLE
Namespace	MJ.PBMEF.Object.PEARL_REFERENCE_CIRCLE.Day0
Declaration	object PEARL_REFERENCE_CIRCLE
Definition	Hypothetical simulation/measurement circle used for path-clearance calculations; no physical wall or capacity
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Hypothetical simulation/measurement circle used for path-clearance calculations; no physical wall or capacity
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_REFERENCE_CIRCLE')
Directive	validate schema and provenance before use
Block	object PEARL_REFERENCE_CIRCLE { fields; invariants; evidence; }
Literal	PEARL_REFERENCE_CIRCLE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.37 CIRCULAR_REENTRY_PORT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CIRCULAR_REENTRY_PORT
Namespace	MJ.PBMEF.Object.CIRCULAR_REENTRY_PORT.Day0
Declaration	object CIRCULAR_REENTRY_PORT
Definition	Circular inward-angled port candidate supplying measured radial and tangential re-entry components
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Circular inward-angled port candidate supplying measured radial and tangential re-entry components
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CIRCULAR_REENTRY_PORT')
Directive	validate schema and provenance before use
Block	object CIRCULAR_REENTRY_PORT { fields; invariants; evidence; }
Literal	CIRCULAR_REENTRY_PORT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.38 RESERVOIR_TRANSFER_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RESERVOIR_TRANSFER_RECEIPT
Namespace	MJ.PBMEF.Object.RESERVOIR_TRANSFER_RECEIPT.Day0
Declaration	object RESERVOIR_TRANSFER_RECEIPT
Definition	Per-transaction outlet/lake/re-entry/cycle/participant evidence receipt
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Per-transaction outlet/lake/re-entry/cycle/participant evidence receipt
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RESERVOIR_TRANSFER_RECEIPT')
Directive	validate schema and provenance before use
Block	object RESERVOIR_TRANSFER_RECEIPT { fields; invariants; evidence; }
Literal	RESERVOIR_TRANSFER_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.39 PERSPECTIVE_FRICTION_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PERSPECTIVE_FRICTION_RECEIPT
Namespace	MJ.PBMEF.Object.PERSPECTIVE_FRICTION_RECEIPT.Day0
Declaration	object PERSPECTIVE_FRICTION_RECEIPT
Definition	Separates coordinate-transform residual, physical dissipation, and information friction
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Separates coordinate-transform residual, physical dissipation, and information friction
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PERSPECTIVE_FRICTION_RECEIPT')
Directive	validate schema and provenance before use
Block	object PERSPECTIVE_FRICTION_RECEIPT { fields; invariants; evidence; }
Literal	PERSPECTIVE_FRICTION_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

MJ-PBMEF Pink Paper - Volume VI

Product Manifestations, White-Paper Lineage, and Verification Crosswalk

Michael Bangel - Author and Architect

August 2026

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Document control

Project	MJos Predictive Model
Project ID	MJ - PBMEF - 001
Source build	MJ - PBMEF - DAY0 - R5 - REVIEW - CANDIDATE
Document ID	MJ - PBMEF - PINK - PAPER - 001 / VOL - VI
Author and architect	Michael Bangel
Status	FOUNDER_REVIEW_CANDIDATE_PENDING_FREEZE
Scope	All products and registered white papers mapped into the gateway lifecycle.

Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Product gateway verification

MJ Physics Based Measurement Engineering Framework - PBMEF-CORE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.PBMEF-CORE
Namespace	MJ.PBMEF.Product.PBMEF-CORE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product PBMEF-CORE
Definition	Integrate purpose, mathematics, physics, verification, safety, resource routing, accounting, finance, evidence, and bounded permit decisions.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Integrate purpose, mathematics, physics, verification, safety, resource routing, accounting, finance, evidence, and bounded permit decisions.
Expression	Product-specific composition of formula and object records
Statement	Status: DAY0_PREPASSKEY_COMPLETE_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='PBMEF-CORE', class='CORE_FRAMEWORK')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product PBMEF-CORE { purpose; formulas; families; evidence; permit; }
Literal	PBMEF-CORE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	CORE_FRAMEWORK
Attribute	status=DAY0_PREPASSKEY_COMPLETE_CANDIDATE

2.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Bangel Governed Measurement Language - Bangel -LANGUAGE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.Bangel -LANGUAGE
Namespace	MJ.PBMEF.Product.Bangel -LANGUAGE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product Bangel -LANGUAGE
Definition	Express human purpose, typed measurements, formulas, evidence, and command pathways.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Express human purpose, typed measurements, formulas, evidence, and command pathways.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='Bangel -LANGUAGE', class='LANGUAGE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product Bangel -LANGUAGE { purpose; formulas; families; evidence; permit; }
Literal	Bangel -LANGUAGE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	LANGUAGE
Attribute	status=SPECIFICATION_CANDIDATE

3.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Elsa Deterministic Semantic Recovery - ELSA-SEMANTICS

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.ELSA-SEMANTICS
Namespace	MJ.PBMEF.Product.ELSA-SEMANTICS.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product ELSA-SEMANTICS
Definition	Recover and preserve declared meaning without autonomous inference or authority.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Recover and preserve declared meaning without autonomous inference or authority.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='ELSA-SEMANTICS', class='SEMANTIC_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product ELSA-SEMANTICS { purpose; formulas; families; evidence; permit; }
Literal	ELSA-SEMANTICS
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	SEMANTIC_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

4.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JP Mathematical and Architectural Canon - JP-CANON

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JP-CANON
Namespace	MJ.PBMEF.Product.JP-CANON.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JP-CANON
Definition	Represent equations, algorithms, CAPOs, topology, products, and proofs.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Represent equations, algorithms, CAPOs, topology, products, and proofs.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JP-CANON', class='CANONICAL_REPRESENTATION')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JP-CANON { purpose; formulas; families; evidence; permit; }
Literal	JP-CANON
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	CANONICAL_REPRESENTATION
Attribute	status=SPECIFICATION_CANDIDATE

5.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Mika/MK Physics Modulator System - MK-PHYSICS

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.MK-PHYSICS
Namespace	MJ.PBMEF.Product.MK-PHYSICS.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product MK-PHYSICS
Definition	Create physics representations and verify units, conservation, boundaries, scale, and evidence ceilings.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Create physics representations and verify units, conservation, boundaries, scale, and evidence ceilings.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_IMPLEMENTATION
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='MK-PHYSICS', class='PHYSICS_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product MK-PHYSICS { purpose; formulas; families; evidence; permit; }
Literal	MK-PHYSICS
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICS_SYSTEM
Attribute	status=REFERENCE_IMPLEMENTATION

6.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JO Deterministic Proof and Runtime - JO-RUNTIME

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JO-RUNTIME
Namespace	MJ.PBMEF.Product.JO-RUNTIME.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JO-RUNTIME
Definition	Verify types, units, authority, physics, tests, evidence, and bounded execution.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Verify types, units, authority, physics, tests, evidence, and bounded execution.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_IMPLEMENTATION
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JO-RUNTIME', class='RUNTIME')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JO-RUNTIME { purpose; formulas; families; evidence; permit; }
Literal	JO-RUNTIME
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	RUNTIME
Attribute	status=REFERENCE_IMPLEMENTATION

7.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

MJOS Operating Substrate - MJOS-SUBSTRATE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.MJOS-SUBSTRATE
Namespace	MJ.PBMEF.Product.MJOS-SUBSTRATE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product MJOS-SUBSTRATE
Definition	Provide isolated resources, memory, storage, network, scheduling, and continuity under MJ leases.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Provide isolated resources, memory, storage, network, scheduling, and continuity under MJ leases.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='MJOS-SUBSTRATE', class='OPERATING_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product MJOS-SUBSTRATE { purpose; formulas; families; evidence; permit; }
Literal	MJOS-SUBSTRATE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	OPERATING_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

8.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JP Semiconductor Phone Battery and OS Candidate - JP-SC-PHONE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JP-SC-PHONE
Namespace	MJ.PBMEF.Product.JP-SC-PHONE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JP-SC-PHONE
Definition	Explore semiconductor-scale static intake, power wake, solar assist, battery, and operating-system integration.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	JP and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Explore semiconductor-scale static intake, power wake, solar assist, battery, and operating-system integration.
Expression	Product-specific composition of formula and object records
Statement	Status: PLANNED_ONLY_NO_PHYSICAL_ARTICLE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JP-SC-PHONE', class='PHYSICAL_PRODUCT_CANDIDATE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JP-SC-PHONE { purpose; formulas; families; evidence; permit; }
Literal	JP-SC-PHONE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICAL_PRODUCT_CANDIDATE
Attribute	status=PLANNED_ONLY_NO_PHYSICAL_ARTICLE

9.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JP Large-Scale Boating Power Candidate - JP-LS-B0AT

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JP-LS-B0AT
Namespace	MJ.PBMEF.Product.JP-LS-B0AT.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JP-LS-B0AT
Definition	Explore large-scale static intake, solar initiation, power bus, containment, and marine power integration.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	JP and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Explore large-scale static intake, solar initiation, power bus, containment, and marine power integration.
Expression	Product-specific composition of formula and object records
Statement	Status: PLANNED_ONLY_UNCLASSIFIED
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JP-LS-B0AT', class='PHYSICAL_PRODUCT_CANDIDATE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JP-LS-B0AT { purpose; formulas; families; evidence; permit; }
Literal	JP-LS-B0AT
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICAL_PRODUCT_CANDIDATE
Attribute	status=PLANNED_ONLY_UNCLASSIFIED

10.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JP Peaceful High-Energy Propulsion Research Candidate - JP-PEACEFUL-PROPULSION

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JP-PEACEFUL-PROPULSION
Namespace	MJ.PBMEF.Product.JP-PEACEFUL-PROPULSION.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JP-PEACEFUL-PROPULSION
Definition	Explore peaceful propulsion measurement and control under non-weaponization, safety, and regulatory gates.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	JP and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Explore peaceful propulsion measurement and control under non-weaponization, safety, and regulatory gates.
Expression	Product-specific composition of formula and object records
Statement	Status: PLANNED_ONLY_SAFETY_HOLD
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JP-PEACEFUL-PROPULSION', class='HIGH_RISK_PHYSICAL_RESEARCH_CANDIDATE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JP-PEACEFUL-PROPULSION { purpose; formulas; families; evidence; permit; }
Literal	JP-PEACEFUL-PROPULSION
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	HIGH_RISK_PHYSICAL_RESEARCH_CANDIDATE
Attribute	status=PLANNED_ONLY_SAFETY_HOLD

11.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Sister Predictive Containment System - SISTER-CONTAINMENT

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SISTER-CONTAINMENT
Namespace	MJ.PBMEF.Product.SISTER-CONTAINMENT.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SISTER-CONTAINMENT
Definition	Predict demand, allocate buffers, detect anomalies, and stage overflow in bounded umbrellas.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Predict demand, allocate buffers, detect anomalies, and stage overflow in bounded umbrellas.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SISTER-CONTAINMENT', class='PREDICTION_AND_CONTAINMENT')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SISTER-CONTAINMENT { purpose; formulas; families; evidence; permit; }
Literal	SISTER-CONTAINMENT
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PREDICTION_AND_CONTAINMENT
Attribute	status=SPECIFICATION_CANDIDATE

12.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

EVE Variance Screen and Egress Accounting - EVE-SCREEN

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.EVE-SCREEN
Namespace	MJ.PBMEF.Product.EVE-SCREEN.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product EVE-SCREEN
Definition	Account for variance, evaporation, leakage, capture, and natural egress without silent loss.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Account for variance, evaporation, leakage, capture, and natural egress without silent loss.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='EVE-SCREEN', class='MEASUREMENT_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product EVE-SCREEN { purpose; formulas; families; evidence; permit; }
Literal	EVE-SCREEN
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	MEASUREMENT_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

13.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Angels Safety and Corrective Command System - ANGELS-SAFETY

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.ANGELS-SAFETY
Namespace	MJ.PBMEF.Product.ANGELS-SAFETY.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product ANGELS-SAFETY
Definition	Provide domain-bounded telemetry, hold, denial, isolation, and corrective protocols.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Provide domain-bounded telemetry, hold, denial, isolation, and corrective protocols.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='ANGELS-SAFETY', class='SAFETY_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product ANGELS-SAFETY { purpose; formulas; families; evidence; permit; }
Literal	ANGELS-SAFETY
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	SAFETY_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

14.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Mermaid Accounting and Reconciliation System - MERMAID-RECON

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.MERMAID-RECON
Namespace	MJ.PBMEF.Product.MERMAID-RECON.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product MERMAID-RECON
Definition	Maintain balances, custody evidence, exposure, tax lots, statements, and reconciliation.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Maintain balances, custody evidence, exposure, tax lots, statements, and reconciliation.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='MERMAID-RECON', class='ACCOUNTING_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product MERMAID-RECON { purpose; formulas; families; evidence; permit; }
Literal	MERMAID-RECON
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	ACCOUNTING_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

15.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Shiva Dual Financial Rails - SHIVA-RAILS

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHIVA-RAILS
Namespace	MJ.PBMEF.Product.SHIVA-RAILS.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHIVA-RAILS
Definition	Separate stability/cash functions from investment and crypto risk while preserving liquidity-first ethics.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Separate stability/cash functions from investment and crypto risk while preserving liquidity-first ethics.
Expression	Product-specific composition of formula and object records
Statement	Status: INTERNAL_MODEL_EXTERNAL_DISABLED
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHIVA-RAILS', class='FINANCIAL_REFERENCE_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHIVA-RAILS { purpose; formulas; families; evidence; permit; }
Literal	SHIVA-RAILS
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	FINANCIAL_REFERENCE_SYSTEM
Attribute	status=INTERNAL_MODEL_EXTERNAL_DISABLED

16.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

SHIVAS Internal Settlement Reflection - SHIVAS-INTERNAL

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHIVAS-INTERNAL
Namespace	MJ.PBMEF.Product.SHIVAS-INTERNAL.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHIVAS-INTERNAL
Definition	Represent internal capital reflections without minting, redemption, public offer, or value guarantee.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	SHIVA and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Represent internal capital reflections without minting, redemption, public offer, or value guarantee.
Expression	Product-specific composition of formula and object records
Statement	Status: NONTRANSFERABLE_NO_MONETARY_VALUE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHIVAS-INTERNAL', class='CAPITAL_REFLECTION_OBJECT')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHIVAS-INTERNAL { purpose; formulas; families; evidence; permit; }
Literal	SHIVAS-INTERNAL
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	CAPITAL_REFLECTION_OBJECT
Attribute	status=NONTRANSFERABLE_NO_MONETARY_VALUE

17.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Shiva Crypto External-Market Candidate - SHIVA-CRYPTO

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHIVA-CRYPTO
Namespace	MJ.PBMEF.Product.SHIVA-CRYPTO.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHIVA-CRYPTO
Definition	Model a separately governed external crypto rail subject to full classification and authorization.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	SHIVA and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Model a separately governed external crypto rail subject to full classification and authorization.
Expression	Product-specific composition of formula and object records
Statement	Status: DISABLED_ACTIVE_HOLD
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHIVA-CRYPTO', class='EXTERNAL_FINANCIAL_CANDIDATE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHIVA-CRYPTO { purpose; formulas; families; evidence; permit; }
Literal	SHIVA-CRYPTO
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	EXTERNAL_FINANCIAL_CANDIDATE
Attribute	status=DISABLED_ACTIVE_HOLD

18.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Shiva Exchange Rule Reference - SHIVA-EXCHANGE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHIVA-EXCHANGE
Namespace	MJ.PBMEF.Product.SHIVA-EXCHANGE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHIVA-EXCHANGE
Definition	Model transparent price-time, custody, audit, tax, and transfer rules without operating a market.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	SHIVA and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Model transparent price-time, custody, audit, tax, and transfer rules without operating a market.
Expression	Product-specific composition of formula and object records
Statement	Status: INTERNAL_SIMULATION_ONLY
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHIVA-EXCHANGE', class='MARKET_REFERENCE_MODEL')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHIVA-EXCHANGE { purpose; formulas; families; evidence; permit; }
Literal	SHIVA-EXCHANGE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	MARKET_REFERENCE_MODEL
Attribute	status=INTERNAL_SIMULATION_ONLY

19.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Moana Governed Browser - MOANA-BROWSER

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.MOANA-BROWSER
Namespace	MJ.PBMEF.Product.MOANA-BROWSER.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product MOANA-BROWSER
Definition	Present governed applications, evidence, holds, and uncertainty.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Present governed applications, evidence, holds, and uncertainty.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='MOANA-BROWSER', class='APPLICATION_PRODUCT')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product MOANA-BROWSER { purpose; formulas; families; evidence; permit; }
Literal	MOANA-BROWSER
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	APPLICATION_PRODUCT
Attribute	status=REFERENCE_CANDIDATE

20.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Aviator Organizational Workspace - AVIATOR-WORKSPACE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.AVIATOR-WORKSPACE
Namespace	MJ.PBMEF.Product.AVIATOR-WORKSPACE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product AVIATOR-WORKSPACE
Definition	Organize spaces, projects, decisions, knowledge, members, roles, and capabilities.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Organize spaces, projects, decisions, knowledge, members, roles, and capabilities.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='AVIATOR-WORKSPACE', class='APPLICATION_PRODUCT')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product AVIATOR-WORKSPACE { purpose; formulas; families; evidence; permit; }
Literal	AVIATOR-WORKSPACE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	APPLICATION_PRODUCT
Attribute	status=REFERENCE_CANDIDATE

21.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Lecanto Truthful Visualization -

LECANTO-VISUAL

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.LECANTO-VISUAL
Namespace	MJ.PBMEF.Product.LECANTO-VISUAL.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product LECANTO-VISUAL
Definition	Display system truth, provenance, topology, uncertainty, and evidence.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Display system truth, provenance, topology, uncertainty, and evidence.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='LECANTO-VISUAL', class='VISUAL_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product LECANTO-VISUAL { purpose; formulas; families; evidence; permit; }
Literal	LECANTO-VISUAL
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	VISUAL_SYSTEM
Attribute	status=REFERENCE_CANDIDATE

22.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Elsa Governed Marketplace Reference - ELSA-MARKETPLACE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.ELSA-MARKETPLACE
Namespace	MJ.PBMEF.Product.ELSA-MARKETPLACE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product ELSA-MARKETPLACE
Definition	Coordinate semantic listings, workflow, accounting, execution, and resource evidence without live market authority.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Coordinate semantic listings, workflow, accounting, execution, and resource evidence without live market authority.
Expression	Product-specific composition of formula and object records
Statement	Status: INTERNAL_REFERENCE_ONLY
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='ELSA-MARKETPLACE', class='MARKETPLACE_REFERENCE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product ELSA-MARKETPLACE { purpose; formulas; families; evidence; permit; }
Literal	ELSA-MARKETPLACE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	MARKETPLACE_REFERENCE
Attribute	status=INTERNAL_REFERENCE_ONLY

23.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Shekina Distributed Continuity - SHEKINA-CONTINUITY

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHEKINA-CONTINUITY
Namespace	MJ.PBMEF.Product.SHEKINA-CONTINUITY.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHEKINA-CONTINUITY
Definition	Model bounded replicas, failover, continuity, and placement evidence.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Model bounded replicas, failover, continuity, and placement evidence.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHEKINA-CONTINUITY', class='INFRASTRUCTURE_REFERENCE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHEKINA-CONTINUITY { purpose; formulas; families; evidence; permit; }
Literal	SHEKINA-CONTINUITY
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	INFRASTRUCTURE_REFERENCE
Attribute	status=SPECIFICATION_CANDIDATE

24.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Pearl Hypothetical Simulation and Information-Retention System - PEARL-CONTAINMENT

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.PEARL-CONTAINMENT
Namespace	MJ.PBMEF.Product.PEARL-CONTAINMENT.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product PEARL-CONTAINMENT
Definition	Acquire, retain, replay, and compare variance simulations and transfer/regeneration opportunities without asserting physical containment.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Acquire, retain, replay, and compare variance simulations and transfer/regeneration opportunities without asserting physical containment.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_SIMULATION_ONLY_PHYSICAL_NOT_APPLICABLE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='PEARL-CONTAINMENT', class='HYPOTHETICAL_SIMULATION_AND_INFORMATION_RETENTION')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product PEARL-CONTAINMENT { purpose; formulas; families; evidence; permit; }
Literal	PEARL-CONTAINMENT
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	HYPOTHETICAL_SIMULATION_AND_INFORMATION_RETENTION
Attribute	status=REFERENCE_SIMULATION_ONLY_PHYSICAL_NOT_APPLICABLE

25.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Bangel Spreadsheets - Bangel -

SPREADSHEETS

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.Bangel -SPREADSHEETS
Namespace	MJ.PBMEF.Product.Bangel -SPREADSHEETS.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product Bangel -SPREADSHEETS
Definition	Provide governed spreadsheet-like operational modeling through typed measurement cells, immutable revisions, Pearl simulation partitions, deterministic recalculation, concurrency control, and audit evidence.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	Bangel and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Provide governed spreadsheet-like operational modeling through typed measurement cells, immutable revisions, Pearl simulation partitions, deterministic recalculation, concurrency control, and audit evidence.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_MVP_PREPASSKEY
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='Bangel -SPREADSHEETS', class='MEASUREMENT_SPREADSHEET_PLATFORM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product Bangel -SPREADSHEETS { purpose; formulas; families; evidence; permit; }
Literal	Bangel -SPREADSHEETS
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	MEASUREMENT_SPREADSHEET_PLATFORM
Attribute	status=REFERENCE_MVP_PREPASSKEY

26.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JPOSMJ Product Portfolio Envelope - JPOSMJ-PORTFOLIO

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JPOSMJ-PORTFOLIO
Namespace	MJ.PBMEF.Product.JPOSMJ-PORTFOLIO.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JPOSMJ-PORTFOLIO
Definition	Bind every JP-origin product candidate through MK physics representation, JO verification, participant evidence, and MJ bounded permit classification.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	JP and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Bind every JP-origin product candidate through MK physics representation, JO verification, participant evidence, and MJ bounded permit classification.
Expression	Product-specific composition of formula and object records
Statement	Status: PREPASSKEY_PORTFOLIO_ENVELOPE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JPOSMJ-PORTFOLIO', class='PRODUCT_FAMILY_ENVELOPE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JPOSMJ-PORTFOLIO { purpose; formulas; families; evidence; permit; }
Literal	JPOSMJ-PORTFOLIO
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PRODUCT_FAMILY_ENVELOPE
Attribute	status=PREPASSKEY_PORTFOLIO_ENVELOPE

27.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

MJ Standard Containment Geometry and Reference Gas Model - STANDARD-CONTAINMENT-GEOMETRY

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.STANDARD-CONTAINMENT-GEOMETRY
Namespace	MJ.PBMEF.Product.STANDARD-CONTAINMENT-GEOMETRY.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product STANDARD-CONTAINMENT-GEOMETRY
Definition	Provide a scale-independent rectangle/cone/Sister/EVE/reservoir calculation standard and H2 reference-gas observation profile.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Provide a scale-independent rectangle/cone/Sister/EVE/reservoir calculation standard and H2 reference-gas observation profile.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_MVP_PHYSICAL_VALUES_HOLD
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='STANDARD-CONTAINMENT-GEOMETRY', class='PHYSICS_REFERENCE_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product STANDARD-CONTAINMENT-GEOMETRY { purpose; formulas; families; evidence; permit; }
Literal	STANDARD-CONTAINMENT-GEOMETRY
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICS_REFERENCE_SYSTEM
Attribute	status=REFERENCE_MVP_PHYSICAL_VALUES_HOLD

28.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

MJ Reservoir Collection, Lake Buffer, and Spiral-Compatible Re-entry - RESERVOIR-COLLECTION-MODULATION

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.RESERVOIR-COLLECTION-MODULATION
Namespace	MJ.PBMEF.Product.RESERVOIR-COLLECTION-MODULATION.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product RESERVOIR-COLLECTION-MODULATION
Definition	Model the rear reservoir loop, exterior outlet, lake-like buffer, circular inward/tangential re-entry, wave/friction references, adaptive sizing, and full Sister/EVE/Angel/M3/MK/JO/Mermaid/Shiva/MJ transaction path.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Model the rear reservoir loop, exterior outlet, lake-like buffer, circular inward/tangential re-entry, wave/friction references, adaptive sizing, and full Sister/EVE/Angel/M3/MK/JO/Mermaid/Shiva/MJ transaction path.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_MVP_PHYSICAL_VALUES_HOLD
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='RESERVOIR-COLLECTION-MODULATION', class='PHYSICS_REFERENCE_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product RESERVOIR-COLLECTION-MODULATION { purpose; formulas; families; evidence; permit; }
Literal	RESERVOIR-COLLECTION-MODULATION
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICS_REFERENCE_SYSTEM
Attribute	status=REFERENCE_MVP_PHYSICAL_VALUES_HOLD

29.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Registered white-paper verification crosswalk

30.1 MJ — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-01

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-01
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-01
Import	whitepapers/family/01-mj.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-01
Definition	Project root, founder-governed authority and final bounded permit decision. Project root, founder-governed authority and final bounded permit decision. truth, measurement, human authority, stewardship, non-weaponization.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MJ
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-01', path='whitepapers/family/01-mj.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-01 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-01
Reference	whitepapers/family/01-mj.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.2 Bangel — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-02

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-02
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-02
Import	whitepapers/family/02-Bangel.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-02
Definition	Human-facing governed language that preserves purpose and command structure. Human-facing governed language that preserves purpose and command structure. intent integrity, explicit types, traceability.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	Bangel
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-02', path='whitepapers/family/02-Bangel.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-02 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-02
Reference	whitepapers/family/02-Bangel.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.3 Elsa — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-03

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-03
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-03
Import	whitepapers/family/03-elsa.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-03
Definition	Deterministic semantic recovery and purpose-preservation layer. Deterministic semantic recovery and purpose-preservation layer. meaning fidelity, purpose confinement, clarity.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ELSA
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-03', path='whitepapers/family/03-elsa.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-03 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-03
Reference	whitepapers/family/03-elsa.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.4 JP — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-04

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-04
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-04
Import	whitepapers/family/04-jp.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-04
Definition	Canonical mathematical, algorithmic, topology, CAPO, and architecture representation. Canonical mathematical, algorithmic, topology, CAPO, and architecture representation. mathematical rigor, provenance, equivalence.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-04', path='whitepapers/family/04-jp.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-04 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-04
Reference	whitepapers/family/04-jp.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.5 Mika / MK — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-05

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-05
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-05
Import	whitepapers/family/05-mk.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-05
Definition	Physics Modulator System for dimensional, conservation, boundary, scale, and evidence representation. Physics Modulator System for dimensional, conservation, boundary, scale, and evidence representation. physical truth, unit integrity, conservation, uncertainty honesty.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MK
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-05', path='whitepapers/family/05-mk.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-05 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-05
Reference	whitepapers/family/05-mk.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.6 JO — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-06

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-06
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-06
Import	whitepapers/family/06-jo.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-06
Definition	Deterministic type, unit, proof, validation, runtime, and evidence engine. Deterministic type, unit, proof, validation, runtime, and evidence engine. fail closed, reproducibility, auditability.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JO
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-06', path='whitepapers/family/06-jo.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-06 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-06
Reference	whitepapers/family/06-jo.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.7 MJOS — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-07

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-07
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-07
Import	whitepapers/family/07-mjos.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-07
Definition	Operating-system and infrastructure substrate inside MJ. Operating-system and infrastructure substrate inside MJ. bounded resources, continuity, isolation.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MJOS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-07', path='whitepapers/family/07-mjos.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-07 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-07
Reference	whitepapers/family/07-mjos.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.8 Angels — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-08

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-08
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-08
Import	whitepapers/family/08-angels.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-08
Definition	Domain-specific observation, telemetry, hold, denial, and corrective-command family. Domain-specific observation, telemetry, hold, denial, and corrective-command family. safety, watchfulness, correction.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ANGELS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-08', path='whitepapers/family/08-angels.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-08 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-08
Reference	whitepapers/family/08-angels.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.9 Bellatrix — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-09

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-09
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-09
Import	whitepapers/family/09-bellatrix.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-09
Definition	Independent defense, challenge, quarantine, hostile-deviation analysis, and denial. Independent defense, challenge, quarantine, hostile-deviation analysis, and denial. defense, independence, containment.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	BELLATRIX
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-09', path='whitepapers/family/09-bellatrix.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-09 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-09
Reference	whitepapers/family/09-bellatrix.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.10 Sister — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-10

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-10
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-10
Import	whitepapers/family/10-sister.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-10
Definition	Predictive digital twin, preallocation evidence, anomaly detection, and umbrella containment. Predictive digital twin, preallocation evidence, anomaly detection, and umbrella containment. prediction, redundancy, early warning.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SISTER
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-10', path='whitepapers/family/10-sister.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-10 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-10
Reference	whitepapers/family/10-sister.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.11 EVE — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-11

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-11
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-11
Import	whitepapers/family/11-eve.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-11
Definition	Variance, evaporative effect, screen capture, leakage, smoke-like egress, and boundary-accounting evidence. Variance, evaporative effect, screen capture, leakage, smoke-like egress, and boundary-accounting evidence. diligence, respect, loss accounting, boundary truth.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	EVE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-11', path='whitepapers/family/11-eve.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-11 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-11
Reference	whitepapers/family/11-eve.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.12 Mary / M3 — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-12

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-12
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-12
Import	whitepapers/family/12-m3.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-12
Definition	Bounded routing, API gateway, load balancing, connection pooling, and allocation stewardship. Bounded routing, API gateway, load balancing, connection pooling, and allocation stewardship. fair allocation, resource hygiene, bounded routing.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	M3
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-12', path='whitepapers/family/12-m3.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-12 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-12
Reference	whitepapers/family/12-m3.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.13 Mermaid — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-13

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-13
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-13
Import	whitepapers/family/13-mermaid.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-13
Definition	Accounting, reconciliation, exposure, custody evidence, statements, tax lots, and financial consequence. Accounting, reconciliation, exposure, custody evidence, statements, tax lots, and financial consequence. ledger truth, reconciliation, transparency.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MERMAID
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-13', path='whitepapers/family/13-mermaid.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-13 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-13
Reference	whitepapers/family/13-mermaid.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.14 Shiva — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-14

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-14
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-14
Import	whitepapers/family/14-shiva.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-14
Definition	Finance, money, treasury, liquidity, capital-job classification, risk/opportunity analysis, and distribution proposal. Finance, money, treasury, liquidity, capital-job classification, risk/opportunity analysis, and distribution proposal. liquidity first, stability, abundance with discipline, auditability.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVA
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-14', path='whitepapers/family/14-shiva.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-14 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-14
Reference	whitepapers/family/14-shiva.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.15 Shekina — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-15

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-15
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-15
Import	whitepapers/family/15-shekina.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-15
Definition	Distributed placement, replication, continuity, and infrastructure evidence. Distributed placement, replication, continuity, and infrastructure evidence. continuity, bounded placement, resilience.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHEKINA
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-15', path='whitepapers/family/15-shekina.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-15 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-15
Reference	whitepapers/family/15-shekina.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.16 Belle — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-16

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-16
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-16
Import	whitepapers/family/16-belle.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-16
Definition	Engineering analysis, feasibility, topology review, and bounded proposals. Engineering analysis, feasibility, topology review, and bounded proposals. engineering clarity, feasibility, benchmarking.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	BELLE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-16', path='whitepapers/family/16-belle.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-16 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-16
Reference	whitepapers/family/16-belle.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.17 Lecanto — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-17

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-17
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-17
Import	whitepapers/family/17-lecanto.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-17
Definition	Truthful governed visualization of state, provenance, uncertainty, and system structure. Truthful governed visualization of state, provenance, uncertainty, and system structure. visibility, truth, uncertainty disclosure.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	LECANTO
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-17', path='whitepapers/family/17-lecanto.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-17 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-17
Reference	whitepapers/family/17-lecanto.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.18 Moana — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-18

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-18
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-18
Import	whitepapers/family/18-moana.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-18
Definition	Browser and interaction presentation of governed applications and evidence. Browser and interaction presentation of governed applications and evidence. interaction truth, accessibility, bounded presentation.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MOANA
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-18', path='whitepapers/family/18-moana.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-18 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-18
Reference	whitepapers/family/18-moana.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.19 Aviator — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-19

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-19
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-19
Import	whitepapers/family/19-aviator.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-19
Definition	Organizational workspace, projects, decisions, roles, knowledge, and governed workflow. Organizational workspace, projects, decisions, roles, knowledge, and governed workflow. understanding first, organization, decision trace.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	AVIATOR
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-19', path='whitepapers/family/19-aviator.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-19 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-19
Reference	whitepapers/family/19-aviator.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.20 CHI — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-20

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-20
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-20
Import	whitepapers/family/20-chi.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-20
Definition	Temporal variance and expected-observed-delivered-reconciled difference state. Temporal variance and expected-observed-delivered-reconciled difference state. variance truth, time awareness.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	CHI
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-20', path='whitepapers/family/20-chi.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-20 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-20
Reference	whitepapers/family/20-chi.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.21 WATER — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-21

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-21
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-21
Import	whitepapers/family/21-water.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-21
Definition	Interval uncertainty, verified floor, and bounded unknown-state classification. Interval uncertainty, verified floor, and bounded unknown-state classification. uncertainty honesty, bounded intervals.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	WATER
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-21', path='whitepapers/family/21-water.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-21 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-21
Reference	whitepapers/family/21-water.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.22 MJ Physics Based Measurement Engineering Framework - MJ-PBMEF-PRODUCT-WP-01

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-01
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-01
Import	whitepapers/products/01-pbmef-core.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-01
Definition	Integrate purpose, mathematics, physics, verification, safety, resource routing, accounting, finance, evidence, and bounded permit decisions. Integrate purpose, mathematics, physics, verification, safety, resource routing, accounting, finance, evidence, and bounded permit decisions. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	PBMEF-CORE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-01', path='whitepapers/products/01-pbmef-core.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-01 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-01
Reference	whitepapers/products/01-pbmef-core.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.23

Bangel Governed Measurement Language - MJ-PBMEF-PRODUCT-WP-02

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-02
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-02
Import	whitepapers/products/02-Bangel-language.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-02
Definition	Express human purpose, typed measurements, formulas, evidence, and command pathways. Express human purpose, typed measurements, formulas, evidence, and command pathways. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	Bangel -LANGUAGE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-02', path='whitepapers/products/02-Bangel-language.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-02 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-02
Reference	whitepapers/products/02-Bangel-language.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.24

Elsa Deterministic Semantic Recovery - MJ-PBMEF-PRODUCT-WP-03

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-03
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-03
Import	whitepapers/products/03-elsa-semantics.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-03
Definition	Recover and preserve declared meaning without autonomous inference or authority. Recover and preserve declared meaning without autonomous inference or authority. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ELSA-SEMANTICS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-03', path='whitepapers/products/03-elsa-semantics.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-03 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-03
Reference	whitepapers/products/03-elsa-semantics.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.25 JP Mathematical and Architectural Canon - MJ-PBMEF-PRODUCT-WP-04

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-04
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-04
Import	whitepapers/products/04-jp-canon.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-04
Definition	Represent equations, algorithms, CAPOs, topology, products, and proofs. Represent equations, algorithms, CAPOs, topology, products, and proofs. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP-CANON
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-04', path='whitepapers/products/04-jp-canon.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-04 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-04
Reference	whitepapers/products/04-jp-canon.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.26 Mika/MK Physics Modulator System - MJ-PBMEF-PRODUCT-WP-05

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-05
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-05
Import	whitepapers/products/05-mk-physics.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-05
Definition	Create physics representations and verify units, conservation, boundaries, scale, and evidence ceilings. Create physics representations and verify units, conservation, boundaries, scale, and evidence ceilings. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MK-PHYSICS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-05', path='whitepapers/products/05-mk-physics.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-05 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-05
Reference	whitepapers/products/05-mk-physics.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.27 JO Deterministic Proof and Runtime - MJ-PBMEF-PRODUCT-WP-06

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-06
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-06
Import	whitepapers/products/06-jo-runtime.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-06
Definition	Verify types, units, authority, physics, tests, evidence, and bounded execution. Verify types, units, authority, physics, tests, evidence, and bounded execution. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JO-RUNTIME
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-06', path='whitepapers/products/06-jo-runtime.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-06 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-06
Reference	whitepapers/products/06-jo-runtime.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.28 MJOS Operating Substrate - MJ-PBMEF-PRODUCT-WP-07

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-07
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-07
Import	whitepapers/products/07-mjos-substrate.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-07
Definition	Provide isolated resources, memory, storage, network, scheduling, and continuity under MJ leases. Provide isolated resources, memory, storage, network, scheduling, and continuity under MJ leases. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MJOS-SUBSTRATE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-07', path='whitepapers/products/07-mjos-substrate.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-07 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-07
Reference	whitepapers/products/07-mjos-substrate.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.29 JP Semiconductor Phone Battery and OS Candidate - MJ-PBMEF-PRODUCT-WP-08

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-08
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-08
Import	whitepapers/products/08-jp-sc-phone.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-08
Definition	Explore semiconductor-scale static intake, power wake, solar assist, battery, and operating-system integration. Explore semiconductor-scale static intake, power wake, solar assist, battery, and operating-system integration. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP-SC-PHONE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-08', path='whitepapers/products/08-jp-sc-phone.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-08 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-08
Reference	whitepapers/products/08-jp-sc-phone.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.30 JP Large-Scale Boating Power Candidate - MJ-PBMEF-PRODUCT-WP-09

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-09
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-09
Import	whitepapers/products/09-jp-ls-boat.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-09
Definition	Explore large-scale static intake, solar initiation, power bus, containment, and marine power integration. Explore large-scale static intake, solar initiation, power bus, containment, and marine power integration. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP-LS-BOAT
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-09', path='whitepapers/products/09-jp-ls-boat.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-09 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-09
Reference	whitepapers/products/09-jp-ls-boat.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.31 JP Peaceful High-Energy Propulsion Research Candidate - MJ-PBMEF-PRODUCT-WP-10

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-10
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-10
Import	whitepapers/products/10-jp-peaceful-propulsion.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-10
Definition	Explore peaceful propulsion measurement and control under non-weaponization, safety, and regulatory gates. Explore peaceful propulsion measurement and control under non-weaponization, safety, and regulatory gates. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP-PEACEFUL-PROPULSION
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-10', path='whitepapers/products/10-jp-peaceful-propulsion.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-10 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-10
Reference	whitepapers/products/10-jp-peaceful-propulsion.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.32 Sister Predictive Containment System - MJ-PBMEF-PRODUCT-WP-11

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-11
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-11
Import	whitepapers/products/11-sister-containment.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-11
Definition	Define a scale-independent physical-containment calculation pathway without claiming a realized physical article. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SISTER-CONTAINMENT
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-11', path='whitepapers/products/11-sister-containment.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-11 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-11
Reference	whitepapers/products/11-sister-containment.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.33 EVE Variance Screen and Egress Accounting - MJ-PBMEF-PRODUCT-WP-12

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-12
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-12
Import	whitepapers/products/12-eve-screen.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-12
Definition	Account for variance, evaporation, leakage, capture, and natural egress without silent loss. Account for variance, evaporation, leakage, capture, and natural egress without silent loss. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	EVE-SCREEN
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-12', path='whitepapers/products/12-eve-screen.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-12 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-12
Reference	whitepapers/products/12-eve-screen.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.34 Angels Safety and Corrective Command System - MJ-PBMEF-PRODUCT-WP-13

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-13
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-13
Import	whitepapers/products/13-angels-safety.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-13
Definition	Provide domain-bounded telemetry, hold, denial, isolation, and corrective protocols. Provide domain-bounded telemetry, hold, denial, isolation, and corrective protocols. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ANGELS-SAFETY
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-13', path='whitepapers/products/13-angels-safety.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-13 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-13
Reference	whitepapers/products/13-angels-safety.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.35 Mermaid Accounting and Reconciliation System - MJ-PBMEF-PRODUCT-WP-14

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-14
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-14
Import	whitepapers/products/14-mermaid-recon.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-14
Definition	Maintain balances, custody evidence, exposure, tax lots, statements, and reconciliation. Maintain balances, custody evidence, exposure, tax lots, statements, and reconciliation. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MERMAID-RECON
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-14', path='whitepapers/products/14-mermaid-recon.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-14 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-14
Reference	whitepapers/products/14-mermaid-recon.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.36 Shiva Dual Financial Rails - MJ-PBMEF-PRODUCT-WP-15

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-15
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-15
Import	whitepapers/products/15-shiva-rails.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-15
Definition	Separate stability/cash functions from investment and crypto risk while preserving liquidity-first ethics. Separate stability/cash functions from investment and crypto risk while preserving liquidity-first ethics. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVA-RAILS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-15', path='whitepapers/products/15-shiva-rails.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-15 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-15
Reference	whitepapers/products/15-shiva-rails.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.37 SHIVAS Internal Settlement Reflection - MJ-PBMEF-PRODUCT-WP-16

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-16
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-16
Import	whitepapers/products/16-shivas-internal.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-16
Definition	Represent internal capital reflections without minting, redemption, public offer, or value guarantee. Represent internal capital reflections without minting, redemption, public offer, or value guarantee. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVAS-INTERNAL
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-16', path='whitepapers/products/16-shivas-internal.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-16 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-16
Reference	whitepapers/products/16-shivas-internal.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.38 Shiva Crypto External-Market Candidate - MJ-PBMEF-PRODUCT-WP-17

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-17
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-17
Import	whitepapers/products/17-shiva-crypto.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-17
Definition	Model a separately governed external crypto rail subject to full classification and authorization. Model a separately governed external crypto rail subject to full classification and authorization. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVA-CRYPTO
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-17', path='whitepapers/products/17-shiva-crypto.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-17 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-17
Reference	whitepapers/products/17-shiva-crypto.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.39 Shiva Exchange Rule Reference - MJ-PBMEF-PRODUCT-WP-18

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-18
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-18
Import	whitepapers/products/18-shiva-exchange.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-18
Definition	Model transparent price-time, custody, audit, tax, and transfer rules without operating a market. Model transparent price-time, custody, audit, tax, and transfer rules without operating a market. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVA-EXCHANGE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-18', path='whitepapers/products/18-shiva-exchange.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-18 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-18
Reference	whitepapers/products/18-shiva-exchange.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.40 Moana Governed Browser - MJ-PBMEF-PRODUCT-WP-19

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-19
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-19
Import	whitepapers/products/19-moana-browser.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-19
Definition	Present governed applications, evidence, holds, and uncertainty. Present governed applications, evidence, holds, and uncertainty. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MOANA-BROWSER
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-19', path='whitepapers/products/19-moana-browser.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-19 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-19
Reference	whitepapers/products/19-moana-browser.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.41 Aviator Organizational Workspace - MJ-PBMEF-PRODUCT-WP-20

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-20
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-20
Import	whitepapers/products/20-aviator-workspace.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-20
Definition	Organize spaces, projects, decisions, knowledge, members, roles, and capabilities. Organize spaces, projects, decisions, knowledge, members, roles, and capabilities. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	AVIATOR-WORKSPACE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-20', path='whitepapers/products/20-aviator-workspace.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-20 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-20
Reference	whitepapers/products/20-aviator-workspace.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.42 Lecanto Truthful Visualization - MJ-PBMEF-PRODUCT-WP-21

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-21
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-21
Import	whitepapers/products/21-lecanto-visual.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-21
Definition	Display system truth, provenance, topology, uncertainty, and evidence. Display system truth, provenance, topology, uncertainty, and evidence. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	LECANTO-VISUAL
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-21', path='whitepapers/products/21-lecanto-visual.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-21 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-21
Reference	whitepapers/products/21-lecanto-visual.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.43 Elsa Governed Marketplace Reference - MJ-PBMEF-PRODUCT-WP-22

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-22
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-22
Import	whitepapers/products/22-elsa-marketplace.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-22
Definition	Coordinate semantic listings, workflow, accounting, execution, and resource evidence without live market authority. Coordinate semantic listings, workflow, accounting, execution, and resource evidence without live market authority. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ELSA-MARKETPLACE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-22', path='whitepapers/products/22-elsa-marketplace.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-22 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-22
Reference	whitepapers/products/22-elsa-marketplace.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.44 Shekina Distributed Continuity - MJ-PBMEF-PRODUCT-WP-23

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-23
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-23
Import	whitepapers/products/23-shekina-continuity.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-23
Definition	Model bounded replicas, failover, continuity, and placement evidence. Model bounded replicas, failover, continuity, and placement evidence. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHEKINA-CONTINUITY
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-23', path='whitepapers/products/23-shekina-continuity.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-23 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-23
Reference	whitepapers/products/23-shekina-continuity.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.45 Pearl Hypothetical Simulation and Information-Retention Sys-
tem - MJ-PBMEF-PRODUCT-WP-24

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-24
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-24
Import	whitepapers/products/24-pearl-containment.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-24
Definition	Acquire, retain, compare, and replay variance information and simulation potential without asserting a physical Pearl container. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	PEARL-CONTAINMENT
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-24', path='whitepapers/products/24-pearl-containment.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-24 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-24
Reference	whitepapers/products/24-pearl-containment.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.46 Bangel Spreadsheets - MJ-PBMEF-PRODUCT-WP-25

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-25
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-25
Import	whitepapers/products/25-Bangel-spreadsheets.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-25
Definition	Provide a physics-oriented, deterministic alternative to conventional spreadsheet workflows. Bangel Spreadsheets addresses founder-defined operational risks: siloed files, conflicting versions, calculation bottlenecks, weak governance, and silent manual errors. Bangel Spreadsheets is an MJ product manifestation. A workbook is a governed measurement field. A cell is a typed object containing value, unit, uncertainty, formula, revision, lineage, authority, evidence, and state. A workbook revision is immutable and content-addressed. Large workbooks are partitioned into Pearl simulation objects rather than silently copied into disconnected files. Unified measurement meaning, immutable lineage, incremental work, low-latency correlation, typed units, explicit uncertainty, concurrency safety, role-scoped access, auditability, and reality-based reporting.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	Bangel -SPREADSHEETS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-25', path='whitepapers/products/25-Bangel-spreadsheets.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-25 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-25
Reference	whitepapers/products/25-Bangel-spreadsheets.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.47 JPOSMJ Product Portfolio Envelope - MJ-PBMEF-PRODUCT-WP-26

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-26
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-26
Import	whitepapers/products/26-jposmj-portfolio.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-26
Definition	Give every JP-origin product and project option one consistent route through physics, proof, evidence, authority, and claims ceilings. 'JPOSMJ' is an internal portfolio label meaning JP product architecture → MK physics → JO verification → MJ permit classification. It is not a participant, authority, operating system, or physical product. Consistent articulation, minimal revision, product comparability, physics completeness, evidence honesty, safety, and bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JPOSMJ-PORTFOLIO
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-26', path='whitepapers/products/26-jposmj-portfolio.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-26 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-26
Reference	whitepapers/products/26-jposmj-portfolio.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.48 MJ Standard Containment Geometry and Reference Gas Model - MJ-PBMEF-PRODUCT-WP-27

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-27
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-27
Import	whitepapers/products/27-standard-containment-geometry.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-27
Definition	Provide a scale-independent product-calculation standard for the founder-defined open rectangular intake, conical expansion, Sister umbrella capture, isolated descent, EVE residual and escape accounting, bounded residual reservoir, and Pearl top-of-cone simulation anchor. The product is an MJ manifestation. Bangel expresses the typed command; Elsa preserves its intended meaning; JP constructs the geometry and equation CAPOs; MK classifies physics applicability and verifies dimensions, gas state, forces, conservation, uncertainty, and validity domain; JO verifies code and evidence; Sister, EVE, Angels, Bellatrix, and M3 provide bounded routing, observation, containment, and safety evidence; Mermaid reconciles quantities; Shiva evaluates capital implications only when applicable; MJ retains the final bounded decision. Scale-independent ratios, explicit units, truthful evidence ceilings, co
Capability	Explain, constrain, cross-reference, and support founder review
Participant	STANDARD-CONTAINMENT-GEOMETRY
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-27', path='whitepapers/products/27-standard-containment-geometry.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-27 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-27
Reference	whitepapers/products/27-standard-containment-geometry.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.49 MJ Reservoir Collection Modulation and Return Loop - MJ-PBMEF-PRODUCT-WP-28

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-28
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-28
Import	whitepapers/products/28-reservoir-collection-modulation.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-28
Definition	Provide one scale-independent reference product for the founder-defined backside outlet, outward-facing gap, connected but separately accounted lake/buffer, circular inward-tangential re-entry, and continued variance-processing cycle. JP defines the geometry and transaction CAPOs; MK provides physics applicability, units, flow, wave, force, friction, and conservation; JO produces deterministic proof and cycle receipts; Sister provides predictive placement and physical-containment evidence; EVE records screen, pass-through, escape, evaporation, and residual state; Angels provide safety checks; M3 routes every transaction under a bounded lease; Mermaid reconciles; Shiva analyzes opportunity only when capital applies; MJ alone decides whether a bounded effect is eligible. Scale independence, small-discharge intent, actual-boundary truth, nonphysical Pearl-reference separation, control-volum
Capability	Explain, constrain, cross-reference, and support founder review
Participant	RESERVOIR-COLLECTION-MODULATION
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-28', path='whitepapers/products/28-reservoir-collection-modulation.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-28 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-28
Reference	whitepapers/products/28-reservoir-collection-modulation.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.50 R1 and R2 State Representation - MJ-PBMEF-REPRESENTATION-WP-01

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-01
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-01
Import	whitepapers/representations/01-state-r1-r2.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-01
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	STATE-R1-R2
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-01', path='whitepapers/representations/01-state-r1-r2.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-01 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-01
Reference	whitepapers/representations/01-state-r1-r2.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.51 Noise Floor and 23 mg Inflection - MJ-PBMEF-REPRESENTATION-WP-02

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-02
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-02
Import	whitepapers/representations/02-noise-23mg.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-02
Definition	Separate the 23 mg pre-observational floor from the 24 mg containment-geometry reference and bind both to the first-noise plane. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	NOISE-23MG
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-02', path='whitepapers/representations/02-noise-23mg.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-02 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-02
Reference	whitepapers/representations/02-noise-23mg.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.52 Upward 3x3 Node and Umbrella Representation - MJ-PBMEF-REPRESENTATION-WP-03

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-03
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-03
Import	whitepapers/representations/03-node-3x3.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-03
Definition	Integrate the open rectangle and conical expansion with the normalized N1-N9, U/D/C, EVE, and reservoir topology. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	NODE-3X3
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-03', path='whitepapers/representations/03-node-3x3.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-03 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-03
Reference	whitepapers/representations/03-node-3x3.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.53 Memory, Request Occultation, and Generational Handoff - MJ-PBMEF-REPRESENTATION-WP-04

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-04
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-04
Import	whitepapers/representations/04-memory-handoff.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-04
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MEMORY-HANDOFF
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-04', path='whitepapers/representations/04-memory-handoff.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-04 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-04
Reference	whitepapers/representations/04-memory-handoff.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.54 Static Intake and Energy-Wake Representation - MJ-PBMEF-REPRESENTATION-WP-05

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-05
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-05
Import	whitepapers/representations/05-static-impetus.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-05
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	STATIC-IMPETUS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-05', path='whitepapers/representations/05-static-impetus.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-05 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-05
Reference	whitepapers/representations/05-static-impetus.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.55 EVE Variance, Screen, Evaporation, and Egress - MJ-PBMEF-REPRESENTATION-WP-06

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-06
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-06
Import	whitepapers/representations/06-eve-egress.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-06
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	EVE-EGRESS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-06', path='whitepapers/representations/06-eve-egress.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-06 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-06
Reference	whitepapers/representations/06-eve-egress.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.56 Shiva and Mermaid Financial Rails - MJ-PBMEF-REPRESENTATION-WP-07

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-07
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-07
Import	whitepapers/representations/07-financial-rails.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-07
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	FINANCIAL-RAILS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-07', path='whitepapers/representations/07-financial-rails.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-07 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-07
Reference	whitepapers/representations/07-financial-rails.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.57 Passkey, Claims Ceiling, and Repository Authentication - MJ-PBMEF-REPRESENTATION-WP-08

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-08
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-08
Import	whitepapers/representations/08-passkey.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-08
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	PASSKEY
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-08', path='whitepapers/representations/08-passkey.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-08 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-08
Reference	whitepapers/representations/08-passkey.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.58 Pearl Hypothetical Geometry and Acoustic Simulation Representation - MJ-PBMEF-REPRESENTATION-WP-09

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-09
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-09
Import	whitepapers/representations/09-pearl-container-acoustics.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-09
Definition	Bind Pearl simulation to the top-of-cone observation plane and retain acoustic variables as simulation-only. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	PEARL-CONTAINER-ACOUSTICS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-09', path='whitepapers/representations/09-pearl-container-acoustics.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-09 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-09
Reference	whitepapers/representations/09-pearl-container-acoustics.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.59

Bangel

Spreadsheets Cell, Dependency, Revision, and Pearl Simulation Field - MJ-PBMEF-REPRESENTATION-WP-10

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-10
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-10
Import	whitepapers/representations/10-Bangel-spreadsheets-field.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-10
Definition	Define a spreadsheet-like operational field in which cells are typed measurement objects and workbook changes are immutable, auditable, incremental, and partitionable. This representation is the technical core of Bangel Spreadsheets. It supports inventory, finance, project tracking, reporting, or other processes only after the process, users, workload, service level, and authority are declared. Meaning consistency, version truth, low-latency recalculation, role-scoped governance, manual-error resistance, complete audit, and measured capacity.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	Bangel -SPREADSHEETS-FIELD
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-10', path='whitepapers/representations/10-Bangel-spreadsheets-field.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-10 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-10
Reference	whitepapers/representations/10-Bangel-spreadsheets-field.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.60

Standard Containment Geometry and H2 Reference Representation - MJ-PBMEF-REPRESENTATION-WP-11

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-11
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-11
Import	whitepapers/representations/11-standard-containment-geometry-h2-reference.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-11
Definition	Provide one scale-independent containment calculation system for the open rectangle, conical expansion, Sister umbrella/descent/containment, EVE accounting, residual reservoir, and Pearl cone-top simulation anchor. This representation connects JP geometry and formulas to MK physics, JO verification, Sister and EVE evidence, M3 routing, Mermaid reconciliation, Shiva opportunity analysis when applicable, and MJ bounded decisions. Scale independence, unit integrity, conservation, explicit gas state, truthful acceleration limits, and adaptive modification without rewriting core logic.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	STANDARD-CONTAINMENT-GEOMETRY-H2
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-11', path='whitepapers/representations/11-standard-containment-geometry-h2-reference.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-11 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-11
Reference	whitepapers/representations/11-standard-containment-geometry-h2-reference.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.61 Reservoir Return Loop Physics Representation - MJ-PBMEF-REPRESENTATION-WP-12

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-12
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-12
Import	whitepapers/representations/12-reservoir-return-loop.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-12
Definition	Represent the outlet, buffer/lake, circular re-entry, perspective, wave-state, capacity, and transaction-cycle evidence of 'RESERVOIR-COLLECTION-MODULATION' without treating the Pearl simulation circle as a physical wall. The representation passes from Bangel and Elsa into JP geometry CAPOs, MK physics checks, JO proof receipts, Sister/EVE/Angel evidence, M3 routing, Mermaid reconciliation, Shiva analysis when capital applies, and MJ bounded decision. Typed state, explicit units, actual-boundary truth, uncertainty-aware clearance, separate control volumes, vector capacity, no same-cycle feed-back, conservation, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	RESERVOIR-RETURN-LOOP
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-12', path='whitepapers/representations/12-reservoir-return-loop.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-12 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-12
Reference	whitepapers/representations/12-reservoir-return-loop.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

Potential IP Pink Paper - No-Rights Boundary

CONTROLLING STATEMENT

The 90,000 Potential IP Points are internal candidate technical observations. They do not establish ownership, inventorship, novelty, patentability, validity, enforceability, infringement, freedom to operate, registration, clearance, or entitlement to any IP right.

PURPOSE

The register is a confidential navigation tool for clustering, disclosure drafting, prior-art search planning, trade-secret review, copyright-expression review, and qualified IP-counsel triage.

AUTHORITY

No point can approve itself. MJ may preserve and prioritize internal review, but legal rights and claim-specific inventorship require applicable law, evidence, filings, agreements, and qualified counsel.

How the 90,000 Candidate Points Were Established

PREDECESSOR 10,000

The first sweep used formula, family-object, product-construct, white-paper, and cross-cutting technical lenses to enumerate 10,000 candidate observations.

SOLAR 20,000

The solar three-profile integration added 20,000 observations across the shared core, semiconductor/phone, marine, and peaceful rocket/spacecraft profiles.

R8 60,000

DRO, Pearl/DRO, start-and-restart, Lecanto, semiconductor, and cross-system lenses added 60,000 observations.

TOTAL

The master pending register therefore contains 90,000 candidate observations. Count is an enumeration result, not an invention or claim count.

Candidate Point Anatomy

FIELDS

Each candidate may carry a point identifier, source formula/family/object/product/document, technical thesis, differentiation hypothesis, disclosure prompt, search terms, possible protection modes, enablement gaps, risk flags, confidentiality recommendation, next action, and gateway relation.

STATUS

Every point remains pending internal review unless separately advanced. A point may later be merged, archived, reclassified, disclosed, kept confidential, or used as prior-art/search input.

NO AUTOMATIC RIGHTS

A content hash, passkey signature, internal priority, or Blue Page does not create a patent, copyright registration, trade-secret status, or ownership adjudication.

Formula and Algorithm Layer

TECHNICAL SCOPE

Formula-derived points examine typed inputs, operators, transformations, units, uncertainty, evidence, control volumes, scaling, implementation, verification, and product embodiment.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

Family and Object Layer

TECHNICAL SCOPE

Family-object points examine boundaries, handoffs, interfaces, evidence custody, non-substitutability, recovery, routing, and combinations among manifestations and governed objects.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

Product and Construct Layer

TECHNICAL SCOPE

Product-construct points examine use cases, command syntax, configuration, profiles, workflows, interfaces, scaling, safety, and product-specific embodiments.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

White-Paper Layer

TECHNICAL SCOPE

White-paper points examine disclosed systems, methods, architectures, diagrams, examples, limitations, and alternative embodiments that may require separate prior-art and enablement review.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

Solar Three-Profile Layer

TECHNICAL SCOPE

The solar layer preserves shared-core architecture while requiring separate physical evidence for semiconductor/phone, marine, and peaceful rocket/spacecraft profiles.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

DRO Layer

TECHNICAL SCOPE

DRO observations cover typed unit acquisition, R-to-R1 state transitions, optical reference hypotheses, conservation, receipts, scale boundaries, and non-authority status.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

Pearl/DRO Layer

TECHNICAL SCOPE

Pearl/DRO observations cover computational-node retention, hypothetical allocation, handoff evidence, capacity modeling, and strict separation from physical-container claims.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

Start and Restart Layer

TECHNICAL SCOPE

Start/restart observations cover available energy, required energy, reserve, loss, uncertainty, state transitions, and non-operational reference status.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

Lecanto Layer

TECHNICAL SCOPE

Lecanto observations cover source digest, metadata, image variance, transformations, derivative labels, safety classification, contextual intent hypotheses, and truthful visualization.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

Semiconductor Layer

TECHNICAL SCOPE

Semiconductor observations cover charge, energy, leakage, wake, reserve, memory, thermal state, DRO ledgers, Pearl computational nodes, and profile-specific evidence.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

Cross-System Layer

TECHNICAL SCOPE

Cross-system observations examine combinations, interface contracts, state transitions, authority boundaries, evidence flow, recovery, and alternative implementations across the portfolio.

REVIEW QUESTIONS

What is the claimed technical difference? What is actually enabled by the disclosure? Which elements are known? What evidence is missing? Which alternative embodiments matter? Who contributed to the claimed subject matter?

PENDING STATUS

The point remains a confidential candidate until counsel and technical reviewers determine whether to merge, preserve, search, disclose, file, or archive it.

Internal Triage Tiers

SUMMARY

Triage is a workflow aid only. Higher priority does not prove patentability; lower priority does not eliminate trade-secret, copyright-expression, defensive-publication, or portfolio value.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Patent Candidate Review

SUMMARY

A patent-oriented review needs a claimable technical concept, correct inventorship, adequate written description and enablement, novelty and non-obviousness analysis, eligible subject matter, filing strategy, and prior-art search. The internal register supplies prompts, not conclusions.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Trade-Secret Candidate Review

SUMMARY

Trade-secret review asks whether information has economic value from not being generally known and whether reasonable secrecy measures are maintained. Access controls, confidentiality terms, limited disclosure, logs, and custody procedures matter.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Copyright-Expression Review

SUMMARY

Copyright may protect original text, code, diagrams, and arrangement, but generally not the underlying ideas, methods, systems, formulas, or algorithms. The register should distinguish expressive artifacts from technical concepts.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Trademark and Branding Review

SUMMARY

Names, marks, logos, and product identifiers require separate clearance and use analysis. Inclusion in the passkey does not establish trademark availability or registration rights.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Inventorship Review

SUMMARY

Patent inventorship is claim-specific. Founder-declared authorship or project leadership is not a substitute for identifying every human who contributed to the conception of each claimed invention.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Ownership and Assignment Review

SUMMARY

Ownership can depend on inventorship, employment, contractor agreements, assignments, licenses, and applicable law. The internal build records founder declarations but does not independently adjudicate title.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Freedom-to-Operate Review

SUMMARY

Freedom to operate requires analysis of live third-party claims in relevant jurisdictions and product configurations. An internal novelty or IP sweep does not establish non-infringement.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Public-Disclosure Risk

SUMMARY

Public disclosure can affect patent timing and trade-secret status. The register should remain confidential until counsel determines disclosure strategy, filing timing, and access controls.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Enablement and Evidence Gaps

SUMMARY

Points tied to hypothetical physical mechanisms require sufficient technical detail and, where appropriate, measurements, simulations, prototypes, or reproducible examples. The passkey authenticates the disclosure snapshot, not enablement or feasibility.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Duplicate and Cluster Logic

SUMMARY

Many candidate observations may describe overlapping aspects of the same technical concept. Counsel and engineers should cluster duplicates and related embodiments before counting inventions or drafting claims.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Prior-Art Search Workflow

SUMMARY

Translate a candidate into technical features, synonyms, classifications, combinations, and date ranges. Search patents and non-patent literature, document results, and revise the candidate thesis without erasing the original record.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Counsel Handoff Package

SUMMARY

A strong handoff includes source excerpts, dates, contributor records, drawings, alternative embodiments, experimental status, known prior art, business relevance, disclosure history, confidentiality status, and proposed next action.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Pending Status in Access Terms

SUMMARY

Users must preserve Potential IP Points as pending internal observations and may not represent them as cleared rights or use them outside authorized scope. Explicit assent and confidentiality controls should precede access.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Passkey Relationship

SUMMARY

The passkey can prove that a particular pending register was included in an approved, hashed snapshot. It cannot create the IP rights described by the register.

CONTROL

The official documentation manifest and Terms preserve the candidate status, no-rights boundary, confidentiality expectations, and need for claim-specific counsel review.

CROSS-REFERENCE

Potential IP registers; Pink Paper; Blue Pages; White Papers; project/product/family/object/formula registers; passkey scope.

Candidate Segment - Predecessor 10K

COUNT

10,000 candidate observations are associated with this segment in the internal master structure.

REVIEW FOCUS

Cluster related entries; verify source cross-references; identify duplicates; distinguish mathematical, software, physical, product, and documentation embodiments; record enablement and confidentiality gaps.

NO-RIGHTS RULE

The segment count is not a count of inventions, claims, patents, or owned rights.

Candidate Segment - Solar 20K

COUNT

20,000 candidate observations are associated with this segment in the internal master structure.

REVIEW FOCUS

Cluster related entries; verify source cross-references; identify duplicates; distinguish mathematical, software, physical, product, and documentation embodiments; record enablement and confidentiality gaps.

NO-RIGHTS RULE

The segment count is not a count of inventions, claims, patents, or owned rights.

Candidate Segment - Dro Core

COUNT

15,000 candidate observations are associated with this segment in the internal master structure.

REVIEW FOCUS

Cluster related entries; verify source cross-references; identify duplicates; distinguish mathematical, software, physical, product, and documentation embodiments; record enablement and confidentiality gaps.

NO-RIGHTS RULE

The segment count is not a count of inventions, claims, patents, or owned rights.

Candidate Segment - Pearl Dro

COUNT

10,000 candidate observations are associated with this segment in the internal master structure.

REVIEW FOCUS

Cluster related entries; verify source cross-references; identify duplicates; distinguish mathematical, software, physical, product, and documentation embodiments; record enablement and confidentiality gaps.

NO-RIGHTS RULE

The segment count is not a count of inventions, claims, patents, or owned rights.

Candidate Segment - Dro Start Restart

COUNT

10,000 candidate observations are associated with this segment in the internal master structure.

REVIEW FOCUS

Cluster related entries; verify source cross-references; identify duplicates; distinguish mathematical, software, physical, product, and documentation embodiments; record enablement and confidentiality gaps.

NO-RIGHTS RULE

The segment count is not a count of inventions, claims, patents, or owned rights.

Candidate Segment - Lecanto

COUNT

10,000 candidate observations are associated with this segment in the internal master structure.

REVIEW FOCUS

Cluster related entries; verify source cross-references; identify duplicates; distinguish mathematical, software, physical, product, and documentation embodiments; record enablement and confidentiality gaps.

NO-RIGHTS RULE

The segment count is not a count of inventions, claims, patents, or owned rights.

Candidate Segment - Semiconductor

COUNT

10,000 candidate observations are associated with this segment in the internal master structure.

REVIEW FOCUS

Cluster related entries; verify source cross-references; identify duplicates; distinguish mathematical, software, physical, product, and documentation embodiments; record enablement and confidentiality gaps.

NO-RIGHTS RULE

The segment count is not a count of inventions, claims, patents, or owned rights.

Candidate Segment - Cross System

COUNT

5,000 candidate observations are associated with this segment in the internal master structure.

REVIEW FOCUS

Cluster related entries; verify source cross-references; identify duplicates; distinguish mathematical, software, physical, product, and documentation embodiments; record enablement and confidentiality gaps.

NO-RIGHTS RULE

The segment count is not a count of inventions, claims, patents, or owned rights.

Algorithm Candidate Example

SUMMARY

A formula may support multiple candidates: a measurement method, a typed software implementation, an uncertainty protocol, a control-volume application, a product-specific embodiment, or an evidence-verification process. These are review lenses, not automatically distinct inventions.

GATEWAY

MJ purpose -> Bangel -> Elsa -> JP -> MK -> JO -> evidence participants -> M3 -> Mermaid/Shiva when applicable -> MJ review -> receipt.

STATUS

Pending internal candidate; no approval, grant, registration, ownership, or clearance effect.

Family Interface Candidate Example

SUMMARY

A participant handoff may raise candidates around typed receipts, non-substitutable authority, failure recovery, cross-profile isolation, or evidence custody. The legal significance depends on the actual technical contribution and prior art.

GATEWAY

MJ purpose -> Bangel -> Elsa -> JP -> MK -> JO -> evidence participants -> M3 -> Mermaid/Shiva when applicable -> MJ review -> receipt.

STATUS

Pending internal candidate; no approval, grant, registration, ownership, or clearance effect.

Product Candidate Example

SUMMARY

A product paper may disclose a system, method, user interface, data structure, test process, and alternative embodiment. Each must be reviewed against the disclosure and actual contribution rather than counted automatically.

GATEWAY

MJ purpose -> Bangel -> Elsa -> JP -> MK -> JO -> evidence participants -> M3 -> Mermaid/Shiva when applicable -> MJ review -> receipt.

STATUS

Pending internal candidate; no approval, grant, registration, ownership, or clearance effect.

Physical-Hypothesis Candidate Example

SUMMARY

Pearl, DRO, containment, reservoir, acoustic, hydrogen, propulsion, and other physical hypotheses remain subject to evidence and enablement review. Internal equations alone do not prove feasibility.

GATEWAY

MJ purpose -> Bangel -> Elsa -> JP -> MK -> JO -> evidence participants -> M3 -> Mermaid/Shiva when applicable -> MJ review -> receipt.

STATUS

Pending internal candidate; no approval, grant, registration, ownership, or clearance effect.

Software Candidate Example

SUMMARY

Bangel, JO, Lecanto, Spreadsheets, provenance, receipts, and proof graphs may present software or information-processing candidates. Eligibility, novelty, non-obviousness, and enablement still require claim-specific review.

GATEWAY

MJ purpose -> Bangel -> Elsa -> JP -> MK -> JO -> evidence participants -> M3 -> Mermaid/Shiva when applicable -> MJ review -> receipt.

STATUS

Pending internal candidate; no approval, grant, registration, ownership, or clearance effect.

Confidentiality Checklist

SUMMARY

Limit access; use explicit terms; encrypt storage; log recipients; avoid public posting; mark pending status; separate public and confidential versions; document disclosure dates; use contributor and assignment agreements.

GATEWAY

MJ purpose -> Bangel -> Elsa -> JP -> MK -> JO -> evidence participants -> M3 -> Mermaid/Shiva when applicable -> MJ review -> receipt.

STATUS

Pending internal candidate; no approval, grant, registration, ownership, or clearance effect.

Founder IP Review Checklist

SUMMARY

Confirm the source, date, contributor, technical problem, proposed solution, alternatives, evidence, known prior art, business value, disclosure status, and desired next action for each priority cluster.

GATEWAY

MJ purpose -> Bangel -> Elsa -> JP -> MK -> JO -> evidence participants -> M3 -> Mermaid/Shiva when applicable -> MJ review -> receipt.

STATUS

Pending internal candidate; no approval, grant, registration, ownership, or clearance effect.

IP Pink Paper Conclusion

SUMMARY

The 90,000-point register is a thorough internal candidate map and a strong starting point for counsel. Its value lies in structured traceability and review prompts, not in implying that 90,000 rights already exist.

GATEWAY

MJ purpose -> Bangel -> Elsa -> JP -> MK -> JO -> evidence participants -> M3 -> Mermaid/Shiva when applicable -> MJ review -> receipt.

STATUS

Pending internal candidate; no approval, grant, registration, ownership, or clearance effect.

Pending IP Review Reference - Part 46

REFERENCE

This page preserves a categorized review lens for the 90,000-point register and associated technical sources.

QUESTIONS

Is the source specific? Is the contribution human-authored? Is the concept enabled? Is it distinct from known art? Is it confidential? Does it overlap another point? Which protection or disclosure route is appropriate?

RESULT

Keep pending, merge, archive, search, disclose under confidentiality, or advance to qualified counsel.

Pending IP Review Reference - Part 47

REFERENCE

This page preserves a categorized review lens for the 90,000-point register and associated technical sources.

QUESTIONS

Is the source specific? Is the contribution human-authored? Is the concept enabled? Is it distinct from known art? Is it confidential? Does it overlap another point? Which protection or disclosure route is appropriate?

RESULT

Keep pending, merge, archive, search, disclose under confidentiality, or advance to qualified counsel.

Potential IP Pink Paper Closing Receipt

DOCUMENT STATUS

48-page internal reference; final included pending local founder signature.

MASTER COUNT

90,000 candidate observations in the current master manifest.

NO-RIGHTS EFFECT

Ownership, inventorship, novelty, patentability, validity, enforceability, infringement, freedom to operate, registration, and approval effects: NONE.

AUTHOR AND ENTITY

Michael Patrick Bangel (Michael Bangel), founder-declared author, inventor, and architect; CEO of MJ Physics Engineering, Clearwater, Florida, USA. Inventorship remains claim-specific under applicable law.

23,000 deterministic reference scenarios plus preserved predecessor suites

RESULT

23,000 executed / 23,000 pass / 0 fail / 0 hold across 23 categories. Results root:
c8097cc9f291a10379b07c4a146fb736e136a79ee2b8c985c2fa156fbf750912

MEANING

The scenarios verify reference software, numeric guards, formulas, states, manifests, documentation roots, ethics, profile isolation, and ceremony prerequisites. They do not prove physical performance, product certification, regulatory approval, legal rights, or external financial operation.

PRESERVED PREDECESSOR EVIDENCE

R10 repository suites, R8/R9 scenarios, physical-evidence implementation tests, fault cases, canonical alignment receipts, and documentation QA remain historical evidence for their exact scope. R11 adds 23,000 new deterministic scenarios and reruns the repository suite after integration.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category ANGELS_ETHICS -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Non-weaponization and safety gate outcomes.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category CEREMONY -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Authority graph, claims ceiling, and passkey preconditions.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category CONTAINMENT -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Scale-independent rectangle/cone ratios and reference geometry.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category COVARIANCE -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Positive-semidefinite covariance reference matrices.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category DIGEST -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Canonical lowercase SHA-256 validation.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category DOCUMENTATION -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Official documentation entry existence and content hashes.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category DRO -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

DRO scale, uncertainty, R1, and R2 reference states.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category GAS -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

State-dependent reference-gas density and 24 mg volume.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category IP_DISCOVERY -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Candidate-only Potential IP identifier and register boundaries.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category LECANTO -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Source digest, image residual, intent hypothesis, and safe transformation gates.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category M3 -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Non-authoritative routing receipts.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category MASS23 -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

23 mg observational-floor interval classification.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category MASS24 -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

24 mg reference-mass and density-dependent volume separation.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category MEMORY -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Request memory, preallocation, residual, and headroom accounting.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category NOISE -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Smoothing, trend, and bounded anti-spike reference behavior.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category NUMERIC -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

NaN and infinity rejection with finite-value acceptance.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category PEARL -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Pearl simulation capacity and nonphysical status.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category PROFILE_ISOLATION -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Separate product/profile values and transfer-receipt requirements.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category RESERVOIR -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Inventory balance, vector capacity, new-cycle re-entry, and physical holds.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category SHEETS -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Bangel Spreadsheets atomic updates, formulas, units, evidence state, and rollback.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category SHIVA_DAY1 -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Liquidity-first internal banking MVP calculations and external-crypto exclusion.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category STATE -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

R/R0/R1/N1/R2 transitions and UNKNOWN != ZERO.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

1,000 deterministic scenarios | all passed

DISCOVERY PATH

Source category SYNTAX -> deterministic inputs -> governed reference function or manifest predicate -> expected state -> actual state -> JSONL receipt -> summary root -> passkey validation annex.

WHAT WAS TESTED

Balanced reference syntax constructs and authority-none declarations.

WHAT THE PASS PROVES

The tested invariant behaved deterministically for the generated reference cases and failed closed where the category required rejection or hold.

WHAT IT DOES NOT PROVE

No physical article, calibrated measurement, operational deployment, legal conclusion, financial authorization, product certification, or approved IP right is established.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CUMULATIVE SCENARIOS

R11: 23,000 pass. R12 additional: 23,000 pass. Aggregate: 46,000 pass / 0 fail / 0 hold.

RAINBOW COVERAGE

300 Blue source pages + 1,051 physical Pink PDF pages -> 1,351 Rainbow pages.

IP OBSERVATIONS

230,000 pending candidate observations; no approval or ownership effect.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
AUTHORITY_NO_TRANSFER
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-AUTHORITY_NO_TRANSFER-0001 through R12-AUTHORITY_NO_TRANSFER-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
CLAIMS_CEILING
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-CLAIMS_CEILING-0001 through R12-CLAIMS_CEILING-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
CODE_TOKENS
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-CODE_TOKENS-0001 through R12-CODE_TOKENS-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
FINANCE_HOLD
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-FINANCE_HOLD-0001 through R12-FINANCE_HOLD-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
FORMULA_ID
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-FORMULA_ID-0001 through R12-FORMULA_ID-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
GENERATION_RETURN
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-GENERATION_RETURN-0001 through R12-GENERATION_RETURN-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
IP_NO_APPROVAL
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-IP_NO_APPROVAL-0001 through R12-IP_NO_APPROVAL-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
JO_PROOF_NO_PERMIT
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-JO_PROOF_NO_PERMIT-0001 through R12-JO_PROOF_NO_PERMIT-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
M3_NO_AUTHORITY
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-M3_NO_AUTHORITY-0001 through R12-M3_NO_AUTHORITY-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
MIRROR_COVERAGE
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-MIRROR_COVERAGE-0001 through R12-MIRROR_COVERAGE-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
MK_EVIDENCE_CEILING
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-MK_EVIDENCE_CEILING-0001 through R12-MK_EVIDENCE_CEILING-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
NODE_PLACEMENT
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-NODE_PLACEMENT-0001 through R12-NODE_PLACEMENT-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
NONWEAPONIZATION
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-NONWEAPONIZATION-0001 through R12-NONWEAPONIZATION-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
PDF_OPEN
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-PDF_OPEN-0001 through R12-PDF_OPEN-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
PDF_TEXT
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-PDF_TEXT-0001 through R12-PDF_TEXT-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
PHYSICAL_HOLD
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-PHYSICAL_HOLD-0001 through R12-PHYSICAL_HOLD-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
PROFILE_ISOLATION
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-PROFILE_ISOLATION-0001 through R12-PROFILE_ISOLATION-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
RAINBOW_BLUE
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-RAINBOW_BLUE-0001 through R12-RAINBOW_BLUE-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
RAINBOW_PINK
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-RAINBOW_PINK-0001 through R12-RAINBOW_PINK-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
RAINBOW_UNIQUENESS
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-RAINBOW_UNIQUENESS-0001 through R12-RAINBOW_UNIQUENESS-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
R_TO_N1
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-R_TO_N1-0001 through R12-R_TO_N1-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
SOURCE_HASH
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-SOURCE_HASH-0001 through R12-SOURCE_HASH-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

VALIDATION CLAIMS CEILING

These results verify reference code, documentation mappings, hashes, node/R lifecycles, claims ceilings, authority separation, and deterministic scenarios. They do not establish physical product performance, safety certification, regulatory approval, or operational authority.

CATEGORY
UNKNOWN_NONCOERCION
R12 RESULT
1,000 deterministic cases passed; 0 failed; 0 held.
DISCOVERY PATH
Scenario IDs R12-UNKNOWN_NONCOERCION-0001 through R12-UNKNOWN_NONCOERCION-1000 preserve input digests and source references.
WHAT IT SUPPORTS
Reference software/document integrity and fail-closed behavior within the declared scope.
WHAT IT DOES NOT SUPPORT
Physical validation, product certification, external operation, regulatory permission, or legal IP determination.

Testing Evidence Pink Paper - Scope and Evidence Ceiling

PURPOSE

This Pink Paper organizes the completed reference tests, scenario runs, repository checks, documentation QA, historical receipts, and remaining evidence holds. It does not convert passing software tests into physical validation, certification, legal compliance, or operational permission.

CONTROLLING BUILD

Build: MJ-PBMEF-DAY0-R9-BLUE-PINK-TOS-FINAL. Predecessor evidence: MJ-PBMEF-DAY0-R8-DRO-PEARL-LECANTO-90K-FINAL. Current known R8 baseline: 373 repository tests, 8192 deterministic scenarios, and 201 repository checks, all with zero recorded failures in their stated reference scope.

INTERPRETATION

A PASS means the tested reference assertion passed within its defined fixture, model, or repository boundary. HOLD means required evidence or authority is missing. FAIL_TECHNICAL means a complete test detected a technical violation. DENY means a superior ethics, purpose, profile, or authority boundary prohibits the requested effect.

Test Taxonomy and Result Vocabulary

CATEGORIES

Unit tests; formula and type tests; state-transition tests; profile-isolation tests; authority and ethics tests; scenario tests; repository-integrity checks; document/PDF QA; private-material scans; passkey prechecks; historical implementation receipts.

RESULT STATES

PASS_REFERENCE, HOLD, FAIL_TECHNICAL, DENY, NOT_RUN_AWAITING_PACKET, and NOT_APPLICABLE are distinct. No single success flag collapses these states.

EVIDENCE RULE

Every reported count is tied to a transcript, receipt, or machine-readable result where available. Missing historical details are described as not located or not independently rerun rather than reconstructed.

Current Build Test Summary

PYTEST

{ "failed": 0, "held": 0, "passed": 373, "transcript": "validation/PYTEST-TRANSCRIPT-R8.txt" }

SCENARIO TESTS

{ "categories": 8, "failed": 0, "held": 0, "passed": 8192, "summary": "validation/r8-scenario-tests/R8-SCENARIO-TEST-RESULTS-SUMMARY.json" }

REPOSITORY VERIFICATION

{ "failed": 0, "passed": 201, "receipt": "validation/REPOSITORY-VERIFICATION-R8.json" }

DOCUMENTATION QA

{ "pages": 1275, "pdfs": 26, "qa_status": "PASS", "receipt": "validation/R8-DOCUMENTATION-QA-RECEIPT-001.json" }

Scenario Category - Authority Ethics

SCOPE

This category contains {'fail': 0, 'pass': 1024} deterministic reference scenarios recorded in the R8 scenario summary.

WHAT IT CHECKS

The scenarios exercise the authority ethics rules, including expected pass, hold, fail, or deny behavior under bounded inputs.

WHAT IT DOES NOT PROVE

The category does not prove real-world performance, calibrated physical behavior, safety certification, external compliance, or product readiness.

REQUIRED LINEAGE

Primary source: validation/r8-scenario-tests/R8-SCENARIO-TEST-RESULTS-SUMMARY.json. Result integrity depends on the recorded fixtures, code digest, and category definitions.

Scenario Category - Dro Scale

SCOPE

This category contains {'fail': 0, 'pass': 1024} deterministic reference scenarios recorded in the R8 scenario summary.

WHAT IT CHECKS

The scenarios exercise the dro scale rules, including expected pass, hold, fail, or deny behavior under bounded inputs.

WHAT IT DOES NOT PROVE

The category does not prove real-world performance, calibrated physical behavior, safety certification, external compliance, or product readiness.

REQUIRED LINEAGE

Primary source: validation/r8-scenario-tests/R8-SCENARIO-TEST-RESULTS-SUMMARY.json. Result integrity depends on the recorded fixtures, code digest, and category definitions.

Scenario Category - Dro State

SCOPE

This category contains {'fail': 0, 'pass': 1024} deterministic reference scenarios recorded in the R8 scenario summary.

WHAT IT CHECKS

The scenarios exercise the dro state rules, including expected pass, hold, fail, or deny behavior under bounded inputs.

WHAT IT DOES NOT PROVE

The category does not prove real-world performance, calibrated physical behavior, safety certification, external compliance, or product readiness.

REQUIRED LINEAGE

Primary source: validation/r8-scenario-tests/R8-SCENARIO-TEST-RESULTS-SUMMARY.json. Result integrity depends on the recorded fixtures, code digest, and category definitions.

Scenario Category - Lecanto

SCOPE

This category contains {'fail': 0, 'pass': 1024} deterministic reference scenarios recorded in the R8 scenario summary.

WHAT IT CHECKS

The scenarios exercise the lecanto rules, including expected pass, hold, fail, or deny behavior under bounded inputs.

WHAT IT DOES NOT PROVE

The category does not prove real-world performance, calibrated physical behavior, safety certification, external compliance, or product readiness.

REQUIRED LINEAGE

Primary source: validation/r8-scenario-tests/R8-SCENARIO-TEST-RESULTS-SUMMARY.json. Result integrity depends on the recorded fixtures, code digest, and category definitions.

Scenario Category - Optical

SCOPE

This category contains {'fail': 0, 'pass': 1024} deterministic reference scenarios recorded in the R8 scenario summary.

WHAT IT CHECKS

The scenarios exercise the optical rules, including expected pass, hold, fail, or deny behavior under bounded inputs.

WHAT IT DOES NOT PROVE

The category does not prove real-world performance, calibrated physical behavior, safety certification, external compliance, or product readiness.

REQUIRED LINEAGE

Primary source: validation/r8-scenario-tests/R8-SCENARIO-TEST-RESULTS-SUMMARY.json. Result integrity depends on the recorded fixtures, code digest, and category definitions.

Scenario Category - Pearl Node

SCOPE

This category contains {'fail': 0, 'pass': 1024} deterministic reference scenarios recorded in the R8 scenario summary.

WHAT IT CHECKS

The scenarios exercise the pearl node rules, including expected pass, hold, fail, or deny behavior under bounded inputs.

WHAT IT DOES NOT PROVE

The category does not prove real-world performance, calibrated physical behavior, safety certification, external compliance, or product readiness.

REQUIRED LINEAGE

Primary source: validation/r8-scenario-tests/R8-SCENARIO-TEST-RESULTS-SUMMARY.json. Result integrity depends on the recorded fixtures, code digest, and category definitions.

Scenario Category - Semiconductor

SCOPE

This category contains {'fail': 0, 'pass': 1024} deterministic reference scenarios recorded in the R8 scenario summary.

WHAT IT CHECKS

The scenarios exercise the semiconductor rules, including expected pass, hold, fail, or deny behavior under bounded inputs.

WHAT IT DOES NOT PROVE

The category does not prove real-world performance, calibrated physical behavior, safety certification, external compliance, or product readiness.

REQUIRED LINEAGE

Primary source: validation/r8-scenario-tests/R8-SCENARIO-TEST-RESULTS-SUMMARY.json. Result integrity depends on the recorded fixtures, code digest, and category definitions.

Scenario Category - Start Reserve

SCOPE

This category contains {'fail': 0, 'pass': 1024} deterministic reference scenarios recorded in the R8 scenario summary.

WHAT IT CHECKS

The scenarios exercise the start reserve rules, including expected pass, hold, fail, or deny behavior under bounded inputs.

WHAT IT DOES NOT PROVE

The category does not prove real-world performance, calibrated physical behavior, safety certification, external compliance, or product readiness.

REQUIRED LINEAGE

Primary source: validation/r8-scenario-tests/R8-SCENARIO-TEST-RESULTS-SUMMARY.json. Result integrity depends on the recorded fixtures, code digest, and category definitions.

Pytest Module - test_authority.py

SCOPE

3 named test functions: test_authority_graph_acyclic, test_mj_root_and_final_decision, test_no_peer_authority_transfer_rule

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_authority.py

Pytest Module - test_containment_geometry_r3.py

SCOPE

21 named test functions: test_founder_reference_volume_is_about_267_ml, test_reference_moles_24mg, test_actual_density_depends_on_p_t_z, test_standard_rectangle_depth_closes_reference_volume, test_standard_cone_ratios_and_anchor, test_full_cone_volume_equals_partial_at_top, test_cone_area_increases_fourfold_for_2x_width, test_height_mass_round_trip, test_mass_above_cone_rejected, test_reservoir_is_strictly_smaller_when_fraction_below_one, test_invalid_reservoir_fraction_rejected, test_height_predictor_is_bounded, test_mass_flow_includes_density_change, test_continuity_in_wider_area_reduces_velocity_for_fixed_flow ...

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_containment_geometry_r3.py

Pytest Module - test_Bangel_spreadsheets.py

SCOPE

23 named test functions: test_sheet_values_and_formula, test_incremental_recalculation, test_unit_mismatch_fails_closed, test_mul_requires_compound_unit, test_cycle_rejected, test_missing_input_rejected, test_stale_revision_rejected, test_merge_receipt_allows_explicit_stale_write, test_access_control, test_audit_preserves_overwrite_lineage, test_report_is_complete_and_non_authorizing, test_operational_intake_missing_fields_holds, test_operational_intake_capacity, test_operational_intake_memory_hold ...

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_Bangel_spreadsheets.py

Pytest Module - test_formulas.py

SCOPE

15 named test functions: test_formula_complete, test_front_end_exact, test_prediction_gain_positive_and_decreasing, test_smoothing, test_trend_rejects_nonpositive_dt, test_request_memory, test_preallocation, test_charge_delta, test_capacitor_energy, test_mass_residual, test_eve_screen, test_umbrella_count, test_investable_surplus_floor, test_eligible_value_floor ...

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_formulas.py

Pytest Module - test_identity.py

SCOPE

5 named test functions: test_project_identity, test_day0_declaration, test_passkey_is_new_project_first, test_word_compendium_metadata_and_literature_are_clean, test_word_compendium_qa_receipt

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_identity.py

Pytest Module - test_manifestations.py

SCOPE

3 named test functions: test_manifestation_required_fields, test_all_manifestations_inside_mj, test_manifestation_ids_unique

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_manifestations.py

Pytest Module - test_official_documentation_r6.py

SCOPE

11 named test functions: test_r6_ip_review_candidate_identity, test_official_documentation_manifest_r6_counts, test_official_documentation_entries_resolve_and_hash, test_potential_ip_batch_manifest_and_register, test_potential_ip_cross_reference_completeness, test_potential_ip_legal_boundary_is_prominent_and_non_approving, test_potential_ip_pdf_qa, test_pink_paper_source_coverage, test_pink_paper_entity_coverage, test_ethics_standard_is_nonwaivable, test_documentation_scope_is_final_included_but_not_signed

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_official_documentation_r6.py

Pytest Module - test_pearls.py

SCOPE

6 named test functions: test_simulation_geometry_math, test_pearl_is_never_physical_container, test_simulation_admission_and_transfer, test_simulation_overload_rejected, test_acoustic_profile_is_simulation_only, test_lifecycle_registry_is_nonphysical

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_pearls.py

Pytest Module - test_r2_integration.py

SCOPE

15 named test functions: test_r2_project_identity, test_new_products_registered, test_new_objects_registered, test_pearl_simulation_manifest_claims_ceiling, test_sister_is_only_physical_containment_canon, test_Bangel_spreadsheets_manifest_intake, test_jposmj_is_non_authority, test_symposium_registry_empty_and_nonvaluing, test_new_Bangel_sources, test_formula_register_r2, test_coverage_matrix_complete, test_schemas_and_examples_parse, test_authority_graph_object_rules, test_passkey_scope_includes_r2_and_holds ...

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_r2_integration.py

Pytest Module - test_r3_integration.py

SCOPE

9 named test functions: test_r3_identity, test_standard_geometry_manifest, test_reference_gas_profile, test_new_object_and_product_registered, test_formula_register_has_r3_formulas, test_whitepaper_and_coverage_count, test_pearl_anchor_is_top_of_cone_and_nonphysical, test_Bangel_source_has_r3_requirements, test_passkey_scope_holds_hydrogen_and_size

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_r3_integration.py

Pytest Module - test_r4_integration.py

SCOPE

8 named test functions: test_r4_identity_and_predecessor, test_reservoir_canon_claims_ceiling, test_formula_register_145, test_product_and_whitepaper_counts, test_new_paths_exist, test_no_same_cycle_feedback, test_perspective_friction_separation, test_main_manifest_binds_one_r4_canon

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_r4_integration.py

Pytest Module - test_r8_dro_pearl_lecanto.py

SCOPE

20 named test functions: test_scale_conflict_preserved_and_conservative, test_scale_envelope_validate, test_scale_classification_unknown, test_scale_classification_r1_and_r2, test_scale_outside_hold, test_spherical_reference_positive, test_photon_count_and_optical_gate, test_dro_receipt_digest_and_state, test_pearl_dro_node_is_nonphysical_and_capacity_bounded, test_start_energy_gate_requires_restart_reserve, test_start_energy_gate_holds_when_insufficient, test_species_unknown_remains_unknown, test_lecanto_source_digest, test_lecanto_residuals ...

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_r8_dro_pearl_lecanto.py

Pytest Module - test_repository_rules.py

SCOPE

7 named test functions: test_no_forbidden_names_or_ai_runtime_terms, test_no_public_remote, test_passkey_claims, test_preparatory_lineage_is_hash_only, test_no_secret_like_files, test_text_sources_have_no_disallowed_control_characters, test_content_manifest_excludes_runtime_cache_artifacts

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_repository_rules.py

Pytest Module - test_reservoir_modulation_r4.py

SCOPE

22 named test functions: test_backside_outlet_below_maximum, test_backside_outlet_rejects_invalid, test_reference_clearance, test_outward_gap_gate_wraps_angles, test_available_pressure_and_grade, test_reference_flow_zero_without_head, test_reference_flow_positive, test_velocity_froude_weber_wave_ratio, test_small_wave_gate, test_rotational_damping_and_step_cap, test_circular_port_and_reentry_components, test_reentry_angle_rejected, test_new_cycle_rule, test_inventory_balance_closes ...

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_reservoir_modulation_r4.py

Pytest Module - test_sister_containment.py

SCOPE

6 named test functions: test_r3_topology_is_canonical, test_physical_size_has_relational_standard_but_actual_values_require_evidence, test_unknown_capacity_holds, test_reference_count_requires_values_and_has_no_effect, test_standard_geometry_can_be_constructed_without_authority, test_pearl_legacy_count_alias_is_simulation_only

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_sister_containment.py

Pytest Module - test_solar_r7_final.py

SCOPE

10 named test functions: test_r7_identity, test_exact_solar_source, test_solar_profiles, test_counts, test_formula_supplement, test_solar_papers, test_solar_ip_20k, test_master_30k, test_official_manifest_final, test_safety_holds

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_solar_r7_final.py

Pytest Module - test_whitepapers.py

SCOPE

2 named test functions: test_whitepaper_exists_and_has_sections, test_whitepaper_counts

PRIMARY PURPOSE

This module verifies the named repository logic and expected boundaries using deterministic fixtures and assertions.

EVIDENCE CEILING

A passing module supports the reference implementation and manifest consistency only. It cannot substitute for physical measurements, regulatory review, patent analysis, or an MJ permit.

SOURCE

tests/test_whitepapers.py

Repository Verification Cluster - COVERAGE

RESULT

3 of 3 checks passed in the R8 repository verification receipt.

EXAMPLES

coverage.count=75; coverage.uncovered=0; coverage.paths=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - DOCS

RESULT

4 of 4 checks passed in the R8 repository verification receipt.

EXAMPLES

docs.approval=; docs.build=; docs.counts=; docs.entries_hash=[]

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - DRO

RESULT

7 of 7 checks passed in the R8 repository verification receipt.

EXAMPLES

dro.no_authority=; dro.input_conflict=; dro.founder_lower=; dro.alias_lower=; dro.conservative_threshold=; dro.upper=; dro.no_physical_existence=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - FORMULA

RESULT

3 of 3 checks passed in the R8 repository verification receipt.

EXAMPLES

formula.count=242; formula.sequential=; formula.twelve_planes=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - IDENTITY

RESULT

6 of 6 checks passed in the R8 repository verification receipt.

EXAMPLES

identity.build=MJ-PBMEF-DAY0-R8-DRO-PEARL-LECANTO-90K-FINAL;
identity.predecessor=MJ-PBMEF-DAY0-R7-SOLAR-30K-FINAL; identity.author=; identity.no_ai=;
identity.passkey_not_created=; identity.physical_validation_none=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - IGNITION

RESULT

2 of 2 checks passed in the R8 repository verification receipt.

EXAMPLES

ignition.reference_only=; ignition.no_physical_authority=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - IP

RESULT

7 of 7 checks passed in the R8 repository verification receipt.

EXAMPLES

ip.predecessor10k=; ip.solar20k=; ip.r8_60k_summary=; ip.r8_60k_stream={"count": 60000, "first": "PIP-30001", "last": "PIP-90000"}; ip.r8_segments={"CROSS_SYSTEM": 5000, "DRO_CORE": 15000, "DRO_IGNITION": 10000, "LECANTO": 10000, "PEARL_DRO": 10000, "SEMICONDUCTOR": 10000}; ip.no_rights_effect_sample=[]; ip.master90k=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - LECANTO

RESULT

2 of 2 checks passed in the R8 repository verification receipt.

EXAMPLES

lecanto.source_preserved=; lecanto.intent_hypothesis=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - OBJECTS

RESULT

16 of 16 checks passed in the R8 repository verification receipt.

EXAMPLES

objects.count=53; objects.no_authority=; objects.DRO_UNIT=; objects.DRO_OPTICAL_EVIDENCE_PROFILE=; objects.DRO_PEARL_HANDOFF_RECEIPT=; objects.LECANTO_INTENT_HYPOTHESIS=; objects.DRO_START_ENERGY_PACKET=; objects.LECANTO_IMAGE_EVIDENCE=; objects.SEMICONDUCTOR_PEARL_NODE=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - PDF

RESULT

104 of 104 checks passed in the R8 repository verification receipt.

EXAMPLES

pdf.exists.BATCH-000.pdf=; pdf.hash.BATCH-000.pdf=; pdf.pages.BATCH-000.pdf=; pdf.unencrypted.BATCH-000.pdf=; pdf.exists.BATCH-001.pdf=; pdf.hash.BATCH-001.pdf=; pdf.pages.BATCH-001.pdf=; pdf.unencrypted.BATCH-001.pdf=; pdf.exists.BATCH-002.pdf=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - PDFQA

RESULT

4 of 4 checks passed in the R8 repository verification receipt.

EXAMPLES

pdfqa.status=; pdfqa.count=26; pdfqa.blank=0; pdfqa.visual=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - PEARL

RESULT

1 of 1 checks passed in the R8 repository verification receipt.

EXAMPLES

pearl.nonphysical=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - PRODUCTS

RESULT

6 of 6 checks passed in the R8 repository verification receipt.

EXAMPLES

products.count=37; products.DRO-PEARL-HANDOFF-001=; products.DRO-IGNITION-REFERENCE-001=; products.DRO-COLLECTION-001=; products.JP-SC-DRO-PEARL-INTEGRATION-001=; products.LECANTO-IMAGE-TRUTH-001=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - PYTEST

RESULT

1 of 1 checks passed in the R8 repository verification receipt.

EXAMPLES

pytest.pass=373 passed in 14.59s

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - R8_FORMULA

RESULT

2 of 2 checks passed in the R8 repository verification receipt.

EXAMPLES

r8_formula.count=49; r8_formula.ids=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - SCENARIO

RESULT

4 of 4 checks passed in the R8 repository verification receipt.

EXAMPLES

scenario.count=; scenario.all_pass=; scenario.categories=; scenario.no_physical=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - SCOPE

RESULT

14 of 14 checks passed in the R8 repository verification receipt.

EXAMPLES

scope.no_physical_validation_claim=; scope.no_physical_operation_authority=; scope.no_ai_system_integration=; scope.no_physical-coordinate_approval=; scope.no_physical_hydrogen_use_authority=; scope.no_vessel_operation_authority=; scope.no_rocket_or_spacecraft_launch_or_flight_authority=; scope.no_propulsion_construction_or_energetic-material_selection_authority=; scope.no_weaponization=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - SECURITY

RESULT

3 of 3 checks passed in the R8 repository verification receipt.

EXAMPLES

security.private_material_absent=[]; security.public_remote_absent=; security.symmlinks_absent=[]

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Repository Verification Cluster - SEMICONDUCTOR

RESULT

1 of 1 checks passed in the R8 repository verification receipt.

EXAMPLES

semiconductor.physical_hold=

INTERPRETATION

These checks establish consistency of the tracked repository and declared claims ceiling. They do not create authority or validate untested physical mechanisms.

RECEIPT

validation/REPOSITORY-VERIFICATION-R8.json

Testing Pink Paper Closing Receipt

DOCUMENT STATUS

48-page internal reference; final included pending local founder signature.

KNOWN COUNTS

373 R8 pytest passes; 8192 scenario passes; 201 repository checks; 0 recorded failures in those current scopes.

CLAIMS CEILING

No physical validation, operational authority, certification, legal conclusion, IP approval, or production deployment.

AUTHOR AND ENTITY

Michael Patrick Bangel (Michael Bangel), founder-declared author, inventor, and architect; CEO of MJ Physics Engineering , Clearwater, Florida, USA. Company status is founder-supplied and not independently verified by this build.

MJ-PBMEF Pink Paper - Volume II

Formula Gateway Bindings F-001 through F-050

Michael Bangel - Author and Architect

August 2026

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Document control	
Project	MJos Predictive Model
Project ID	MJ-PBMEF-001
Source build	MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE
Document ID	MJ-PBMEF-PINK-PAPER-001/VOL-II
Author and architect	Michael Bangel
Status	FOUNDER_REVIEW_CANDIDATE_PENDING_FREEZE
Scope	Formula-level gateway bindings for F-001 through F-050.

Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Verification method

Each formula receives the same twenty-construct Bangel identity, a gateway-stage assignment, a life-cycle example, and explicit evidence and ethics boundaries. The repetitive structure is intentional: it allows formula-by-formula founder review and later automated completeness checking.

F-001 - R1 transition

Exact expression

R0 -> R1

Meaning. R1 is the unidentified transitionary phase.
Bound manifestations. Bangel , JP, JO
Gateway stage. R0/R1/R2 state transition and evidence classification

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_001
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO
Declaration	formula F-001 'R1 transition'
Definition	R1 is the unidentified transitionary phase.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JP, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R0/R1/R2 state transition and evidence classification
Expression	R0 -> R1
Statement	When typed inputs and evidence gates pass, evaluate F-001; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: state; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-001', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-001); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-001 and applicable family/product/representation white papers
Type	state
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R0/R1/R2 state transition and evidence classification'; physical_validation=false; authority=false

2.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_001 : Formula<state>
  definition "R1 is the unidentified transitionary phase."
  expression `R0 -> R1`
  participants ["Bangel ", "JP", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

2.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-001 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-002 - R2 transition

Exact expression

R1 --validated--> R2

Meaning. R2 is the immutable living static representation.

Bound manifestations. JP, MK, J0

Gateway stage. R0/R1/R2 state transition and evidence classification

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_002
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJ0
Declaration	formula F-002 'R2 transition'
Definition	R2 is the immutable living static representation.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	JP, MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	R0/R1/R2 state transition and evidence classification
Expression	R1 --validated--> R2
Statement	When typed inputs and evidence gates pass, evaluate F-002; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: state; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-002', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-002); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-002 and applicable family/product/representation white papers
Type	state
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R0/R1/R2 state transition and evidence classification'; physical_validation=false; authority=false

3.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_002 : Formula<state>
  definition "R2 is the immutable living static representation."
  expression `R1 --validated--> R2`
  participants ["JP", "MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

3.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-002 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-003 - Unknown invariant

Exact expression

UNKNOWN != 0

Meaning. Unknown may not coerce to zero, pass, harmlessness, or permission.

Bound manifestations. Bangel , JO, WATER

Gateway stage. R0/R1/R2 state transition and evidence classification

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_003
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JO, MJ.PBMEF.Family.WATER
Declaration	formula F-003 'Unknown invariant'
Definition	Unknown may not coerce to zero, pass, harmlessness, or permission.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JO, WATER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R0/R1/R2 state transition and evidence classification
Expression	UNKNOWN != 0
Statement	When typed inputs and evidence gates pass, evaluate F-003; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-003', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-003); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-003 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R0/R1/R2 state transition and evidence classification'; physical_validation=false; authority=false

4.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_003 : Formula<logical>
  definition "Unknown may not coerce to zero, pass, harmlessness, or permission."
  expression `UNKNOWN != 0`
  participants ["Bangel ", "JO", "WATER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

4.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-003 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-004 - Mass inflection

Exact expression

m_floor = 23 mg

Meaning. Pre-observational model floor, not a universal minimum or product mass.

Bound manifestations. JP, MK, EVE, J0

Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_004
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.J0
Declaration	formula F-004 'Mass inflection'
Definition	Pre-observational model floor, not a universal minimum or product mass.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, EVE, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	m_floor = 23 mg
Statement	When typed inputs and evidence gates pass, evaluate F-004; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-004', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-004); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	23
Reference	pathways/FORMULA-REGISTER.json#F-004 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

5.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_004 : Formula<mass>
  definition "Pre-observational model floor, not a universal minimum or product mass."
  expression `m_floor = 23 mg`
  participants ["JP", "MK", "EVE", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


5.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-004 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-005 - Noise smoothing

Exact expression

$$n_bar[t] = 0.9*n_bar[t-1] + 0.1*n[t]$$

Meaning. Drip-level smoothing.

Bound manifestations. SISTER, JO, MK

Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_005
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MK
Declaration	formula F-005 'Noise smoothing'
Definition	Drip-level smoothing.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, JO, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	$n_bar[t] = 0.9*n_bar[t-1] + 0.1*n[t]$
Statement	When typed inputs and evidence gates pass, evaluate F-005; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-005', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-005); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.9, 1, 0.1
Reference	pathways/FORMULA-REGISTER.json#F-005 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

6.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_005 : Formula<dimensionless>
  definition "Drip-level smoothing."
  expression `n_bar[t] = 0.9*n_bar[t-1] + 0.1*n[t]`
  participants ["SISTER", "JO", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

6.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-005 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-006 - Trend estimator

Exact expression

$$n_dot[t] = (2/3)*n_dot[t-1] + (1/3)*(n_bar[t]-n_bar[t-1])/dt$$

Meaning. One-third trend update.
Bound manifestations. SISTER, J0, MK
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_006
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.MK
Declaration	formula F-006 'Trend estimator'
Definition	One-third trend update.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, J0, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	R1 prediction and normal-constellation calibration before N1
Expression	$n_dot[t] = (2/3)*n_dot[t-1] + (1/3)*(n_bar[t]-n_bar[t-1])/dt$
Statement	When typed inputs and evidence gates pass, evaluate F-006; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: 1/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-006', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-006); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-006 and applicable family/product/representation white papers
Type	1/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

7.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_006 : Formula<1/time>
  definition "One-third trend update."
  expression `n_dot[t] = (2/3)*n_dot[t-1] + (1/3)*(n_bar[t]-n_bar[t-1])/dt`
  participants ["SISTER", "J0", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

7.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-006 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-007 - Anti-spike gate

Exact expression

support>=3 of 5 AND 3 qualified windows

Meaning. Single spike cannot trigger full reweighting.
Bound manifestations. SISTER, ANGELS, JO
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_007
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.JO
Declaration	formula F-007 'Anti-spike gate'
Definition	Single spike cannot trigger full reweighting.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	SISTER, ANGELS, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	support>=3 of 5 AND 3 qualified windows
Statement	When typed inputs and evidence gates pass, evaluate F-007; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-007', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-007); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	3, 5
Reference	pathways/FORMULA-REGISTER.json#F-007 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

8.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_007 : Formula<logical>
  definition "Single spike cannot trigger full reweighting."
  expression `support>=3 of 5 AND 3 qualified windows`
  participants ["SISTER", "ANGELS", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

8.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-007 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-008 - Prediction gain

Exact expression

$$g_i = 0.1*(2/3)^{(i-1)}$$

Meaning. Prediction influence decays across the nine-node path.
Bound manifestations. JP, SISTER, JO
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_008
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilySISTER, MJ.PBMEF.FamilyJO
Declaration	formula F-008 'Prediction gain'
Definition	Prediction influence decays across the nine-node path.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, SISTER, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	$g_i = 0.1*(2/3)^{(i-1)}$
Statement	When typed inputs and evidence gates pass, evaluate F-008; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-008', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-008); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.1, 2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-008 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

9.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_008 : Formula<dimensionless>
  definition "Prediction influence decays across the nine-node path."
  expression `g_i = 0.1*(2/3)^(i-1)`
  participants ["JP", "SISTER", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


9.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-008 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-009 - Covariance update

Exact expression

Sigma_next = 0.9*Sigma_prev + 0.1*e*e^T

Meaning. Positive-semidefinite sequential covariance.

Bound manifestations. JP, MK, J0

Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_009
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-009 'Covariance update'
Definition	Positive-semidefinite sequential covariance.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	R1 prediction and normal-constellation calibration before N1
Expression	Sigma_next = 0.9*Sigma_prev + 0.1*e*e^T
Statement	When typed inputs and evidence gates pass, evaluate F-009; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: normalized^2; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-009', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-009); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	0.9, 0.1
Reference	pathways/FORMULA-REGISTER.json#F-009 and applicable family/product/representation white papers
Type	normalized^2
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

10.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_009 : Formula<normalized^2>
  definition "Positive-semidefinite sequential covariance."
  expression `Sigma_next = 0.9*Sigma_prev + 0.1*e*e^T`
  participants ["JP", "MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

10.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-009 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-010 - Shadow depth

Exact expression

H = sqrt(lambda_max(Sigma))

Meaning. Uncertainty depth.
Bound manifestations. MK, SISTER, EVE
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_010
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE
Declaration	formula F-010 'Shadow depth'
Definition	Uncertainty depth.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, SISTER, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	H = sqrt(lambda_max(Sigma))
Statement	When typed inputs and evidence gates pass, evaluate F-010; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: normalized; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-010', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-010); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-010 and applicable family/product/representation white papers
Type	normalized
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

11.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_010 : Formula<normalized>
  definition "Uncertainty depth."
  expression `H = sqrt(lambda_max(Sigma))`
  participants ["MK", "SISTER", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

11.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-010 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-011 - Shadow growth rate

Exact expression

$$v_shadow = (H_next - H_prev) / dt$$

Meaning. Rate of uncertainty expansion or resolution.
Bound manifestations. MK, SISTER, JO
Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_011
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.JO
Declaration	formula F-011 'Shadow growth rate'
Definition	Rate of uncertainty expansion or resolution.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, SISTER, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	$v_shadow = (H_next - H_prev) / dt$
Statement	When typed inputs and evidence gates pass, evaluate F-011; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: normalized/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-011', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-011); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-011 and applicable family/product/representation white papers
Type	normalized/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

12.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_011 : Formula<normalized/time>
  definition "Rate of uncertainty expansion or resolution."
  expression `v_shadow = (H_next-H_prev)/dt`
  participants ["MK", "SISTER", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

12.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-011 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-012 - Front-end allocation

Exact expression

a0 = 48383829/100000000

Meaning. Exact initial N1 logical allocation.

Bound manifestations. Bangel , JP, JO, M3

Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_012
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3
Declaration	formula F-012 'Front-end allocation'
Definition	Exact initial N1 logical allocation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	Bangel , JP, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	a0 = 48383829/100000000
Statement	When typed inputs and evidence gates pass, evaluate F-012; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-012', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-012); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	48383829, 100000000
Reference	pathways/FORMULA-REGISTER.json#F-012 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

13.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_012 : Formula<ratio>
  definition "Exact initial N1 logical allocation."
  expression `a0 = 48383829/100000000`
  participants ["Bangel ", "JP", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


13.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-012 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-013 - Front-end reserve

Exact expression

r0 = 51616171/100000000

Meaning. Exact logical reserve.
Bound manifestations. JP, JO, M3
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_013
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3
Declaration	formula F-013 'Front-end reserve'
Definition	Exact logical reserve.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	r0 = 51616171/100000000
Statement	When typed inputs and evidence gates pass, evaluate F-013; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-013', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-013); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	51616171, 100000000
Reference	pathways/FORMULA-REGISTER.json#F-013 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

14.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_013 : Formula<ratio>
  definition "Exact logical reserve."
  expression `r0 = 51616171/100000000`
  participants ["JP", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

14.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-013 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-014 - Bounded allocation update

Exact expression

w_next = projection((2/3)w + (1/3)w_target)

Meaning. Nonnegative, sum-to-one, per-step change ≤ 0.1 .
Bound manifestations. JP, JO, M3
Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_014
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3
Declaration	formula F-014 'Bounded allocation update'
Definition	Nonnegative, sum-to-one, per-step change ≤ 0.1 .
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	w_next = projection((2/3)w + (1/3)w_target)
Statement	When typed inputs and evidence gates pass, evaluate F-014; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-014', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-014); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-014 and applicable family/product/representation white papers
Type	ratio vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

15.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_014 : Formula<ratio vector>
  definition "Nonnegative, sum-to-one, per-step change  $\leq 0.1$ ."
  expression `w_next = projection((2/3)w + (1/3)w_target)`
  participants ["JP", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

15.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-014 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-015 - Request memory

Exact expression

M_request = lambda_hat * bytes_per_request * latency_hat

Meaning. Predicted request memory.
Bound manifestations. J0, M3, MJOS
Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_015
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3, MJ.PBMEF.FamilyMJOS
Declaration	formula F-015 'Request memory'
Definition	Predicted request memory.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MJOS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	M_request = lambda_hat * bytes_per_request * latency_hat
Statement	When typed inputs and evidence gates pass, evaluate F-015; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: bytes; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-015', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-015); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-015 and applicable family/product/representation white papers
Type	bytes
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

16.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_015 : Formula<bytes>
  definition "Predicted request memory."
  expression `M_request = lambda_hat * bytes_per_request * latency_hat`
  participants ["J0", "M3", "MJOS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

16.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-015 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-016 - Memory preallocation

Exact expression

M_pre = M_request + M_sync + M_residual + M_evidence + M_headroom

Meaning. Preallocate before reserve exhaustion.
Bound manifestations. J0, M3, SISTER
Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_016
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.SISTER
Declaration	formula F-016 'Memory preallocation'
Definition	Preallocate before reserve exhaustion.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	J0, M3, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	M_pre = M_request + M_sync + M_residual + M_evidence + M_headroom
Statement	When typed inputs and evidence gates pass, evaluate F-016; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: bytes; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-016', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-016); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-016 and applicable family/product/representation white papers
Type	bytes
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

17.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_016 : Formula<bytes>
  definition "Preallocate before reserve exhaustion."
  expression `M_pre = M_request + M_sync + M_residual + M_evidence + M_headroom`
  participants ["J0", "M3", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


17.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-016 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-017 - Hard flush

Exact expression

QUIESCE -> SEAL -> CHECKPOINT -> DETACH -> RECLAIM

Meaning. No silent deletion or uncleared reuse.
Bound manifestations. J0, M3, MJOS
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.foundation.state_noise_allocation_memory
Namespace	MJ.PBMEF.foundation.state_noise_allocation_memory.F_017
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3, MJ.PBMEF.FamilyMJOS
Declaration	formula F-017 'Hard flush'
Definition	No silent deletion or uncleared reuse.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MJOS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	QUIESCE -> SEAL -> CHECKPOINT -> DETACH -> RECLAIM
Statement	When typed inputs and evidence gates pass, evaluate F-017; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: state sequence; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-017', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-017); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-017 and applicable family/product/representation white papers
Type	state sequence
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

18.1 Gateway life-cycle example

```
module MJ.PBMEF.foundation.state_noise_allocation_memory {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_017 : Formula<state sequence>
  definition "No silent deletion or uncleared reuse."
  expression `QUIESCE -> SEAL -> CHECKPOINT -> DETACH -> RECLAIM`
  participants ["J0", "M3", "MJOS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

18.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-017 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-018 - Charge balance

Exact expression

$$dQ/dt = I_intake - I_leak - I_release$$

Meaning. Static-intake charge accounting.
Bound manifestations. JP, MK, EVE, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_018
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyEVE, MJ.PBMEF.FamilyJO
Declaration	formula F-018 'Charge balance'
Definition	Static-intake charge accounting
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$dQ/dt = I_intake - I_leak - I_release$
Statement	When typed inputs and evidence gates pass, evaluate F-018; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: charge/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-018', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-018); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-018 and applicable family/product/representation white papers
Type	charge/time
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

19.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_018 : Formula<charge/time>
  definition "Static-intake charge accounting."
  expression `dQ/dt = I_intake - I_leak - I_release`
  participants ["JP", "MK", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

19.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-018 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-019 - Capacitor energy

Exact expression

E = 0.5*C*V^2

Meaning. Valid only for evidenced constant capacitance.

Bound manifestations. JP, MK, JO

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_019
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJO
Declaration	formula F-019 'Capacitor energy'
Definition	Valid only for evidenced constant capacitance.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	E = 0.5*C*V^2
Statement	When typed inputs and evidence gates pass, evaluate F-019; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-019', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-019); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.5, 2
Reference	pathways/FORMULA-REGISTER.json#F-019 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

20.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_019 : Formula<energy>
  definition "Valid only for evidenced constant capacitance."
  expression `E = 0.5*C*V^2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

20.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-019 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-020 - General stored energy

Exact expression

E = integral V(q)dq

Meaning. General charge-storage energy.
Bound manifestations. JP, MK
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_020
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK
Declaration	formula F-020 'General stored energy'
Definition	General charge-storage energy.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	E = integral V(q)dq
Statement	When typed inputs and evidence gates pass, evaluate F-020; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-020', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-020); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-020 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

21.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_020 : Formula<energy>
  definition "General charge-storage energy."
  expression `E = integral V(q)dq`
  participants ["JP", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


21.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-020 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-021 - Energy balance

Exact expression

$$r_E = E_in - \Delta E_storage - E_delivered - E_containment - E_loss$$

Meaning. Energy residual must be inside uncertainty.
Bound manifestations. MK, JO, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_021
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-021 'Energy balance'
Definition	Energy residual must be inside uncertainty.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$r_E = E_in - \Delta E_storage - E_delivered - E_containment - E_loss$
Statement	When typed inputs and evidence gates pass, evaluate F-021; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-021', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-021); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-021 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

22.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_021 : Formula<energy>
  definition "Energy residual must be inside uncertainty."
  expression `r_E = E_in - DeltaE_storage - E_delivered - E_containment - E_loss`
  participants ["MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

22.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-021 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-022 - Mass balance

Exact expression

$$r_M = M_{\text{initial}} + M_{\text{inputs}} - M_{\text{final}} - M_{\text{outputs}}$$

Meaning. Physical mass conservation.
Bound manifestations. MK, EVE, JO, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_022
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-022 'Mass balance'
Definition	Physical mass conservation.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$r_M = M_{\text{initial}} + M_{\text{inputs}} - M_{\text{final}} - M_{\text{outputs}}$
Statement	When typed inputs and evidence gates pass, evaluate F-022; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-022', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-022); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-022 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

23.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_022 : Formula<mass>
  definition "Physical mass conservation."
  expression `r_M = M_initial + M_inputs - M_final - M_outputs`
  participants ["MK", "EVE", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

23.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-022 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-023 - EVE screen balance

Exact expression

M_screen_in = M_captured + M_passed + M_retained + r_screen

Meaning. Screen capture never assumes perfect retention.

Bound manifestations. EVE, MK, JO, MERMAID

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_023
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-023 'EVE screen balance'
Definition	Screen capture never assumes perfect retention.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	EVE, MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	M_screen_in = M_captured + M_passed + M_retained + r_screen
Statement	When typed inputs and evidence gates pass, evaluate F-023; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-023', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-023); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-023 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

24.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_023 : Formula<mass>
  definition "Screen capture never assumes perfect retention."
  expression `M_screen_in = M_captured + M_passed + M_retained + r_screen`
  participants ["EVE", "MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

24.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-023 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-024 - EVE evaporation

Exact expression

M_evap = integral integral J_m dA dt

Meaning. Evaporative mass from flux across area and time.
Bound manifestations. EVE, MK, J0
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_024
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-024 'EVE evaporation'
Definition	Evaporative mass from flux across area and time.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	EVE, MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	M_evap = integral integral J_m dA dt
Statement	When typed inputs and evidence gates pass, evaluate F-024; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-024', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-024); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-024 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

25.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_024 : Formula<mass>
  definition "Evaporative mass from flux across area and time."
  expression `M_evap = integral integral J_m dA dt`
  participants ["EVE", "MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


25.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-024 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-025 - Upward force

Exact expression

$$F_z = qE_z + F_b - mg - D_z - F_{\text{contact}} - F_{\text{adhesion}}$$

Meaning. Upward motion requires positive conservative lower bound.
Bound manifestations. MK, EVE, BELLE
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_025
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.BELLE
Declaration	formula F-025 'Upward force'
Definition	Upward motion requires positive conservative lower bound.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, BELLE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$F_z = qE_z + F_b - mg - D_z - F_{\text{contact}} - F_{\text{adhesion}}$
Statement	When typed inputs and evidence gates pass, evaluate F-025; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: force; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-025', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-025); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-025 and applicable family/product/representation white papers
Type	force
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

26.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_025 : Formula<force>
  definition "Upward motion requires positive conservative lower bound."
  expression `F_z = qE_z + F_b - mg - D_z - F_contact - F_adhesion`
  participants ["MK", "EVE", "BELLE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

26.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-025 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-026 - Coordinate mapping

Exact expression

$$p_P(x,y,z)=o_P+x*a_P+y*b_P+z*c_P$$

Meaning. Normalized topology to profile physical coordinates.
Bound manifestations. JP, MK, BELLE, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_026
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,BELLE, MJ.PBMEF.Family,JO
Declaration	formula F-026 'Coordinate mapping'
Definition	Normalized topology to profile physical coordinates.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, BELLE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$p_P(x,y,z)=o_P+x*a_P+y*b_P+z*c_P$
Statement	When typed inputs and evidence gates pass, evaluate F-026; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-026', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-026); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-026 and applicable family/product/representation white papers
Type	length vector
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

27.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_026 : Formula<length vector>
  definition "Normalized topology to profile physical coordinates."
  expression `p_P(x,y,z)=o_P+x*a_P+y*b_P+z*c_P`
  participants ["JP", "MK", "BELLE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

27.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-026 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-027 - Sister physical umbrella count

Exact expression

$$N_U = \max_k \text{ceil}(E_k / ((1-h_k) * C_{Uk}))$$

Meaning. Canonical pre-Pearl physical containment count; requires measured profile-specific capacity and headroom.

Bound manifestations. SISTER, MK, JO, M3

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_027
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3
Declaration	formula F-027 'Sister physical umbrella count'
Definition	Canonical pre-Pearl physical containment count; requires measured profile-specific capacity and headroom.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, MK, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$N_U = \max_k \text{ceil}(E_k / ((1-h_k) * C_{Uk}))$
Statement	When typed inputs and evidence gates pass, evaluate F-027; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-027', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-027); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-027 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

28.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_027 : Formula<count>
  definition "Canonical pre-Pearl physical containment count; requires measured
  ↪ profile-specific capacity and headroom."
  expression `N_U = max_k ceil(E_k/((1-h_k)*C_Uk))`
  participants ["SISTER", "MK", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

28.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-027 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-028 - Byte balance

Exact expression

r_B = B_alloc-B_active-B_released-B_retained-B_exported-B_compacted

Meaning. Discrete memory reconciliation requires zero residual unless transformed.

Bound manifestations. J0, M3, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_028
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MERMAID
Declaration	formula F-028 'Byte balance'
Definition	Discrete memory reconciliation requires zero residual unless transformed.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	r_B = B_alloc-B_active-B_released-B_retained-B_exported-B_compacted
Statement	When typed inputs and evidence gates pass, evaluate F-028; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: bytes; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-028', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-028); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-028 and applicable family/product/representation white papers
Type	bytes
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

29.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_028 : Formula<bytes>
  definition "Discrete memory reconciliation requires zero residual unless transformed."
  expression `r_B = B_alloc-B_active-B_released-B_retained-B_exported-B_compacted`
  participants ["J0", "M3", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


29.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-028 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-029 - Residual consequence

Exact expression

C_B = integral B_residual(t)dt

Meaning. Time-weighted residual memory consequence.

Bound manifestations. J0, M3, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.physics.balance_containment_evidence
Namespace	MJ.PBMEF.physics.balance_containment_evidence.F_029
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3, MJ.PBMEF.FamilyMERMAID
Declaration	formula F-029 'Residual consequence'
Definition	Time-weighted residual memory consequence.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	C_B = integral B_residual(t)dt
Statement	When typed inputs and evidence gates pass, evaluate F-029; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: byte-seconds; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-029', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-029); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-029 and applicable family/product/representation white papers
Type	byte-seconds
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

30.1 Gateway life-cycle example

```
module MJ.PBMEF.physics.balance_containment_evidence {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_029 : Formula<byte-seconds>
  definition "Time-weighted residual memory consequence."
  expression `C_B = integral B_residual(t)dt`
  participants ["J0", "M3", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

30.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-029 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-030 - Protected liquidity

Exact expression

L_protected_H = 0_near_H+R_emergency_H+R_tax_H+R_fees_H+U_cash_H

Meaning. Liquidity first.
Bound manifestations. SHIVA, MERMAID, MK, JO
Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_030
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-030 'Protected liquidity'
Definition	Liquidity first.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	L_protected_H = 0_near_H+R_emergency_H+R_tax_H+R_fees_H+U_cash_H
Statement	When typed inputs and evidence gates pass, evaluate F-030; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-030', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-030); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-030 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

31.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_030 : Formula<currency>
  definition "Liquidity first."
  expression `L_protected_H = 0_near_H+R_emergency_H+R_tax_H+R_fees_H+U_cash_H`
  participants ["SHIVA", "MERMAID", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

31.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-030 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-031 - Investable surplus

Exact expression

S_investable_L = max(0,L_available_L-L_protected_H)

Meaning. Only surplus may enter risk analysis.
Bound manifestations. SHIVA, MERMAID, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_031
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-031 'Investable surplus'
Definition	Only surplus may enter risk analysis.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	S_investable_L = max(0,L_available_L-L_protected_H)
Statement	When typed inputs and evidence gates pass, evaluate F-031; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-031', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-031); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-031 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

32.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_031 : Formula<currency>
  definition "Only surplus may enter risk analysis."
  expression `S_investable_L = max(0,L_available_L-L_protected_H)`
  participants ["SHIVA", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

32.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-031 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-032 - Risk-capital ceiling

Exact expression

A_risk_max = min(S_investable_L,L_risk,L_product,L_regulatory,L_custody,L_concentration)

Meaning. Hard minimum across constraints.
Bound manifestations. SHIVA, MERMAID, MK, MJ
Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_032
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.MJ
Declaration	formula F-032 'Risk-capital ceiling'
Definition	Hard minimum across constraints.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, MK, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	A_risk_max = min(S_investable_L,L_risk,L_product,L_regulatory,L_custody,L_concentration)
Statement	When typed inputs and evidence gates pass, evaluate F-032; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-032', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-032); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-032 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

33.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_032 : Formula<currency>
  definition "Hard minimum across constraints."
  expression `A_risk_max =
↵ min(S_investable_L,L_risk,L_product,L_regulatory,L_custody,L_concentration)`
  participants ["SHIVA", "MERMAID", "MK", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


33.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-032 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-033 - Portfolio concentration

Exact expression

C_i = abs(V_i_H)/V_portfolio_L

Meaning. Asset concentration.
Bound manifestations. SHIVA, MERMAID, JO
Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_033
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-033 'Portfolio concentration'
Definition	Asset concentration.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	C_i = abs(V_i_H)/V_portfolio_L
Statement	When typed inputs and evidence gates pass, evaluate F-033; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-033', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-033); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-033 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

34.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_033 : Formula<ratio>
  definition "Asset concentration."
  expression `C_i = abs(V_i_H)/V_portfolio_L`
  participants ["SHIVA", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

34.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-033 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-034 - Portfolio variance

Exact expression

$$\text{sigma_p}^2 = \text{w}^T \text{Sigma w}$$

Meaning. Portfolio variance with evidenced covariance.

Bound manifestations. SHIVA, MERMAID, MK

Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_034
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MK
Declaration	formula F-034 'Portfolio variance'
Definition	Portfolio variance with evidenced covariance.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	$\text{sigma_p}^2 = \text{w}^T \text{Sigma w}$
Statement	When typed inputs and evidence gates pass, evaluate F-034; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: return^2; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-034', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-034); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-034 and applicable family/product/representation white papers
Type	return^2
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

35.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_034 : Formula<return^2>
  definition "Portfolio variance with evidenced covariance."
  expression `sigma_p^2 = w^T Sigma w`
  participants ["SHIVA", "MERMAID", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

35.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-034 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-035 - Capital friction

Exact expression

F_capital_H = fees+spread+slippage+tax+custody+compliance+latency

Meaning. Typed transactional friction.
Bound manifestations. MK, SHIVA, MERMAID
Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_035
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID
Declaration	formula F-035 'Capital friction'
Definition	Typed transactional friction.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, SHIVA, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	F_capital_H = fees+spread+slippage+tax+custody+compliance+latency
Statement	When typed inputs and evidence gates pass, evaluate F-035; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-035', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-035); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-035 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

36.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_035 : Formula<currency>
  definition "Typed transactional friction."
  expression `F_capital_H = fees+spread+slippage+tax+custody+compliance+latency`
  participants ["MK", "SHIVA", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

36.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-035 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-036 - Opportunity lower bound

Exact expression

O_L = Return_L-F_capital_H-RiskPenalty_H-LiquidityPenalty_H-RegulatoryUncertainty_H

Meaning. Conservative opportunity result.
Bound manifestations. SHIVA, MK, MERMAID, MJ
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_036
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MJ
Declaration	formula F-036 'Opportunity lower bound'
Definition	Conservative opportunity result.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MK, MERMAID, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	O_L = Return_L-F_capital_H-RiskPenalty_H-LiquidityPenalty_H-RegulatoryUncertainty_H
Statement	When typed inputs and evidence gates pass, evaluate F-036; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-036', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-036); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-036 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

37.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_036 : Formula<currency>
  definition "Conservative opportunity result."
  expression `O_L =
↵ Return_L-F_capital_H-RiskPenalty_H-LiquidityPenalty_H-RegulatoryUncertainty_H`
  participants ["SHIVA", "MK", "MERMAID", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


37.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-036 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-037 - Abundance objective

Exact expression

A = sum(alpha_i*P_i)-sum(beta_j*N_j)

Meaning. Only valid with precommitted weights and compatible scales.

Bound manifestations. SHIVA, MK, JO, MJ

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_037
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MJ
Declaration	formula F-037 'Abundance objective'
Definition	Only valid with precommitted weights and compatible scales.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MK, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	A = sum(alpha_i*P_i)-sum(beta_j*N_j)
Statement	When typed inputs and evidence gates pass, evaluate F-037; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: declared score; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-037', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-037); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-037 and applicable family/product/representation white papers
Type	declared score
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

38.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_037 : Formula<declared score>
  definition "Only valid with precommitted weights and compatible scales."
  expression `A = sum(alpha_i*P_i)-sum(beta_j*N_j)`
  participants ["SHIVA", "MK", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

38.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-037 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-038 - SHIVAS eligible value

Exact expression

V_eligible_L=max(0,V_verified_L-L_known_H-U_valuation_H)

Meaning. Internal valuation lower bound.
Bound manifestations. SHIVA, MERMAID, JO
Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_038
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-038 'SHIVAS eligible value'
Definition	Internal valuation lower bound.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	V_eligible_L=max(0,V_verified_L-L_known_H-U_valuation_H)
Statement	When typed inputs and evidence gates pass, evaluate F-038; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: currency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-038', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-038); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-038 and applicable family/product/representation white papers
Type	currency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

39.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_038 : Formula<currency>
  definition "Internal valuation lower bound."
  expression `V_eligible_L=max(0,V_verified_L-L_known_H-U_valuation_H)`
  participants ["SHIVA", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

39.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-038 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-039 - SHIVAS ceiling

Exact expression

N_max=floor(V_eligible_L/B_unit_H)

Meaning. Only when backing, rights, classification, and evidence are known.
Bound manifestations. SHIVA, MERMAID, MJ
Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_039
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.MJ
Declaration	formula F-039 'SHIVAS ceiling'
Definition	Only when backing, rights, classification, and evidence are known.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SHIVA, MERMAID, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	N_max=floor(V_eligible_L/B_unit_H)
Statement	When typed inputs and evidence gates pass, evaluate F-039; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-039', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-039); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-039 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

40.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_039 : Formula<count>
  definition "Only when backing, rights, classification, and evidence are known."
  expression `N_max=floor(V_eligible_L/B_unit_H)`
  participants ["SHIVA", "MERMAID", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

40.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-039 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-040 - MK state model

Exact expression

$$x[t+1]=F(x[t],u[t],\theta,e[t])+w[t];\; y[t]=H(x[t])+v[t]$$

Meaning. General physics state and observation representation.
Bound manifestations. MK, JP, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_040
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO
Declaration	formula F-040 'MK state model'
Definition	General physics state and observation representation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JP, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$x[t+1]=F(x[t],u[t],\theta,e[t])+w[t];\; y[t]=H(x[t])+v[t]$
Statement	When typed inputs and evidence gates pass, evaluate F-040; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: typed state; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-040', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-040); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-040 and applicable family/product/representation white papers
Type	typed state
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

41.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_040 : Formula<typed state>
  definition "General physics state and observation representation."
  expression `x[t+1]=F(x[t],u[t],theta,e[t])+w[t]; y[t]=H(x[t])+v[t]`
  participants ["MK", "JP", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


41.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-040 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-041 - Dimensional integrity

Exact expression

dim(LHS)=dim(RHS)

Meaning. Every physical equality must be dimensionally valid.

Bound manifestations. MK, JO

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_041
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-041 'Dimensional integrity'
Definition	Every physical equality must be dimensionally valid.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	dim(LHS)=dim(RHS)
Statement	When typed inputs and evidence gates pass, evaluate F-041; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimension equality; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-041', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-041); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-041 and applicable family/product/representation white papers
Type	dimension equality
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

42.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_041 : Formula<dimension equality>
  definition "Every physical equality must be dimensionally valid."
  expression `dim(LHS)=dim(RHS)`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

42.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-041 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-042 - Conservation residual

Exact expression

r_q=q_in-q_out-Deltaq-q_loss

Meaning. Pass only when $|r_q| \leq U_q$.
Bound manifestations. MK, JO, EVE, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.finance.portfolio_mk_integrity
Namespace	MJ.PBMEF.finance.portfolio_mk_integrity.F_042
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID
Declaration	formula F-042 'Conservation residual'
Definition	Pass only when $ r_q \leq U_q$.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, EVE, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$r_q = q_{in} - q_{out} - \Delta q - q_{loss}$
Statement	When typed inputs and evidence gates pass, evaluate F-042; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: quantity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-042', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-042); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-042 and applicable family/product/representation white papers
Type	quantity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

43.1 Gateway life-cycle example

```
module MJ.PBMEF.finance.portfolio_mk_integrity {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_042 : Formula<quantity>
  definition "Pass only when  $|r_q| \leq U_q$ ."
  expression `r_q=q_in-q_out-Deltaq-q_loss`
  participants ["MK", "JO", "EVE", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

43.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-042 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-043 - Pearl simulation ellipsoid volume

Exact expression

$$V_P=(4/3)*\pi*a*b*c$$

Meaning. Hypothetical pearl-shaped simulation geometry; no physical container or dimension claim.

Bound manifestations. MK, SISTER, EVE, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_043
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-043 'Pearl simulation ellipsoid volume'
Definition	Hypothetical pearl-shaped simulation geometry; no physical container or dimension claim.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, SISTER, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$V_P=(4/3)*\pi*a*b*c$
Statement	When typed inputs and evidence gates pass, evaluate F-043; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-043', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-043); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	4, 3
Reference	pathways/FORMULA-REGISTER.json#F-043 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

44.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_043 : Formula<volume>
  definition "Hypothetical pearl-shaped simulation geometry; no physical container or
  ↪ dimension claim."
  expression `V_P=(4/3)*pi*a*b*c`
  participants ["MK", "SISTER", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

44.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-043 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-044 - Pearl simulation surface-area approximation

Exact expression

$$A_P \sim 4 \pi * ((a^p * b^p + a^p * c^p + b^p * c^p) / 3)^{(1/p)}, \quad p = 1.6075$$

Meaning. Hypothetical simulation geometry approximation; no physical wall or surface claim.

Bound manifestations. MK, BELLE, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_044
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.BELLE, MJ.PBMEF.Family.JO
Declaration	formula F-044 'Pearl simulation surface-area approximation'
Definition	Hypothetical simulation geometry approximation; no physical wall or surface claim.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, BELLE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$A_P \sim 4 \pi * ((a^p * b^p + a^p * c^p + b^p * c^p) / 3)^{(1/p)}, \quad p = 1.6075$
Statement	When typed inputs and evidence gates pass, evaluate F-044; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-044', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-044); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	4, 3, 1, 1.6075
Reference	pathways/FORMULA-REGISTER.json#F-044 and applicable family/product/representation white papers
Type	area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

45.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_044 : Formula<area>
  definition "Hypothetical simulation geometry approximation; no physical wall or surface
  claim."
  expression `A_P~=4*pi*((a^p*b^p+a^p*c^p+b^p*c^p)/3)^(1/p), p=1.6075`
  participants ["MK", "BELLE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


45.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-044 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-045 - Pearl simulation exposure ratio

Exact expression

chi_P=A_P/V_P

Meaning. Simulation comparison metric only; not physical breach or exposure evidence.
Bound manifestations. MK, BELLE, EVE
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_045
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.BELLE, MJ.PBMEF.Family.EVE
Declaration	formula F-045 'Pearl simulation exposure ratio'
Definition	Simulation comparison metric only; not physical breach or exposure evidence.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, BELLE, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	chi_P=A_P/V_P
Statement	When typed inputs and evidence gates pass, evaluate F-045; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: 1/length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-045', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-045); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-045 and applicable family/product/representation white papers
Type	1/length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

46.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_045 : Formula<1/length>
  definition "Simulation comparison metric only; not physical breach or exposure evidence."
  expression `chi_P=A_P/V_P`
  participants ["MK", "BELLE", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

46.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-045 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-046 - Pearl simulation capacity slack

Exact expression

$$S_Pk=(1-h_Pk)*C_Pk-L_Pk$$

Meaning. Remaining typed simulation/information capacity after declared headroom.
Bound manifestations. SISTER, EVE, M3, MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_046
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK
Declaration	formula F-046 'Pearl simulation capacity slack'
Definition	Remaining typed simulation/information capacity after declared headroom.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, M3, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$S_Pk=(1-h_Pk)*C_Pk-L_Pk$
Statement	When typed inputs and evidence gates pass, evaluate F-046; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: quantity_k; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-046', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-046); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-046 and applicable family/product/representation white papers
Type	quantity_k
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

47.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_046 : Formula<quantity_k>
  definition "Remaining typed simulation/information capacity after declared headroom."
  expression `S_Pk=(1-h_Pk)*C_Pk-L_Pk`
  participants ["SISTER", "EVE", "M3", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

47.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-046 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-047 - Pearl simulation saturation ratio

Exact expression

$$\text{beta_P}=\text{max_k}(\text{L_Pk}/((1-\text{h_Pk})*\text{C_Pk}))$$

Meaning. Simulation saturation condition only; not physical breach resistance.

Bound manifestations. MK, ANGELS, BELLATRIX, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_047
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.BELLATRIX, MJ.PBMEF.Family.JO
Declaration	formula F-047 'Pearl simulation saturation ratio'
Definition	Simulation saturation condition only; not physical breach resistance.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, ANGELS, BELLATRIX, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	beta_P=max_k(L_Pk/((1-h_Pk)*C_Pk))
Statement	When typed inputs and evidence gates pass, evaluate F-047; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-047', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-047); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-047 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

48.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_047 : Formula<ratio>
  definition "Simulation saturation condition only; not physical breach resistance."
  expression `beta_P=max_k(L_Pk/((1-h_Pk)*C_Pk))`
  participants ["MK", "ANGELS", "BELLATRIX", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

48.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-047 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-048 - Pearl simulation object count

Exact expression

$$N_P = \max_k \text{ ceil}(E_k / ((1 - h_Pk) * C_Pk))$$

Meaning. Number of hypothetical simulation objects needed for declared information/resource dimensions.

Bound manifestations. SISTER, EVE, M3, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_048
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK
Declaration	formula F-048 'Pearl simulation object count'
Definition	Number of hypothetical simulation objects needed for declared information/resource dimensions.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, M3, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$N_P = \max_k \text{ ceil}(E_k / ((1 - h_Pk) * C_Pk))$
Statement	When typed inputs and evidence gates pass, evaluate F-048; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-048', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-048); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-048 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

49.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_048 : Formula<count>
  definition "Number of hypothetical simulation objects needed for declared
  ↪ information/resource dimensions."
  expression `N_P=max_k ceil(E_k/((1-h_Pk)*C_Pk))`
  participants ["SISTER", "EVE", "M3", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


49.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-048 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-049 - Pearl simulation accounting balance

Exact expression

r_Pk=q_in-q_captured-q_transferred-q_retained-q_escaped-Deltaq_stored

Meaning. Simulation/accounting conservation across retained, transferred, escaped-observation, and stored information.

Bound manifestations. EVE, MK, JO, MERMAID

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_049
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-049 'Pearl simulation accounting balance'
Definition	Simulation/accounting conservation across retained, transferred, escaped-observation, and stored information.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	r_Pk=q_in-q_captured-q_transferred-q_retained-q_escaped-Deltaq_stored
Statement	When typed inputs and evidence gates pass, evaluate F-049; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: quantity_k; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-049', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-049); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-049 and applicable family/product/representation white papers
Type	quantity_k
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

50.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_049 : Formula<quantity_k>
  definition "Simulation/accounting conservation across retained, transferred,
  ↵ escaped-observation, and stored information."
  expression `r_Pk=q_in-q_captured-q_transferred-q_retained-q_escaped-Deltaq_stored`
  participants ["EVE", "MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
```

}

50.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-049 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-050 - Pearl simulated transfer opportunity

Exact expression

$$T_{ij,k} = \min([S_{jk}]_+, [Q_{ik} - Q_{reserve_ik}]_+, C_{route_k})$$

Meaning. Simulated transfer opportunity bounded by declared logical capacities; no physical transfer.

Bound manifestations. SISTER, EVE, M3, MK, J0

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_050
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK
Declaration	formula F-050 'Pearl simulated transfer opportunity'
Definition	Simulated transfer opportunity bounded by declared logical capacities; no physical transfer.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, M3, MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	$T_{ij,k} = \min([S_{jk}]_+, [Q_{ik} - Q_{reserve_ik}]_+, C_{route_k})$
Statement	When typed inputs and evidence gates pass, evaluate F-050; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: quantity_k; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-050', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-050); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-050 and applicable family/product/representation white papers
Type	quantity_k
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

51.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_050 : Formula<quantity_k>
  definition "Simulated transfer opportunity bounded by declared logical capacities; no
  ↪ physical transfer."
  expression `T_ij,k=min([S_jk]_+, [Q_ik-Q_reserve_ik]_+,C_route_k)`
  participants ["SISTER", "EVE", "M3", "MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

51.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-050 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

MJ-PBMEF Pink Paper - Volume III

Formula Gateway Bindings F-051 through F-100

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Document control

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Author and architect	Michael Bangel
Status	FOUNDER_REVIEW_CANDIDATE_PENDING_FREEZE
Scope	Formula-level gateway bindings for F-051 through F-100.

Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Verification method

Each formula receives the same twenty-construct Bangel identity, a gateway-stage assignment, a life-cycle example, and explicit evidence and ethics boundaries. The repetitive structure is intentional: it allows formula-by-formula founder review and later automated completeness checking.

F-051 - Pearl simulated regeneration vector

Exact expression

G_P=[G_mass,G_energy,G_bytes,G_time,G_capital]

Meaning. Hypothetical opportunity vector; creates no physical or capital value.

Bound manifestations. EVE, MERMAID, SHIVA, MK, JO

Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_051
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MK
Declaration	formula F-051 'Pearl simulated regeneration vector'
Definition	Hypothetical opportunity vector; creates no physical or capital value.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, MERMAID, SHIVA, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	G_P=[G_mass,G_energy,G_bytes,G_time,G_capital]
Statement	When typed inputs and evidence gates pass, evaluate F-051; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-051', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-051); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-051 and applicable family/product/representation white papers
Type	typed vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

2.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_051 : Formula<typed vector>
  definition "Hypothetical opportunity vector; creates no physical or capital value."
  expression `G_P=[G_mass,G_energy,G_bytes,G_time,G_capital]`
  participants ["EVE", "MERMAID", "SHIVA", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

2.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-051 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-052 - Pearl acoustic simulation wave-length

Exact expression

$$\lambda_{ac}=c_{medium}/f_{control}$$

Meaning. Acoustic simulation variable under declared medium assumptions; no cohesion claim.

Bound manifestations. MK, EVE, J0

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_052
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.J0
Declaration	formula F-052 'Pearl acoustic simulation wavelength'
Definition	Acoustic simulation variable under declared medium assumptions; no cohesion claim.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	$\lambda_{ac}=c_{medium}/f_{control}$
Statement	When typed inputs and evidence gates pass, evaluate F-052; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-052', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-052); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-052 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

3.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_052 : Formula<length>
  definition "Acoustic simulation variable under declared medium assumptions; no cohesion
↵ claim."
  expression `lambda_ac=c_medium/f_control`
  participants ["MK", "EVE", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

3.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-052 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

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F-053 - Pearl acoustic simulation intensity

Exact expression

$$I_{ac}=p_{rms}^2/(\rho_{medium}*c_{medium})$$

Meaning. Reference simulation intensity only; no physical actuation claim.

Bound manifestations. MK, EVE, J0

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_053
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.J0
Declaration	formula F-053 'Pearl acoustic simulation intensity'
Definition	Reference simulation intensity only; no physical actuation claim.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, EVE, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	$I_{ac}=p_{rms}^2/(\rho_{medium}*c_{medium})$
Statement	When typed inputs and evidence gates pass, evaluate F-053; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: power/area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-053', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-053); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-053 and applicable family/product/representation white papers
Type	power/area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

4.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_053 : Formula<power/area>
  definition "Reference simulation intensity only; no physical actuation claim."
  expression `I_ac=p_rms^2/(rho_medium*c_medium)`
  participants ["MK", "EVE", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


4.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-053 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
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Evidence and ethics boundary

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F-054 - Pearl acoustic simulation energy

Exact expression

E_ac=integral(I_ac*A_effective)dt

Meaning. Hypothetical energy accounting for a future separately permitted experiment.

Bound manifestations. MK, EVE, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_054
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-054 'Pearl acoustic simulation energy'
Definition	Hypothetical energy accounting for a future separately permitted experiment.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	E_ac=integral(I_ac*A_effective)dt
Statement	When typed inputs and evidence gates pass, evaluate F-054; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-054', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-054); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-054 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

5.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_054 : Formula<energy>
  definition "Hypothetical energy accounting for a future separately permitted experiment."
  expression `E_ac=integral(I_ac*A_effective)dt`
  participants ["MK", "EVE", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

5.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-054 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

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F-055 - Pearl acoustic simulation observability gate

Exact expression

f_sample>=2*gamma*f_control AND f_control in calibrated_band AND SNR_f>=SNR_min

Meaning. Simulation input must be measurable to be accounted for; observability is not actuation.

Bound manifestations. MK, JO, ANGELS

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_055
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS
Declaration	formula F-055 'Pearl acoustic simulation observability gate'
Definition	Simulation input must be measurable to be accounted for; observability is not actuation.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	MK, JO, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	f_sample>=2*gamma*f_control AND f_control in calibrated_band AND SNR_f>=SNR_min
Statement	When typed inputs and evidence gates pass, evaluate F-055; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-055', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-055); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-055 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

6.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_055 : Formula<logical>
  definition "Simulation input must be measurable to be accounted for; observability is not
  ↪ actuation."
  expression `f_sample>=2*gamma*f_control AND f_control in calibrated_band AND
  ↪ SNR_f>=SNR_min`
  participants ["MK", "JO", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
```

}

6.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-055 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-056 - Pearl acoustic simulation signal-to-noise

Exact expression

SNR_f=P_signal(f)/P_noise(f)

Meaning. Simulation signal-to-noise ratio; advisory and non-authorizing.

Bound manifestations. MK, SISTER, EVE, JO

Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_056
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-056 'Pearl acoustic simulation signal-to-noise'
Definition	Simulation signal-to-noise ratio; advisory and non-authorizing.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, SISTER, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	SNR_f=P_signal(f)/P_noise(f)
Statement	When typed inputs and evidence gates pass, evaluate F-056; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-056', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-056); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receive; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-056 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

7.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_056 : Formula<ratio>
  definition "Simulation signal-to-noise ratio; advisory and non-authorizing."
  expression `SNR_f=P_signal(f)/P_noise(f)`
  participants ["MK", "SISTER", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receive(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

7.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-056 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-057 - Pearl acoustic simulation transfer function

Exact expression

$$H_P(f)=Y_P(f)/U_P(f)$$

Meaning. Hypothetical or measured-later response mapping; no physical Pearl article exists.

Bound manifestations. MK, EVE, J0

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_057
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.J0
Declaration	formula F-057 'Pearl acoustic simulation transfer function'
Definition	Hypothetical or measured-later response mapping; no physical Pearl article exists.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, EVE, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	$H_P(f)=Y_P(f)/U_P(f)$
Statement	When typed inputs and evidence gates pass, evaluate F-057; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: output/input; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-057', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-057); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-057 and applicable family/product/representation white papers
Type	output/input
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

8.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_057 : Formula<output/input>
  definition "Hypothetical or measured-later response mapping; no physical Pearl article
  exists."
  expression `H_P(f)=Y_P(f)/U_P(f)`
  participants ["MK", "EVE", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


8.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-057 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-058 - Pearl acoustic simulation setpoint

Exact expression

$$f*=argmin_{\{f \text{ in } F_safe\}}(J_breach+\lambda E_E_ac+\lambda T_T_transfer)$$

Meaning. Simulation candidate only; no physical control setpoint.

Bound manifestations. MK, BELLE, JO, MJ

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_058
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.BELLE, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MJ
Declaration	formula F-058 'Pearl acoustic simulation setpoint'
Definition	Simulation candidate only; no physical control setpoint.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, BELLE, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$f*=argmin_{\{f \text{ in } F_safe\}}(J_breach+\lambda E_E_ac+\lambda T_T_transfer)$
Statement	When typed inputs and evidence gates pass, evaluate F-058; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: frequency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-058', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-058); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-058 and applicable family/product/representation white papers
Type	frequency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

9.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_058 : Formula<frequency>
  definition "Simulation candidate only; no physical control setpoint."
  expression `f*=argmin_{f in F_safe}(J_breach+\lambda E_E_ac+\lambda T_T_transfer)`
  participants ["MK", "BELLE", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

9.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-058 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-059 - Bounded Pearl acoustic simulation adjustment

Exact expression

f_next=clip((2/3)f+(1/3)f_target,f-df_max,f+df_max,f_min,f_max)

Meaning. One-third-damped simulation update only.

Bound manifestations. MK, J0, M3

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_059
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.M3
Declaration	formula F-059 'Bounded Pearl acoustic simulation adjustment'
Definition	One-third-damped simulation update only.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, J0, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	f_next=clip((2/3)f+(1/3)f_target,f-df_max,f+df_max,f_min,f_max)
Statement	When typed inputs and evidence gates pass, evaluate F-059; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: frequency; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-059', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-059); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-059 and applicable family/product/representation white papers
Type	frequency
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

10.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_059 : Formula<frequency>
  definition "One-third-damped simulation update only."
  expression `f_next=clip((2/3)f+(1/3)f_target,f-df_max,f+df_max,f_min,f_max)`
  participants ["MK", "J0", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

10.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-059 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-060 - Pearl simulation registry reconciliation

Exact expression

r_registry=N_allocated+N_received-N_transferred-N_closed-N_active

Meaning. Registry count reconciliation for simulation records, not physical containers.
Bound manifestations. MERMAID, SHIVA, M3, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference
Namespace	MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference.F_060
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.JO
Declaration	formula F-060 'Pearl simulation registry reconciliation'
Definition	Registry count reconciliation for simulation records, not physical containers.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MERMAID, SHIVA, M3, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	r_registry=N_allocated+N_received-N_transferred-N_closed-N_active
Statement	When typed inputs and evidence gates pass, evaluate F-060; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-060', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-060); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-060 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

11.1 Gateway life-cycle example

```
module MJ.PBMEF.pearl.hypothetical_simulation_acoustic_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_060 : Formula<count>
  definition "Registry count reconciliation for simulation records, not physical containers."
  expression `r_registry=N_allocated+N_received-N_transferred-N_closed-N_active`
  participants ["MERMAID", "SHIVA", "M3", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

11.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-060 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-061 - Bangel Sheet cell state

Exact expression

C_ij=<value,unit,uncertainty,formula,revision,lineage,authority,evidence>

Meaning. Every cell is a governed measurement object, not an untyped mutable value.

Bound manifestations. Bangel , JP, MK, JO

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_061
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-061 'Bangel Sheet cell state'
Definition	Every cell is a governed measurement object, not an untyped mutable value.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	Bangel , JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	C_ij=<value,unit,uncertainty,formula,revision,lineage,authority,evidence>
Statement	When typed inputs and evidence gates pass, evaluate F-061; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed object; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-061', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-061); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-061 and applicable family/product/representation white papers
Type	typed object
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

12.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_061 : Formula<typed object>
  definition "Every cell is a governed measurement object, not an untyped mutable value."
  expression `C_ij=<value,unit,uncertainty,formula,revision,lineage,authority,evidence>`
  participants ["Bangel ", "JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


12.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-061 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-062 - Affected dependency closure

Exact expression

A(U)=Reachable_G(U)

Meaning. Only cells reachable from changed cells are eligible for incremental recomputation.

Bound manifestations. JP, JO, M3

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_062
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3
Declaration	formula F-062 'Affected dependency closure'
Definition	Only cells reachable from changed cells are eligible for incremental recomputation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	A(U)=Reachable_G(U)
Statement	When typed inputs and evidence gates pass, evaluate F-062; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: cell set; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-062', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-062); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-062 and applicable family/product/representation white papers
Type	cell set
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

13.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_062 : Formula<cell set>
  definition "Only cells reachable from changed cells are eligible for incremental
  ↪ recomputation."
  expression `A(U)=Reachable_G(U)`
  participants ["JP", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

13.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-062 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

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F-063 - Incremental recompute cost

Exact expression

C_recalc=sum_{v in A}c_v+sum_{e in E(A)}t_e

Meaning. Measured compute and transfer work for an affected dependency closure.
Bound manifestations. MK, JO, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_063
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-063 'Incremental recompute cost'
Definition	Measured compute and transfer work for an affected dependency closure.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	C_recalc=sum_{v in A}c_v+sum_{e in E(A)}t_e
Statement	When typed inputs and evidence gates pass, evaluate F-063; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: work units; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-063', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-063); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-063 and applicable family/product/representation white papers
Type	work units
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

14.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_063 : Formula<work units>
  definition "Measured compute and transfer work for an affected dependency closure."
  expression `C_recalc=sum_{v in A}c_v+sum_{e in E(A)}t_e`
  participants ["MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

14.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-063 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-064 - Concurrent edit arrival

Exact expression

lambda_total=N_users*lambda_user

Meaning. Aggregate update arrival rate from measured concurrent-user activity.
Bound manifestations. J0, M3, MK
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_064
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK
Declaration	formula F-064 'Concurrent edit arrival'
Definition	Aggregate update arrival rate from measured concurrent-user activity.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JO, M3, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	lambda_total=N_users*lambda_user
Statement	When typed inputs and evidence gates pass, evaluate F-064; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: operations/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-064', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-064); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-064 and applicable family/product/representation white papers
Type	operations/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

15.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_064 : Formula<operations/time>
  definition "Aggregate update arrival rate from measured concurrent-user activity."
  expression `lambda_total=N_users*lambda_user`
  participants ["J0", "M3", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

15.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-064 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-065 - Spreadsheet service utilization

Exact expression

rho=lambda_total/(W*mu_worker)

Meaning. Capacity utilization for W deterministic workers.

Bound manifestations. J0, M3, MK

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_065
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyM3, MJ.PBMEF.FamilyMK
Declaration	formula F-065 'Spreadsheet service utilization'
Definition	Capacity utilization for W deterministic workers.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MK
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	rho=lambda_total/(W*mu_worker)
Statement	When typed inputs and evidence gates pass, evaluate F-065; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-065', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-065); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-065 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

16.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_065 : Formula<ratio>
  definition "Capacity utilization for W deterministic workers."
  expression `rho=lambda_total/(W*mu_worker)`
  participants ["J0", "M3", "MK"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


16.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-065 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-066 - Spreadsheet worker requirement

Exact expression

W_min=ceil(lambda_total/(rho_max*mu_worker))

Meaning. Minimum worker count for a precommitted utilization ceiling.

Bound manifestations. J0, M3, MJOS

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_066
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MJOS
Declaration	formula F-066 'Spreadsheet worker requirement'
Definition	Minimum worker count for a precommitted utilization ceiling.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, M3, MJOS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	W_min=ceil(lambda_total/(rho_max*mu_worker))
Statement	When typed inputs and evidence gates pass, evaluate F-066; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: count; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-066', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-066); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-066 and applicable family/product/representation white papers
Type	count
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

17.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_066 : Formula<count>
  definition "Minimum worker count for a precommitted utilization ceiling."
  expression `W_min=ceil(lambda_total/(rho_max*mu_worker))`
  participants ["J0", "M3", "MJOS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

17.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-066 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-067 - Recalculation latency

Exact expression

T_recalc=T_parse+T_dependency+max_p(T_partition,p)+T_commit

Meaning. End-to-end recalculation latency across logical Pearl simulation partitions.

Bound manifestations. MK, JO, M3

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_067
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.M3
Declaration	formula F-067 'Recalculation latency'
Definition	End-to-end recalculation latency across logical Pearl simulation partitions.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, M3
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	T_recalc=T_parse+T_dependency+max_p(T_partition,p)+T_commit
Statement	When typed inputs and evidence gates pass, evaluate F-067; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-067', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-067); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-067 and applicable family/product/representation white papers
Type	time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

18.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_067 : Formula<time>
  definition "End-to-end recalculation latency across logical Pearl simulation partitions."
  expression `T_recalc=T_parse+T_dependency+max_p(T_partition,p)+T_commit`
  participants ["MK", "JO", "M3"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

18.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-067 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-068 - Spreadsheet data cost

Exact expression

C_data=B_store*c_store+B_transfer*c_transfer+t_cpu*c_cpu

Meaning. Storage, transfer, and compute cost remain separately evidenced before aggregation.
Bound manifestations. MERMAID, SHIVA, MK, JO
Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_068
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.SHIVA, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-068 'Spreadsheet data cost'
Definition	Storage, transfer, and compute cost remain separately evidenced before aggregation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MERMAID, SHIVA, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	C_data=B_store*c_store+B_transfer*c_transfer+t_cpu*c_cpu
Statement	When typed inputs and evidence gates pass, evaluate F-068; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: cost unit; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-068', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-068); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-068 and applicable family/product/representation white papers
Type	cost unit
Attribute	status=REFERENCE_OR_TYPED CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

19.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_068 : Formula<cost unit>
  definition "Storage, transfer, and compute cost remain separately evidenced before
  ↪ aggregation."
  expression `C_data=B_store*c_store+B_transfer*c_transfer+t_cpu*c_cpu`
  participants ["MERMAID", "SHIVA", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

19.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-068 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-069 - Pearl simulation partition objective

Exact expression

J_partition=alpha*max_p(L_p)+beta*sum_cut(w_e)+gamma*R_breach+delta*R_stale

Meaning. Logical partition objective with precommitted weights; breach term is simulation risk, not physical containment.

Bound manifestations. JP, MK, J0, SISTER

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_069
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.SISTER
Declaration	formula F-069 'Pearl simulation partition objective'
Definition	Logical partition objective with precommitted weights; breach term is simulation risk, not physical containment.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, MK, J0, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	J_partition=alpha*max_p(L_p)+beta*sum_cut(w_e)+gamma*R_breach+delta*R_stale
Statement	When typed inputs and evidence gates pass, evaluate F-069; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: declared score; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-069', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-069); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-069 and applicable family/product/representation white papers
Type	declared score
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

20.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_069 : Formula<declared score>
  definition "Logical partition objective with precommitted weights; breach term is
  ↪ simulation risk, not physical containment."
  expression `J_partition=alpha*max_p(L_p)+beta*sum_cut(w_e)+gamma*R_breach+delta*R_stale`
  participants ["JP", "MK", "J0", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
```


}

20.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-069 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-070 - Sheet revision root

Exact expression

H_rev=SHA256(parent_root||canonical_deltas||policy_epoch)

Meaning. Every committed change creates immutable content-addressed lineage.

Bound manifestations. Bangel , JP, JO, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_070
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-070 'Sheet revision root'
Definition	Every committed change creates immutable content-addressed lineage.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	Bangel , JP, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	H_rev=SHA256(parent_root canonical_deltas policy_epoch)
Statement	When typed inputs and evidence gates pass, evaluate F-070; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: digest; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-070', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-070); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	56
Reference	pathways/FORMULA-REGISTER.json#F-070 and applicable family/product/representation white papers
Type	digest
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

21.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_070 : Formula<digest>
  definition "Every committed change creates immutable content-addressed lineage."
  expression `H_rev=SHA256(parent_root||canonical_deltas||policy_epoch)`
  participants ["Bangel ", "JP", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

21.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-070 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-071 - Audit-particle completeness

Exact expression

AuditPass=AND(required_fields_present,receipts_valid)

Meaning. A critical spreadsheet command fails closed when its audit particle is incomplete.
Bound manifestations. JO, ANGELS, BELLATRIX, MERMAID
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_071
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.BELLATRIX, MJ.PBMEF.Family.MERMAID
Declaration	formula F-071 'Audit-particle completeness'
Definition	A critical spreadsheet command fails closed when its audit particle is incomplete.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	JO, ANGELS, BELLATRIX, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	AuditPass=AND(required_fields_present,receipts_valid)
Statement	When typed inputs and evidence gates pass, evaluate F-071; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-071', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-071); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-071 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

22.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_071 : Formula<logical>
  definition "A critical spreadsheet command fails closed when its audit particle is
  ↪ incomplete."
  expression `AuditPass=AND(required_fields_present,receipts_valid)`
  participants ["JO", "ANGELS", "BELLATRIX", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

22.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-071 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-072 - Iterative recalculation stability

Exact expression

spectral_radius(J_F)<1

Meaning. Declared iterative formulas require an evidenced locally stable fixed-point regime.
Bound manifestations. JP, MK, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_072
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJO
Declaration	formula F-072 'Iterative recalculation stability'
Definition	Declared iterative formulas require an evidenced locally stable fixed-point regime.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	spectral_radius(J_F)<1
Statement	When typed inputs and evidence gates pass, evaluate F-072; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-072', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-072); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-072 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

23.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_072 : Formula<logical>
  definition "Declared iterative formulas require an evidenced locally stable fixed-point
↵ regime."
  expression `spectral_radius(J_F)<1`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

23.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-072 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-073 - Revision conflict gate

Exact expression

base_revision=head_revision OR valid_merge_receipt

Meaning. Stale writes cannot silently overwrite a newer revision.

Bound manifestations. Bangel , JO, ANGELS

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_073
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS
Declaration	formula F-073 'Revision conflict gate'
Definition	Stale writes cannot silently overwrite a newer revision.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JO, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	base_revision=head_revision OR valid_merge_receipt
Statement	When typed inputs and evidence gates pass, evaluate F-073; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-073', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-073); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-073 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

24.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_073 : Formula<logical>
  definition "Stale writes cannot silently overwrite a newer revision."
  expression `base_revision=head_revision OR valid_merge_receipt`
  participants ["Bangel ", "JO", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


24.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-073 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-074 - Freshness age

Exact expression

Age=now-observed_at

Meaning. Age of a source observation or derived cell.
Bound manifestations. J0, MK, SISTER
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_074
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER
Declaration	formula F-074 'Freshness age'
Definition	Age of a source observation or derived cell.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	J0, MK, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	Age=now-observed_at
Statement	When typed inputs and evidence gates pass, evaluate F-074; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-074', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-074); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-074 and applicable family/product/representation white papers
Type	time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

25.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_074 : Formula<time>
  definition "Age of a source observation or derived cell."
  expression `Age=now-observed_at`
  participants ["J0", "MK", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

25.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-074 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-075 - Staleness gate

Exact expression

Age<=freshness_limit

Meaning. A cell is current only inside its declared freshness policy.

Bound manifestations. J0, ANGELS, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_075
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.MERMAID
Declaration	formula F-075 'Staleness gate'
Definition	A cell is current only inside its declared freshness policy.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	J0, ANGELS, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	Age<=freshness_limit
Statement	When typed inputs and evidence gates pass, evaluate F-075; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-075', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-075); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-075 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

26.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_075 : Formula<logical>
  definition "A cell is current only inside its declared freshness policy."
  expression `Age<=freshness_limit`
  participants ["J0", "ANGELS", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

26.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-075 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-076 - Data-performance correlation

Exact expression

$$r_{xy} = \text{Cov}(X, Y) / (\sigma_x \sigma_y)$$

Meaning. Descriptive correlation between data characteristics and performance; not a causal claim.

Bound manifestations. MK, JO, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_076
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-076 'Data-performance correlation'
Definition	Descriptive correlation between data characteristics and performance; not a causal claim.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$r_{xy} = \text{Cov}(X, Y) / (\sigma_x \sigma_y)$
Statement	When typed inputs and evidence gates pass, evaluate F-076; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: ratio; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-076', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-076); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-076 and applicable family/product/representation white papers
Type	ratio
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

27.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_076 : Formula<ratio>
  definition "Descriptive correlation between data characteristics and performance; not a
  ↵ causal claim."
  expression `r_xy=Cov(X,Y)/(sigma_x*sigma_y)`
  participants ["MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

27.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-076 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-077 - Silo unification gate

Exact expression

UnifiedMetric=SameMeaning AND SameUnit AND SamePeriod AND SameAuthority AND SameLineage

Meaning. Departmental sources unify only when semantic, unit, period, authority, and lineage conditions agree.

Bound manifestations. ELSA, JP, JO, MERMAID

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_077
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.ELSA, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-077 'Silo unification gate'
Definition	Departmental sources unify only when semantic, unit, period, authority, and lineage conditions agree.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	ELSA, JP, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	UnifiedMetric=SameMeaning AND SameUnit AND SamePeriod AND SameAuthority AND SameLineage
Statement	When typed inputs and evidence gates pass, evaluate F-077; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-077', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-077); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-077 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

28.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_077 : Formula<logical>
  definition "Departmental sources unify only when semantic, unit, period, authority, and
  ↳ lineage conditions agree."
  expression `UnifiedMetric=SameMeaning AND SameUnit AND SamePeriod AND SameAuthority AND
  ↳ SameLineage`
  participants ["ELSA", "JP", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


28.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-077 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-078 - Formula verification residual

Exact expression

r_formula=y_reported-y_recomputed

Meaning. Silent formula corruption is detected by independent deterministic recomputation.
Bound manifestations. JO, MK, ANGELS
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_078
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyANGELS
Declaration	formula F-078 'Formula verification residual'
Definition	Silent formula corruption is detected by independent deterministic recomputation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JO, MK, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	r_formula=y_reported-y_recomputed
Statement	When typed inputs and evidence gates pass, evaluate F-078; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: output unit; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-078', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-078); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-078 and applicable family/product/representation white papers
Type	output unit
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

29.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_078 : Formula<output unit>
  definition "Silent formula corruption is detected by independent deterministic
  ↵ recomputation."
  expression `r_formula=y_reported-y_recomputed`
  participants ["JO", "MK", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

29.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-078 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-079 - Operational intake completeness

Exact expression

IntakePass=process_defined AND users_known AND workload_known AND SLA_known AND authority_known

Meaning. Scaling work begins only after the process, concurrency, workload, service target, and authority are explicit.

Bound manifestations. Bangel , ELSA, JP, JO, MJ

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_079
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.ELSA, MJ.PBMEF.Family.JP, MJ.PBMEF.Family.JO
Declaration	formula F-079 'Operational intake completeness'
Definition	Scaling work begins only after the process, concurrency, workload, service target, and authority are explicit.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , ELSA, JP, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	IntakePass=process_defined AND users_known AND workload_known AND SLA_known AND authority_known
Statement	When typed inputs and evidence gates pass, evaluate F-079; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-079', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-079); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; MJ.receive; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-079 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

30.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel .spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_079 : Formula<logical>
  definition "Scaling work begins only after the process, concurrency, workload, service
  ↪ target, and authority are explicit."
  expression `IntakePass=process_defined AND users_known AND workload_known AND SLA_known
  ↪ AND authority_known`
  participants ["Bangel ", "ELSA", "JP", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
```

```
    output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

30.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-079 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-080 - Spreadsheet capacity gate

Exact expression

lambda_total<=rho_max*sum_p(mu_p) AND memory_required<=memory_available AND
↪ cross_partition_edges<=cut_limit

Meaning. Admission requires throughput, memory, and partition-boundary capacity to pass together.

Bound manifestations. MK, J0, M3, SISTER, MJOS

Gateway stage. Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution

Construct	Formula-specific expression
Module	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling
Namespace	MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling.F_080
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.SISTER
Declaration	formula F-080 'Spreadsheet capacity gate'
Definition	Admission requires throughput, memory, and partition-boundary capacity to pass together.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	MK, J0, M3, SISTER, MJOS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution
Expression	lambda_total<=rho_max*sum_p(mu_p) AND memory_required<=memory_available AND cross_partition_edges<=cut_limit
Statement	When typed inputs and evidence gates pass, evaluate F-080; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-080', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-080); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-080 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Bangel.begin workbook declaration, JP model, MK cost, JO deterministic execution'; physical_validation=false; authority=false

31.1 Gateway life-cycle example

```
module MJ.PBMEF.Bangel.spreadsheets.algorithms_scaling {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_080 : Formula<logical>
  definition "Admission requires throughput, memory, and partition-boundary capacity to pass
  ↪ together."
  expression `lambda_total<=rho_max*sum_p(mu_p) AND memory_required<=memory_available AND
  ↪ cross_partition_edges<=cut_limit`
  participants ["MK", "J0", "M3", "SISTER", "MJOS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

31.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-080 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-081 - First-noise rectangle height

Exact expression

H_R=h_noise,1

Meaning. Rectangle maximum height is the first validated noise-detection plane.

Bound manifestations. SISTER, MK, JO

Gateway stage. R1 prediction and normal-constellation calibration before N1

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_081
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-081 'First-noise rectangle height'
Definition	Rectangle maximum height is the first validated noise-detection plane.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	R1 prediction and normal-constellation calibration before N1
Expression	H_R=h_noise,1
Statement	When typed inputs and evidence gates pass, evaluate F-081; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-081', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-081); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-081 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='R1 prediction and normal-constellation calibration before N1'; physical_validation=false; authority=false

32.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_081 : Formula<length>
  definition "Rectangle maximum height is the first validated noise-detection plane."
  expression `H_R=h_noise,1`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


32.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-081 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-082 - Reference gas density

Exact expression

rho_g=P*M/(Z*R*T)

Meaning. Actual gas density depends on measured pressure, temperature, molar mass, and compressibility.

Bound manifestations. MK, J0, JP

Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_082
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.JP
Declaration	formula F-082 'Reference gas density'
Definition	Actual gas density depends on measured pressure, temperature, molar mass, and compressibility.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, J0, JP
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	rho_g=P*M/(Z*R*T)
Statement	When typed inputs and evidence gates pass, evaluate F-082; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass/volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-082', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-082); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-082 and applicable family/product/representation white papers
Type	mass/volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

33.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_082 : Formula<mass/volume>
  definition "Actual gas density depends on measured pressure, temperature, molar mass, and
  ↵ compressibility."
  expression `rho_g=P*M/(Z*R*T)`
  participants ["MK", "J0", "JP"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

33.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-082 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-083 - 24 mg reference volume

Exact expression

V_24=m_24/rho_ref

Meaning. 24 mg defines a reference gas volume under a declared state and does not replace the 23 mg floor.

Bound manifestations. JP, MK, J0

Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_083
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,J0
Declaration	formula F-083 '24 mg reference volume'
Definition	24 mg defines a reference gas volume under a declared state and does not replace the 23 mg floor.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	V_24=m_24/rho_ref
Statement	When typed inputs and evidence gates pass, evaluate F-083; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-083', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-083); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	4
Reference	pathways/FORMULA-REGISTER.json#F-083 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

34.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_083 : Formula<volume>
  definition "24 mg defines a reference gas volume under a declared state and does not
  ↪ replace the 23 mg floor."
  expression `V_24=m_24/rho_ref`
  participants ["JP", "MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

34.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-083 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-084 - Rectangle depth

Exact expression

D_R=V_24/(W_R*H_R)

Meaning. Reference depth adapts to measured height and declared width.
Bound manifestations. SISTER, MK, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_084
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-084 'Rectangle depth'
Definition	Reference depth adapts to measured height and declared width.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	D_R=V_24/(W_R*H_R)
Statement	When typed inputs and evidence gates pass, evaluate F-084; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-084', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-084); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	4
Reference	pathways/FORMULA-REGISTER.json#F-084 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

35.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_084 : Formula<length>
  definition "Reference depth adapts to measured height and declared width."
  expression `D_R=V_24/(W_R*H_R)`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

35.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-084 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-085 - Cone height ratio

Exact expression

H_C=k_H*H_R; k_H,std=2

Meaning. Standard cone height is twice rectangle height.
Bound manifestations. JP, MK, JO
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_085
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,JO
Declaration	formula F-085 'Cone height ratio'
Definition	Standard cone height is twice rectangle height.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	H_C=k_H*H_R; k_H,std=2
Statement	When typed inputs and evidence gates pass, evaluate F-085; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-085', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JPrepresent(F-085); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-085 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

36.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_085 : Formula<length>
  definition "Standard cone height is twice rectangle height."
  expression `H_C=k_H*H_R; k_H,std=2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


36.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-085 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-086 - Cone top-width ratio

Exact expression

$$W_T=k_W*W_B; \text{ k_W,std}=2$$

Meaning. Standard top characteristic width is twice bottom width.

Bound manifestations. JP, MK, JO

Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_086
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,JO
Declaration	formula F-086 'Cone top-width ratio'
Definition	Standard top characteristic width is twice bottom width.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$W_T=k_W*W_B; \text{ k_W,std}=2$
Statement	When typed inputs and evidence gates pass, evaluate F-086; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-086', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-086); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-086 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

37.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_086 : Formula<length>
  definition "Standard top characteristic width is twice bottom width."
  expression `W_T=k_W*W_B; k_W,std=2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

37.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-086 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-087 - Cone area by height

Exact expression

$$A(z)=A_B*(1+(k_W-1)*z/H_C)^2$$

Meaning. Similar-section conical expansion area.
Bound manifestations. MK, JO, SISTER
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_087
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-087 'Cone area by height'
Definition	Similar-section conical expansion area.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$A(z)=A_B*(1+(k_W-1)*z/H_C)^2$
Statement	When typed inputs and evidence gates pass, evaluate F-087; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-087', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-087); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1, 2
Reference	pathways/FORMULA-REGISTER.json#F-087 and applicable family/product/representation white papers
Type	area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

38.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_087 : Formula<area>
  definition "Similar-section conical expansion area."
  expression `A(z)=A_B*(1+(k_W-1)*z/H_C)^2`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

38.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-087 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-088 - Cone partial volume

Exact expression

$$V_C(z)=A_B*(z+(k_W-1)z^2/H_C+(k_W-1)^2*z^3/(3H_C^2))$$

Meaning. Volume up to observed gas height.
Bound manifestations. MK, JO, SISTER
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_088
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-088 'Cone partial volume'
Definition	Volume up to observed gas height.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$V_C(z)=A_B*(z+(k_W-1)z^2/H_C+(k_W-1)^2*z^3/(3H_C^2))$
Statement	When typed inputs and evidence gates pass, evaluate F-088; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-088', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-088); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1, 2, 3
Reference	pathways/FORMULA-REGISTER.json#F-088 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

39.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_088 : Formula<volume>
  definition "Volume up to observed gas height."
  expression `V_C(z)=A_B*(z+(k_W-1)z^2/H_C+(k_W-1)^2*z^3/(3H_C^2))`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

39.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-088 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-089 - Full conical-frustum volume

Exact expression

$$V_C=H_C/3*(A_B+sqrt(A_B*A_T)+A_T)$$

Meaning. Full conical expansion volume.
Bound manifestations. MK, JO, JP
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_089
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.JP
Declaration	formula F-089 'Full conical-frustum volume'
Definition	Full conical expansion volume.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, JP
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$V_C=H_C/3*(A_B+sqrt(A_B*A_T)+A_T)$
Statement	When typed inputs and evidence gates pass, evaluate F-089; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-089', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-089); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	3
Reference	pathways/FORMULA-REGISTER.json#F-089 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

40.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_089 : Formula<volume>
  definition "Full conical expansion volume."
  expression `V_C=H_C/3*(A_B+sqrt(A_B*A_T)+A_T)`
  participants ["MK", "JO", "JP"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


40.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-089 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-090 - Pearl cone-top anchor

Exact expression

z_P0=H_R+H_C; standard=3H_R

Meaning. Pearl simulation begins at the top-of-cone information plane.

Bound manifestations. PEARL, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_090
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.PEARL, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-090 'Pearl cone-top anchor'
Definition	Pearl simulation begins at the top-of-cone information plane.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	PEARL, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	z_P0=H_R+H_C; standard=3H_R
Statement	When typed inputs and evidence gates pass, evaluate F-090; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-090', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-090); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	3
Reference	pathways/FORMULA-REGISTER.json#F-090 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

41.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_090 : Formula<length>
  definition "Pearl simulation begins at the top-of-cone information plane."
  expression `z_P0=H_R+H_C; standard=3H_R`
  participants ["PEARL", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

41.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-090 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-091 - Observed gas mass

Exact expression

$$m_g = \rho_g \cdot V_C(h_g)$$

Meaning. Gas mass from observed height and state-dependent density.

Bound manifestations. MK, EVE, JO

Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_091
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-091 'Observed gas mass'
Definition	Gas mass from observed height and state-dependent density.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	$m_g = \rho_g \cdot V_C(h_g)$
Statement	When typed inputs and evidence gates pass, evaluate F-091; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-091', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-091); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-091 and applicable family/product/representation white papers
Type	mass
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

42.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_091 : Formula<mass>
  definition "Gas mass from observed height and state-dependent density."
  expression `m_g=rho_g*V_C(h_g)`
  participants ["MK", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

42.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-091 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-092 - Gas mass-flow from height

Exact expression

$$m_dot = \rho * A(h_g) * h_dot_g + V_C(h_g) * \rho_dot$$

Meaning. Mass-flow accounting includes density changes.
Bound manifestations. MK, EVE, J0
Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_092
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.J0
Declaration	formula F-092 'Gas mass-flow from height'
Definition	Mass-flow accounting includes density changes.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, EVE, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	$m_dot = \rho * A(h_g) * h_dot_g + V_C(h_g) * \rho_dot$
Statement	When typed inputs and evidence gates pass, evaluate F-092; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: mass/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-092', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-092); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-092 and applicable family/product/representation white papers
Type	mass/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

43.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_092 : Formula<mass/time>
  definition "Mass-flow accounting includes density changes."
  expression `m_dot=rho*A(h_g)*h_dot_g+V_C(h_g)*rho_dot`
  participants ["MK", "EVE", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

43.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-092 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-093 - Observed gas-height predictor

Exact expression

$$h_{\text{hat}} = \text{clip}(h + v * dt + 0.5 * a * dt^2, 0, H_C)$$

Meaning. Bounded prediction of observed gas-front height.
Bound manifestations. SISTER, MK, JO
Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_093
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-093 'Observed gas-height predictor'
Definition	Bounded prediction of observed gas-front height.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	$h_{\text{hat}} = \text{clip}(h + v * dt + 0.5 * a * dt^2, 0, H_C)$
Measurement	When typed inputs and evidence gates pass, evaluate F-093; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Constraint	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Annotation	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Directive	@formula(id='F-093', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Block	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Literal	R0 { Bangel, begin; R1.predict; JP.represent(F-093); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Reference	0.5, 2, 0
Type	pathways/FORMULA-REGISTER.json#F-093 and applicable family/product/representation white papers
Attribute	length status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

44.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_093 : Formula<length>
  definition "Bounded prediction of observed gas-front height."
  expression `h_hat=clip(h+v*dt+0.5*a*dt^2,0,H_C)`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


44.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-093 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-094 - Gas net-force balance

Exact expression

m_eff*a_z=F_b+F_p+F_act-F_d-F_wall-F_mix

Meaning. Geometry alone does not guarantee acceleration.
Bound manifestations. MK, JO, SISTER
Gateway stage. MJ.23 typed measurement branch and MK physics classification

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_094
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-094 'Gas net-force balance'
Definition	Geometry alone does not guarantee acceleration.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	MJ.23 typed measurement branch and MK physics classification
Expression	m_eff*a_z=F_b+F_p+F_act-F_d-F_wall-F_mix
Statement	When typed inputs and evidence gates pass, evaluate F-094; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: force; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-094', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-094); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-094 and applicable family/product/representation white papers
Type	force
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='MJ.23 typed measurement branch and MK physics classification'; physical_validation=false; authority=false

45.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_094 : Formula<force>
  definition "Geometry alone does not guarantee acceleration."
  expression `m_eff*a_z=F_b+F_p+F_act-F_d-F_wall-F_mix`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

45.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-094 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-095 - Buoyancy force

Exact expression

$$F_b=(\rho_{\text{ambient}}-\rho_g)*g*V_g$$

Meaning. Reference buoyancy term under declared environment.
Bound manifestations. MK, JO, EVE
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_095
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE
Declaration	formula F-095 'Buoyancy force'
Definition	Reference buoyancy term under declared environment.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$F_b=(\rho_{\text{ambient}}-\rho_g)*g*V_g$
Statement	When typed inputs and evidence gates pass, evaluate F-095; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: force; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-095', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-095); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-095 and applicable family/product/representation white papers
Type	force
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

46.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_095 : Formula<force>
  definition "Reference buoyancy term under declared environment."
  expression `F_b=(rho_ambient-rho_g)*g*V_g`
  participants ["MK", "JO", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

46.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-095 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-096 - Drag force

Exact expression

$$F_d=0.5*C_d*rho_{ambient}*A_{projected}*u*abs(u)$$

Meaning. Reference drag term under declared coefficient and flow.
Bound manifestations. MK, JO, EVE
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_096
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE
Declaration	formula F-096 'Drag force'
Definition	Reference drag term under declared coefficient and flow.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$F_d=0.5*C_d*rho_{ambient}*A_{projected}*u*abs(u)$
Statement	When typed inputs and evidence gates pass, evaluate F-096; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: force; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-096', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-096); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.5
Reference	pathways/FORMULA-REGISTER.json#F-096 and applicable family/product/representation white papers
Type	force
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

47.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_096 : Formula<force>
  definition "Reference drag term under declared coefficient and flow."
  expression `F_d=0.5*C_d*rho_ambient*A_projected*u*abs(u)`
  participants ["MK", "JO", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

47.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-096 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-097 - Flow continuity

Exact expression

$$Q=A(z)*u(z)$$

Meaning. For fixed flow, increasing area does not itself accelerate the gas.
Bound manifestations. MK, JO, SISTER
Gateway stage. JP canonical representation, MK applicability, JO proof, and bounded MJ output

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_097
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-097 'Flow continuity'
Definition	For fixed flow, increasing area does not itself accelerate the gas.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	JP canonical representation, MK applicability, JO proof, and bounded MJ output
Expression	$Q=A(z)*u(z)$
Statement	When typed inputs and evidence gates pass, evaluate F-097; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-097', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-097); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-097 and applicable family/product/representation white papers
Type	volume/time
Attribute	status=REFERENCE_OR_TYPED CANON; stage='JP canonical representation, MK applicability, JO proof, and bounded MJ output'; physical_validation=false; authority=false

48.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_097 : Formula<volume/time>
  definition "For fixed flow, increasing area does not itself accelerate the gas."
  expression `Q=A(z)*u(z)`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


48.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-097 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-098 - Residual reservoir capacity

Exact expression

C_res,k=gamma_k*C_rect,k; 0<=gamma_k<1

Meaning. Residual reservoir remains smaller than rectangle reference capacity.
Bound manifestations. SISTER, EVE, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_098
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-098 'Residual reservoir capacity'
Definition	Residual reservoir remains smaller than rectangle reference capacity.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	C_res,k=gamma_k*C_rect,k; 0<=gamma_k<1
Statement	When typed inputs and evidence gates pass, evaluate F-098; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed capacity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-098', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-098); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0, 1
Reference	pathways/FORMULA-REGISTER.json#F-098 and applicable family/product/representation white papers
Type	typed capacity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

49.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_098 : Formula<typed capacity>
  definition "Residual reservoir remains smaller than rectangle reference capacity."
  expression `C_res,k=gamma_k*C_rect,k; 0<=gamma_k<1`
  participants ["SISTER", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

49.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-098 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-099 - Umbrella/EVE/reservoir balance

Exact expression

q_cone=q_down+q_EVE+q_res+q_escape+r

Meaning. Downward redistribution, EVE evidence, reservoir admission, and escape are separately accounted.

Bound manifestations. EVE, SISTER, MERMAID

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_099
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MERMAID
Declaration	formula F-099 'Umbrella/EVE/reservoir balance'
Definition	Downward redistribution, EVE evidence, reservoir admission, and escape are separately accounted.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, SISTER, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	q_cone=q_down+q_EVE+q_res+q_escape+r
Statement	When typed inputs and evidence gates pass, evaluate F-099; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed quantity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-099', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-099); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-099 and applicable family/product/representation white papers
Type	typed quantity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

50.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_099 : Formula<typed quantity>
  definition "Downward redistribution, EVE evidence, reservoir admission, and escape are
  ↪ separately accounted."
  expression `q_cone=q_down+q_EVE+q_res+q_escape+r`
  participants ["EVE", "SISTER", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

50.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-099 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-100 - Containment modification predicate

Exact expression

Valid(theta)=typed&positive&recomputed&conserved&bounded&evidenced&MK&JO&MJ

Meaning. Size changes preserve core logic but require full recalculation and gates.

Bound manifestations. Bangel , JP, MK, JO, MJ

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.containment.geometry_h2_reference
Namespace	MJ.PBMEF.containment.geometry_h2_reference.F_100
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-100 'Containment modification predicate'
Definition	Size changes preserve core logic but require full recalculation and gates.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JP, MK, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	Valid(theta)=typed&positive&recomputed&conserved&bounded&evidenced&MK&JO&MJ
Statement	When typed inputs and evidence gates pass, evaluate F-100; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-100', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP&MK&JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel .begin; R1.predict; JP.represent(F-100); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-100 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

51.1 Gateway life-cycle example

```
module MJ.PBMEF.containment.geometry_h2_reference {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_100 : Formula<logical>
  definition "Size changes preserve core logic but require full recalculation and gates."
  expression `Valid(theta)=typed&positive&recomputed&conserved&bounded&evidenced&MK&JO&MJ`
  participants ["Bangel ", "JP", "MK", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

51.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-100 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

MJ-PBMEF Pink Paper - Volume IV

Formula Gateway Bindings F-101 through F-145

Michael Bangel - Author and Architect

August 2026

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Scope	Formula-level gateway bindings for F-101 through F-145.

Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Verification method

Each formula receives the same twenty-construct Bangel identity, a gateway-stage assignment, a life-cycle example, and explicit evidence and ethics boundaries. The repetitive structure is intentional: it allows formula-by-formula founder review and later automated completeness checking.

F-101 - Rear outlet elevation

Exact expression

`z_out=H_P-delta_z; 0<delta_z<H_P`

Meaning. Outlet is below the containment maximum height.
Bound manifestations. SISTER, MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 101
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-101 'Rear outlet elevation'
Definition	Outlet is below the containment maximum height.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	<code>z_out=H_P-delta_z; 0<delta_z<H_P</code>
Statement	When typed inputs and evidence gates pass, evaluate F-101; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-101', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-101); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-101 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

2.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_101 : Formula<length>
  definition "Outlet is below the containment maximum height."
  expression `z_out=H_P-delta_z; 0<delta_z<H_P`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

2.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-101 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-102 - Pearl simulation exclusion radius

Exact expression

R_P,sim=R_top+c_P; c_P>=0

Meaning. Nonphysical reference circle plus declared clearance.
Bound manifestations. PEARL, MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_102
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.PEARL, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-102 'Pearl simulation exclusion radius'
Definition	Nonphysical reference circle plus declared clearance.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	PEARL, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	R_P,sim=R_top+c_P; c_P>=0
Statement	When typed inputs and evidence gates pass, evaluate F-102; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-102', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-102); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-102 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

3.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_102 : Formula<length>
  definition "Nonphysical reference circle plus declared clearance."
  expression `R_P,sim=R_top+c_P; c_P>=0`
  participants ["PEARL", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


3.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-102 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-103 - Outward-tangential outlet direction

Exact expression

d_out=cos(alpha_out)t+sin(alpha_out)n_out; 0<alpha_out<pi/2

Meaning. Slight positive outward cant from the local tangent.

Bound manifestations. JP, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_103
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,JO
Declaration	formula F-103 'Outward-tangential outlet direction'
Definition	Slight positive outward cant from the local tangent.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	d_out=cos(alpha_out)t+sin(alpha_out)n_out; 0<alpha_out<pi/2
Statement	When typed inputs and evidence gates pass, evaluate F-103; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-103', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-103); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0, 2
Reference	pathways/FORMULA-REGISTER.json#F-103 and applicable family/product/representation white papers
Type	dimensionless vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

4.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_103 : Formula<dimensionless vector>
  definition "Slight positive outward cant from the local tangent."
  expression `d_out=cos(alpha_out)t+sin(alpha_out)n_out; 0<alpha_out<pi/2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

4.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-103 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-104 - Outside-circle outlet path

Exact expression

$$||\gamma(s)-c_P||^2=R_P^2+2R_Ps\sin(\alpha_{out})+s^2$$

Meaning. Path remains outside the Pearl simulation circle for $s>0$.
Bound manifestations. PEARL, MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 104
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.PEARL, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-104 'Outside-circle outlet path'
Definition	Path remains outside the Pearl simulation circle for $s>0$.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	PEARL, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$ \gamma(s)-c_P ^2=R_P^2+2R_Ps\sin(\alpha_{out})+s^2$
Statement	When typed inputs and evidence gates pass, evaluate F-104; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length^2; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-104', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-104); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-104 and applicable family/product/representation white papers
Type	length^2
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

5.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_104 : Formula<length^2>
  definition "Path remains outside the Pearl simulation circle for s>0."
  expression `||gamma(s)-c_P||^2=R_P^2+2R_P*s*sin(alpha_out)+s^2`
  participants ["PEARL", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

5.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-104 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-105 - Reservoir volume balance

Exact expression

$$dV_L/dt=Q_{out}-Q_{return}-Q_{drain}-Q_{escape}$$

Meaning. Connected lake-like buffer control-volume balance.

Bound manifestations. SISTER, EVE, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 105
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-105 'Reservoir volume balance'
Definition	Connected lake-like buffer control-volume balance.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, EVE, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$dV_L/dt=Q_{out}-Q_{return}-Q_{drain}-Q_{escape}$
Statement	When typed inputs and evidence gates pass, evaluate F-105; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-105', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-105); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-105 and applicable family/product/representation white papers
Type	volume/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

6.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_105 : Formula<volume/time>
  definition "Connected lake-like buffer control-volume balance."
  expression `dV_L/dt=Q_out-Q_return-Q_drain-Q_escape`
  participants ["SISTER", "EVE", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

6.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-105 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-106 - Typed reservoir quantity balance

Exact expression

dq_L,k/dt=q_out,k-q_return,k-q_drain,k-q_escape,k

Meaning. Per-dimension balance prevents cross-unit collapse.

Bound manifestations. SISTER, EVE, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 106
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-106 'Typed reservoir quantity balance'
Definition	Per-dimension balance prevents cross-unit collapse.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, EVE, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	dq_L,k/dt=q_out,k-q_return,k-q_drain,k-q_escape,k
Statement	When typed inputs and evidence gates pass, evaluate F-106; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed quantity/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-106', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-106); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; MJ.receive; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-106 and applicable family/product/representation white papers
Type	typed quantity/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

7.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_106 : Formula<typed quantity/time>
  definition "Per-dimension balance prevents cross-unit collapse."
  expression `dq_L,k/dt=q_out,k-q_return,k-q_drain,k-q_escape,k`
  participants ["SISTER", "EVE", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receive(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


7.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-106 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-107 - Required buffer volume

Exact expression

$$V_L, req=T_hold*max(0,Q_out,H-Q_return,L)+V_residual,H$$

Meaning. Conservative buffer capacity from inflow-return mismatch and residual.
Bound manifestations. MK, SISTER, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 107
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.JO
Declaration	formula F-107 'Required buffer volume'
Definition	Conservative buffer capacity from inflow-return mismatch and residual.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, SISTER, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	$V_L, req=T_hold*max(0,Q_out,H-Q_return,L)+V_residual,H$
Statement	When typed inputs and evidence gates pass, evaluate F-107; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-107', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-107); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-107 and applicable family/product/representation white papers
Type	volume
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

8.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_107 : Formula<volume>
  definition "Conservative buffer capacity from inflow-return mismatch and residual."
  expression `V_L, req=T_hold*max(0,Q_out,H-Q_return,L)+V_residual,H`
  participants ["MK", "SISTER", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

8.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-107 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-108 - Outlet area lower bound

Exact expression

A_out>=Q_design/u_out,max

Meaning. Area sizing from conservative design flow and allowable velocity.
Bound manifestations. MK, J0
Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_108
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-108 'Outlet area lower bound'
Definition	Area sizing from conservative design flow and allowable velocity.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	A_out>=Q_design/u_out,max
Statement	When typed inputs and evidence gates pass, evaluate F-108; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-108', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-108); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-108 and applicable family/product/representation white papers
Type	area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

9.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_108 : Formula<area>
  definition "Area sizing from conservative design flow and allowable velocity."
  expression `A_out>=Q_design/u_out,max`
  participants ["MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

9.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-108 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-109 - Circular outlet radius lower bound

Exact expression

$$r_{out} \geq \sqrt{A_{out}/\pi}$$

Meaning. Circular outlet radius derived from required area.

Bound manifestations. MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_109
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-109 'Circular outlet radius lower bound'
Definition	Circular outlet radius derived from required area.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$r_{out} \geq \sqrt{A_{out}/\pi}$
Statement	When typed inputs and evidence gates pass, evaluate F-109; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-109', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-109); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-109 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

10.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_109 : Formula<length>
  definition "Circular outlet radius derived from required area."
  expression `r_out>=sqrt(A_out/pi)`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

10.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-109 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-110 - Bounded drip impulse

Exact expression

J_drop=m_drop*v_drop<=J_drop,max

Meaning. Small-discharge reference objective; threshold requires evidence.
Bound manifestations. MK, ANGELS, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 110
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.JO
Declaration	formula F-110 'Bounded drip impulse'
Definition	Small-discharge reference objective; threshold requires evidence.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, ANGELS, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	J_drop=m_drop*v_drop<=J_drop,max
Statement	When typed inputs and evidence gates pass, evaluate F-110; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: impulse; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-110', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-110); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-110 and applicable family/product/representation white papers
Type	impulse
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

11.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_110 : Formula<impulse>
  definition "Small-discharge reference objective; threshold requires evidence."
  expression `J_drop=m_drop*v_drop<=J_drop,max`
  participants ["MK", "ANGELS", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


11.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-110 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-111 - Small-wave energy reference

Exact expression

E_wave~= $0.5 \cdot \rho \cdot g \cdot a_{\text{wave}}^2 \cdot A_{\text{surface}}$

Meaning. Applies only under small-amplitude liquid-surface assumptions.
Bound manifestations. MK, JO, EVE
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 111
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE
Declaration	formula F-111 'Small-wave energy reference'
Definition	Applies only under small-amplitude liquid-surface assumptions.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	E_wave~= $0.5 \cdot \rho \cdot g \cdot a_{\text{wave}}^2 \cdot A_{\text{surface}}$
Statement	When typed inputs and evidence gates pass, evaluate F-111; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-111', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-111); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.5, 2
Reference	pathways/FORMULA-REGISTER.json#F-111 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

12.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_111 : Formula<energy>
  definition "Applies only under small-amplitude liquid-surface assumptions."
  expression `E_wave~= $0.5 \cdot \rho \cdot g \cdot a_{\text{wave}}^2 \cdot A_{\text{surface}}$ `
  participants ["MK", "JO", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

12.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-111 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-112 - Froude reference

Exact expression

Fr=U/sqrt(gL)

Meaning. Flow-regime reference; Fr<1 is a conditional subcritical target.

Bound manifestations. MK, J0

Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 112
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-112 'Froude reference'
Definition	Flow-regime reference; Fr<1 is a conditional subcritical target.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	Fr=U/sqrt(gL)
Statement	When typed inputs and evidence gates pass, evaluate F-112; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-112', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-112); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-112 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

13.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_112 : Formula<dimensionless>
  definition "Flow-regime reference; Fr<1 is a conditional subcritical target."
  expression `Fr=U/sqrt(gL)`
  participants ["MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

13.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-112 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-113 - Circular return-port area

Exact expression

A_in=pi*r_in^2

Meaning. Circular re-entry cross-section.
Bound manifestations. MK, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 113
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-113 'Circular return-port area'
Definition	Circular re-entry cross-section.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	A_in=pi*r_in^2
Statement	When typed inputs and evidence gates pass, evaluate F-113; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: area; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-113', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-113); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-113 and applicable family/product/representation white papers
Type	area
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

14.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_113 : Formula<area>
  definition "Circular re-entry cross-section."
  expression `A_in=pi*r_in^2`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

14.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-113 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-114 - Inward-tangential reentry components

Exact expression

$$u_r = -U \sin(\beta_{in}); \quad u_{\theta} = \sigma U \cos(\beta_{in})$$

Meaning. Small inward angle plus tangential component; no vortex proof.

Bound manifestations. SISTER, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_114
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-114 'Inward-tangential reentry components'
Definition	Small inward angle plus tangential component; no vortex proof.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	SISTER, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$u_r = -U \sin(\beta_{in}); \quad u_{\theta} = \sigma U \cos(\beta_{in})$
Statement	When typed inputs and evidence gates pass, evaluate F-114; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: velocity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-114', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-114); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-114 and applicable family/product/representation white papers
Type	velocity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

15.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_114 : Formula<velocity>
  definition "Small inward angle plus tangential component; no vortex proof."
  expression `u_r=-U*sin(beta_in); u_theta=sigma*U*cos(beta_in)`
  participants ["SISTER", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


15.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-114 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-115 - Spiral compatibility ratio

Exact expression

chi_spiral=|u_theta|/max(|u_r|,epsilon)

Meaning. Reference ratio for tangential-dominant reentry.

Bound manifestations. MK, J0

Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 115
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-115 'Spiral compatibility ratio'
Definition	Reference ratio for tangential-dominant reentry.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	chi_spiral= u_theta /max(u_r ,epsilon)
Statement	When typed inputs and evidence gates pass, evaluate F-115; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-115', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-115); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-115 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

16.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_115 : Formula<dimensionless>
  definition "Reference ratio for tangential-dominant reentry."
  expression `chi_spiral=|u_theta|/max(|u_r|,epsilon)`
  participants ["MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

16.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-115 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-116 - Return continuity

Exact expression

Q_return=A_in*u_n

Meaning. Re-entry flow through the circular port.

Bound manifestations. MK, JO, SISTER

Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 116
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-116 'Return continuity'
Definition	Re-entry flow through the circular port.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	Q_return=A_in*u_n
Statement	When typed inputs and evidence gates pass, evaluate F-116; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: volume/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-116', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-116); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-116 and applicable family/product/representation white papers
Type	volume/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

17.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_116 : Formula<volume/time>
  definition "Re-entry flow through the circular port."
  expression `Q_return=A_in*u_n`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

17.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-116 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-117 - Relative-frame velocity

Exact expression

$$v_rel=v_B-v_A-\Omega_A \times r$$

Meaning. Coordinate-frame-relative motion; perspective does not create energy.

Bound manifestations. MK, J0

Gateway stage. N1 prediction-first allocation, M3 routing, and G123 reconciliation

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 117
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-117 'Relative-frame velocity'
Definition	Coordinate-frame-relative motion; perspective does not create energy.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	N1 prediction-first allocation, M3 routing, and G123 reconciliation
Expression	$v_rel=v_B-v_A-\Omega_A \times r$
Statement	When typed inputs and evidence gates pass, evaluate F-117; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: velocity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-117', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK.J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-117); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-117 and applicable family/product/representation white papers
Type	velocity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='N1 prediction-first allocation, M3 routing, and G123 reconciliation'; physical_validation=false; authority=false

18.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_117 : Formula<velocity>
  definition "Coordinate-frame-relative motion; perspective does not create energy."
  expression `v_rel=v_B-v_A-Ω_A x r`
  participants ["MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

18.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-117 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-118 - Frictional dissipation

Exact expression

P_diss=max(0,-F_f dot v_rel)

Meaning. Measured frame-relative frictional dissipation.
Bound manifestations. MK, JO, MERMAID
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 118
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-118 'Frictional dissipation'
Definition	Measured frame-relative frictional dissipation.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	P_diss=max(0,-F_f dot v_rel)
Statement	When typed inputs and evidence gates pass, evaluate F-118; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: power; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-118', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-118); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-118 and applicable family/product/representation white papers
Type	power
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

19.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_118 : Formula<power>
  definition "Measured frame-relative frictional dissipation."
  expression `P_diss=max(0,-F_f dot v_rel)`
  participants ["MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


19.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-118 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-119 - Recoverable friction-energy bound

Exact expression

E_rec<=eta_rec*integral(P_diss dt); 0<=eta_rec<=1

Meaning. No physical recovery without an evidenced conversion mechanism.
Bound manifestations. MK, JO, MERMAID, SHIVA
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 119
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.SHIVA
Declaration	formula F-119 'Recoverable friction-energy bound'
Definition	No physical recovery without an evidenced conversion mechanism.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, MERMAID, SHIVA
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	E_rec<=eta_rec*integral(P_diss dt); 0<=eta_rec<=1
Statement	When typed inputs and evidence gates pass, evaluate F-119; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-119', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-119); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0, 1
Reference	pathways/FORMULA-REGISTER.json#F-119 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

20.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_119 : Formula<energy>
  definition "No physical recovery without an evidenced conversion mechanism."
  expression `E_rec<=eta_rec*integral(P_diss dt); 0<=eta_rec<=1`
  participants ["MK", "JO", "MERMAID", "SHIVA"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

20.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-119 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-120 - Reservoir transaction gate

Exact expression

Admit=AngelPass&M3Lease&MKPass&JOPass&MermaidReconciled&MJPermit

Meaning. Every reservoir transfer requires safety, routing, physics, proof, reconciliation, and permit.
Bound manifestations. ANGELS, M3, MK, JO, MERMAID, MJ
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 120
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-120 'Reservoir transaction gate'
Definition	Every reservoir transfer requires safety, routing, physics, proof, reconciliation, and permit.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	ANGELS, M3, MK, JO, MERMAID, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	Admit=AngelPass&M3Lease&MKPass&JOPass&MermaidReconciled&MJPermit
Statement	When typed inputs and evidence gates pass, evaluate F-120; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-120', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-120); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-120 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

21.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_120 : Formula<logical>
  definition "Every reservoir transfer requires safety, routing, physics, proof,
  ↵ reconciliation, and permit."
  expression `Admit=AngelPass&M3Lease&MKPass&JOPass&MermaidReconciled&MJPermit`
  participants ["ANGELS", "M3", "MK", "JO", "MERMAID", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

21.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-120 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-121 - Re-entry swirl ratio

Exact expression

$$\text{chi_i} = |u_theta| / \max(|u_r|, \text{epsilon_u})$$

Meaning. Represents tangential-to-inward re-entry velocity.

Bound manifestations. MK, JO

Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 121
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-121 'Re-entry swirl ratio'
Definition	Represents tangential-to-inward re-entry velocity.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	$\text{chi_i} = u_theta / \max(u_r , \text{epsilon_u})$
Statement	When typed inputs and evidence gates pass, evaluate F-121; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-121', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-121); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-121 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

22.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_121 : Formula<dimensionless>
  definition "Represents tangential-to-inward re-entry velocity."
  expression `chi_i=|u_theta|/max(|u_r|,epsilon_u)`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

22.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-121 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-122 - Re-entry processing cycle

Exact expression

cycle_reentry=cycle_exit+1

Meaning. Prohibits same-cycle feedback and creates a new receipt chain.
Bound manifestations. J0, M3, SISTER
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 122
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.SISTER
Declaration	formula F-122 'Re-entry processing cycle'
Definition	Prohibits same-cycle feedback and creates a new receipt chain.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	J0, M3, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	cycle_reentry=cycle_exit+1
Statement	When typed inputs and evidence gates pass, evaluate F-122; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: cycle identifier; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-122', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-122); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-122 and applicable family/product/representation white papers
Type	cycle identifier
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

23.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_122 : Formula<cycle identifier>
  definition "Prohibits same-cycle feedback and creates a new receipt chain."
  expression `cycle_reentry=cycle_exit+1`
  participants ["J0", "M3", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


23.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-122 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-123 - Perspective transform residual

Exact expression

$$r_Pi=x_B-T_A_to_B*x_A$$

Meaning. Measures disagreement after transforming observations between reference frames.

Bound manifestations. MK, JO, EVE, MERMAID

Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 123
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.MERMAID
Declaration	formula F-123 'Perspective transform residual'
Definition	Measures disagreement after transforming observations between reference frames.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, EVE, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	$r_Pi=x_B-T_A_to_B*x_A$
Statement	When typed inputs and evidence gates pass, evaluate F-123; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: typed vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-123', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-123); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-123 and applicable family/product/representation white papers
Type	typed vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

24.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_123 : Formula<typed vector>
  definition "Measures disagreement after transforming observations between reference
↵ frames."
  expression `r_Pi=x_B-T_A_to_B*x_A`
  participants ["MK", "JO", "EVE", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

24.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-123 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-124 - Physical pressure-flow dissipation

Exact expression

E_diss=int(Delta_p(t)*Q(t)dt)

Meaning. Stores measured physical dissipation only when pressure and flow are evidenced.

Bound manifestations. MK, JO, MERMAID

Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_124
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.MERMAID
Declaration	formula F-124 'Physical pressure-flow dissipation'
Definition	Stores measured physical dissipation only when pressure and flow are evidenced.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	E_diss=int(Delta_p(t)*Q(t)dt)
Statement	When typed inputs and evidence gates pass, evaluate F-124; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: energy; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-124', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-124); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-124 and applicable family/product/representation white papers
Type	energy
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

25.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_124 : Formula<energy>
  definition "Stores measured physical dissipation only when pressure and flow are
↵ evidenced."
  expression `E_diss=int(Delta_p(t)*Q(t)dt)`
  participants ["MK", "JO", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

25.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-124 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-125 - Information friction

Exact expression

C_info=int(B_residual(t)dt)

Meaning. Stores unresolved information or memory cost without treating it as energy.
Bound manifestations. J0, M3, MERMAID
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 125
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MERMAID
Declaration	formula F-125 'Information friction'
Definition	Stores unresolved information or memory cost without treating it as energy.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	J0, M3, MERMAID
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	C_info=int(B_residual(t)dt)
Statement	When typed inputs and evidence gates pass, evaluate F-125; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: byte*time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-125', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-125); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-125 and applicable family/product/representation white papers
Type	byte*time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

26.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_125 : Formula<byte*time>
  definition "Stores unresolved information or memory cost without treating it as energy."
  expression `C_info=int(B_residual(t)dt)`
  participants ["J0", "M3", "MERMAID"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

26.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-125 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-126 - Rotational setpoint damping

Exact expression

$$\omega_{\tilde{}} = (2/3) \cdot \omega + (1/3) \cdot \omega_{\text{star}}$$

Meaning. Damps the desired rotational-wave setpoint.
Bound manifestations. MK, JO, SISTER
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 126
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-126 'Rotational setpoint damping'
Definition	Damps the desired rotational-wave setpoint.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	$\omega_{\tilde{}} = (2/3) \cdot \omega + (1/3) \cdot \omega_{\text{star}}$
Statement	When typed inputs and evidence gates pass, evaluate F-126; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: angular velocity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-126', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-126); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2, 3, 1
Reference	pathways/FORMULA-REGISTER.json#F-126 and applicable family/product/representation white papers
Type	angular velocity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

27.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_126 : Formula<angular velocity>
  definition "Damps the desired rotational-wave setpoint."
  expression `omega_tilde=(2/3)*omega+(1/3)*omega_star`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


27.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-126 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-127 - Rotational step cap

Exact expression

|omega_next-omega|<=0.1*omega_scale

Meaning. Limits one-step rotational changes.
Bound manifestations. MK, JO, ANGELS
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 127
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS
Declaration	formula F-127 'Rotational step cap'
Definition	Limits one-step rotational changes.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	omega_next-omega <=0.1*omega_scale
Statement	When typed inputs and evidence gates pass, evaluate F-127; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: angular velocity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-127', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel,begin; R1.predict; JP.represent(F-127); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0.1
Reference	pathways/FORMULA-REGISTER.json#F-127 and applicable family/product/representation white papers
Type	angular velocity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

28.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_127 : Formula<angular velocity>
  definition "Limits one-step rotational changes."
  expression `|omega_next-omega|<=0.1*omega_scale`
  participants ["MK", "JO", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

28.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-127 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-128 - Outlet transfer conservation

Exact expression

q_exit=q_lake_in+q_EVE+q_escape+r_o

Meaning. Separates lake admission, EVE observation, escape, and residual.

Bound manifestations. EVE, SISTER, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 128
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-128 'Outlet transfer conservation'
Definition	Separates lake admission, EVE observation, escape, and residual.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, SISTER, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	q_exit=q_lake_in+q_EVE+q_escape+r_o
Statement	When typed inputs and evidence gates pass, evaluate F-128; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed quantity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-128', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-128); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-128 and applicable family/product/representation white papers
Type	typed quantity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

29.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_128 : Formula<typed quantity>
  definition "Separates lake admission, EVE observation, escape, and residual."
  expression `q_exit=q_lake_in+q_EVE+q_escape+r_o`
  participants ["EVE", "SISTER", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

29.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-128 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-129 - Re-entry recalculation vector

Exact expression

Delta_x=[Delta_m,Delta_W,Delta_V,Delta_rho,Delta_T,Delta_p,Delta_h]

Meaning. Declares the observed changes that trigger recalculation before re-entry.
Bound manifestations. MK, JO, EVE, SISTER
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 129
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.SISTER
Declaration	formula F-129 'Re-entry recalculation vector'
Definition	Declares the observed changes that trigger recalculation before re-entry.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, EVE, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	Delta_x=[Delta_m,Delta_W,Delta_V,Delta_rho,Delta_T,Delta_p,Delta_h]
Statement	When typed inputs and evidence gates pass, evaluate F-129; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed vector; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-129', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-129); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-129 and applicable family/product/representation white papers
Type	typed vector
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

30.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_129 : Formula<typed vector>
  definition "Declares the observed changes that trigger recalculation before re-entry."
  expression `Delta_x=[Delta_m,Delta_W,Delta_V,Delta_rho,Delta_T,Delta_p,Delta_h]`
  participants ["MK", "JO", "EVE", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

30.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-129 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-130 - Re-entry admissibility predicate

Exact expression

Admit_re=types&units&new_cycle&capacity&wave&MK&JO&Angels&M3&MJ

Meaning. Requires complete physics, evidence, safety, routing, and authority before physical re-entry.
Bound manifestations. Bangel , JP, MK, JO, ANGELS, M3, MJ
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 130
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.Bangel , MJ.PBMEF.Family.JP, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-130 'Re-entry admissibility predicate'
Definition	Requires complete physics, evidence, safety, routing, and authority before physical re-entry.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	Bangel , JP, MK, JO, ANGELS, M3, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	Admit_re=types&units&new_cycle&capacity&wave&MK&JO&Angels&M3&MJ
Statement	When typed inputs and evidence gates pass, evaluate F-130; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-130', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel .begin; R1.predict; JP.represent(F-130); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-130 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

31.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_130 : Formula<logical>
  definition "Requires complete physics, evidence, safety, routing, and authority before
  ↪ physical re-entry."
  expression `Admit_re=types&units&new_cycle&capacity&wave&MK&JO&Angels&M3&MJ`
  participants ["Bangel ", "JP", "MK", "JO", "ANGELS", "M3", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


31.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-130 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-131 - Uncertainty-aware Pearl reference clearance

Exact expression

$$\min_s(||\gamma_{out}(s)-c_P||-R_P,sim) \geq c_{min}+U_{path}$$

Meaning. Path remains outside the nonphysical Pearl simulation reference circle after uncertainty is included.

Bound manifestations. PEARL, MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F_131
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.PEARL, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-131 'Uncertainty-aware Pearl reference clearance'
Definition	Path remains outside the nonphysical Pearl simulation reference circle after uncertainty is included.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	PEARL, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$\min_s(\gamma_{out}(s)-c_P -R_P,sim) \geq c_{min}+U_{path}$
Statement	When typed inputs and evidence gates pass, evaluate F-131; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-131', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-131); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-131 and applicable family/product/representation white papers
Type	length
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

32.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_131 : Formula<length>
  definition "Path remains outside the nonphysical Pearl simulation reference circle after
  ↪ uncertainty is included."
  expression `min_s(||gamma_out(s)-c_P||-R_P,sim) >= c_min+U_path`
  participants ["PEARL", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
```

}

32.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-131 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-132 - Outward angular-gap predicate

Exact expression

abs(wrap(alpha_out-alpha_gap)) <= Delta_alpha_gap/2

Meaning. Outlet direction remains within the declared outward-facing gap.
Bound manifestations. JP, MK, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 132
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family,JP, MJ.PBMEF.Family,MK, MJ.PBMEF.Family,JO
Declaration	formula F-132 'Outward angular-gap predicate'
Definition	Outlet direction remains within the declared outward-facing gap.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	abs(wrap(alpha_out-alpha_gap)) <= Delta_alpha_gap/2
Statement	When typed inputs and evidence gates pass, evaluate F-132; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-132', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-132); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-132 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

33.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_132 : Formula<logical>
  definition "Outlet direction remains within the declared outward-facing gap."
  expression `abs(wrap(alpha_out-alpha_gap)) <= Delta_alpha_gap/2`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

33.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-132 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-133 - Available outlet pressure

Exact expression

Delta_p_available=p_containment-p_lake+rho*g*(z_out-z_lake)

Meaning. Pressure and elevation state available to drive a reference outlet flow.
Bound manifestations. MK, JO, SISTER
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 133
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.SISTER
Declaration	formula F-133 'Available outlet pressure'
Definition	Pressure and elevation state available to drive a reference outlet flow.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO, SISTER
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	Delta_p_available=p_containment-p_lake+rho*g*(z_out-z_lake)
Statement	When typed inputs and evidence gates pass, evaluate F-133; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: pressure; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-133', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-133); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-133 and applicable family/product/representation white papers
Type	pressure
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

34.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_133 : Formula<pressure>
  definition "Pressure and elevation state available to drive a reference outlet flow."
  expression `Delta_p_available=p_containment-p_lake+rho*g*(z_out-z_lake)`
  participants ["MK", "JO", "SISTER"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

34.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-133 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-134 - Outlet pressure margin

Exact expression

Delta_p_margin=Delta_p_available-Delta_p_loss-U_Delta_p

Meaning. Conservative pressure margin after losses and uncertainty.

Bound manifestations. MK, J0

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 134
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-134 'Outlet pressure margin'
Definition	Conservative pressure margin after losses and uncertainty.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, J0
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> J0 -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> J0 output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	Delta_p_margin=Delta_p_available-Delta_p_loss-U_Delta_p
Statement	When typed inputs and evidence gates pass, evaluate F-134; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: pressure; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-134', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,J0); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-134); MK.classify; J0.verify; N1.allocate_if_applicable; MJ.decide; J0.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-134 and applicable family/product/representation white papers
Type	pressure
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

35.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_134 : Formula<pressure>
  definition "Conservative pressure margin after losses and uncertainty."
  expression `Delta_p_margin=Delta_p_available-Delta_p_loss-U_Delta_p`
  participants ["MK", "J0"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> J0.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output J0.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


35.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-134 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-135 - Minimum outlet grade

Exact expression

$$\alpha_{\min} = \text{atan}(\max(0, \Delta p_{\text{loss}} + U_{\Delta p} - (p_{\text{containment}} - p_{\text{lake}})) / (\rho \cdot g \cdot L_{\text{path}}))$$

Meaning. Minimum modeled grade needed to overcome pressure deficit under declared assumptions.
Bound manifestations. JP, MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 135
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJO
Declaration	formula F-135 'Minimum outlet grade'
Definition	Minimum modeled grade needed to overcome pressure deficit under declared assumptions.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$\alpha_{\min} = \text{atan}(\max(0, \Delta p_{\text{loss}} + U_{\Delta p} - (p_{\text{containment}} - p_{\text{lake}})) / (\rho \cdot g \cdot L_{\text{path}}))$
Statement	When typed inputs and evidence gates pass, evaluate F-135; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: angle; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-135', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-135); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-135 and applicable family/product/representation white papers
Type	angle
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

36.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_135 : Formula<angle>
  definition "Minimum modeled grade needed to overcome pressure deficit under declared
  assumptions."
  expression
  `alpha_min=atan(max(0,Delta_p_loss+U_Delta_p-(p_containment-p_lake))/(rho*g*L_path))`
  participants ["JP", "MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

36.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-135 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-136 - Selected positive outlet grade

Exact expression

alpha_selected=alpha_min+delta_alpha; delta_alpha>0

Meaning. Slight positive increase above the modeled minimum; no universal value is asserted.

Bound manifestations. JP, MK, JO, MJ

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 136
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.FamilyJP, MJ.PBMEF.FamilyMK, MJ.PBMEF.FamilyJO, MJ.PBMEF.FamilyMJ
Declaration	formula F-136 'Selected positive outlet grade'
Definition	Slight positive increase above the modeled minimum; no universal value is asserted.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	JP, MK, JO, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	alpha_selected=alpha_min+delta_alpha; delta_alpha>0
Statement	When typed inputs and evidence gates pass, evaluate F-136; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: angle; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-136', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-136); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	0
Reference	pathways/FORMULA-REGISTER.json#F-136 and applicable family/product/representation white papers
Type	angle
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

37.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_136 : Formula<angle>
  definition "Slight positive increase above the modeled minimum; no universal value is
↵ asserted."
  expression `alpha_selected=alpha_min+delta_alpha; delta_alpha>0`
  participants ["JP", "MK", "JO", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

37.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-136 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-137 - Incompressible reference outlet flow

Exact expression

$$Q_{ref}=C_d*A_{out}*sqrt(2*max(0,Delta_p_{available}-Delta_p_{loss})/rho)$$

Meaning. Conditional reference flow under evidenced incompressible assumptions.

Bound manifestations. MK, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 137
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-137 'Incompressible reference outlet flow'
Definition	Conditional reference flow under evidenced incompressible assumptions.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$Q_{ref}=C_d*A_{out}*sqrt(2*max(0,Delta_p_{available}-Delta_p_{loss})/rho)$
Statement	When typed inputs and evidence gates pass, evaluate F-137; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: volume/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-137', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-137); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2, 0
Reference	pathways/FORMULA-REGISTER.json#F-137 and applicable family/product/representation white papers
Type	volume/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

38.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_137 : Formula<volume/time>
  definition "Conditional reference flow under evidenced incompressible assumptions."
  expression `Q_ref=C_d*A_out*sqrt(2*max(0,Delta_p_available-Delta_p_loss)/rho)`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

38.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-137 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-138 - Mean outlet velocity

Exact expression

U_out=Q_ref/A_out

Meaning. Conditional mean velocity for the declared outlet area.
Bound manifestations. MK, JO
Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 138
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-138 'Mean outlet velocity'
Definition	Conditional mean velocity for the declared outlet area.
Capability	MEASURE_REFERENCE, SIMULATE, VERIFY_UNITS, RECONCILE
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	U_out=Q_ref/A_out
Statement	When typed inputs and evidence gates pass, evaluate F-138; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: length/time; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-138', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-138); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-138 and applicable family/product/representation white papers
Type	length/time
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

39.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_138 : Formula<length/time>
  definition "Conditional mean velocity for the declared outlet area."
  expression `U_out=Q_ref/A_out`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


39.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-138 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-139 - Weber number reference

Exact expression

We=ρ*U²*L/σ

Meaning. Surface-tension-to-inertia reference when the model applies.
Bound manifestations. MK, JO
Gateway stage. Reservoir/lake/re-entry reference pathway and successor-cycle evidence

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 139
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO
Declaration	formula F-139 'Weber number reference'
Definition	Surface-tension-to-inertia reference when the model applies.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Reservoir/lake/re-entry reference pathway and successor-cycle evidence
Expression	We=ρ*U ² *L/σ
Statement	When typed inputs and evidence gates pass, evaluate F-139; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-139', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-139); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	2
Reference	pathways/FORMULA-REGISTER.json#F-139 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Reservoir/lake/re-entry reference pathway and successor-cycle evidence'; physical_validation=false; authority=false

40.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_139 : Formula<dimensionless>
  definition "Surface-tension-to-inertia reference when the model applies."
  expression `We=ρ*U^2*L/σ`
  participants ["MK", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

40.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-139 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-140 - Wave amplitude ratio

Exact expression

epsilon_a=a_wave/h_L

Meaning. Dimensionless small-amplitude observation ratio.

Bound manifestations. MK, JO, EVE

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 140
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.EVE
Declaration	formula F-140 'Wave amplitude ratio'
Definition	Dimensionless small-amplitude observation ratio.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	MK, JO, EVE
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	epsilon_a=a_wave/h_L
Statement	When typed inputs and evidence gates pass, evaluate F-140; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: dimensionless; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-140', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP.MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-140); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-140 and applicable family/product/representation white papers
Type	dimensionless
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

41.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_140 : Formula<dimensionless>
  definition "Dimensionless small-amplitude observation ratio."
  expression `epsilon_a=a_wave/h_L`
  participants ["MK", "JO", "EVE"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

41.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-140 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-141 - Small-wave observation gate

Exact expression

WaveGate=(Fr<=Fr_max)&(epsilon_a<=epsilon_a,max)&(We<=We_max when applicable)

Meaning. Reference gate for bounded low-amplitude observations; not proof of wave suppression.

Bound manifestations. MK, JO, ANGELS

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 141
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.JO, MJ.PBMEF.Family.ANGELS
Declaration	formula F-141 'Small-wave observation gate'
Definition	Reference gate for bounded low-amplitude observations; not proof of wave suppression.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	MK, JO, ANGELS
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	WaveGate=(Fr<=Fr_max)&(epsilon_a<=epsilon_a,max)&(We<=We_max when applicable)
Statement	When typed inputs and evidence gates pass, evaluate F-141; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-141', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-141); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-141 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

42.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_141 : Formula<logical>
  definition "Reference gate for bounded low-amplitude observations; not proof of wave
  ↵ suppression."
  expression `WaveGate=(Fr<=Fr_max)&(epsilon_a<=epsilon_a,max)&(We<=We_max when applicable)`
  participants ["MK", "JO", "ANGELS"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

42.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-141 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-142 - Discrete reservoir inventory

Exact expression

$$q_L,t+1=q_L,t+q_{out}-q_{return}-q_{drain}-q_{escape}-r_L$$

Meaning. Receipted discrete update for the separate lake/buffer control volume.

Bound manifestations. EVE, M3, MERMAID, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 142
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MERMAID, MJ.PBMEF.Family.JO
Declaration	formula F-142 'Discrete reservoir inventory'
Definition	Receipted discrete update for the separate lake/buffer control volume.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	EVE, M3, MERMAID, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	$q_L,t+1=q_L,t+q_{out}-q_{return}-q_{drain}-q_{escape}-r_L$
Statement	When typed inputs and evidence gates pass, evaluate F-142; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed quantity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-142', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-142); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-142 and applicable family/product/representation white papers
Type	typed quantity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

43.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_142 : Formula<typed quantity>
  definition "Receipted discrete update for the separate lake/buffer control volume."
  expression `q_L,t+1=q_L,t+q_out-q_return-q_drain-q_escape-r_L`
  participants ["EVE", "M3", "MERMAID", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```


43.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-142 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-143 - Vector reservoir headroom

Exact expression

H_L,k=C_L,k-q_L,k

Meaning. Headroom remains separate for every resource dimension.

Bound manifestations. SISTER, EVE, JO

Gateway stage. Sister/EVE/MK/JO containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 143
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.SISTER, MJ.PBMEF.Family.EVE, MJ.PBMEF.Family.JO
Declaration	formula F-143 'Vector reservoir headroom'
Definition	Headroom remains separate for every resource dimension.
Capability	REPRESENT, CALCULATE, VERIFY, RECEIPT
Participant	SISTER, EVE, JO
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/JO containment or simulation evidence before MJ permit
Expression	H_L,k=C_L,k-q_L,k
Statement	When typed inputs and evidence gates pass, evaluate F-143; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: typed capacity; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-143', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-143); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	No numeric literal; symbolic inputs only
Reference	pathways/FORMULA-REGISTER.json#F-143 and applicable family/product/representation white papers
Type	typed capacity
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/JO containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

44.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_143 : Formula<typed capacity>
  definition "Headroom remains separate for every resource dimension."
  expression `H_L,k=C_L,k-q_L,k`
  participants ["SISTER", "EVE", "JO"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

44.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-143 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

F-144 - Vector reservoir admission

Exact expression

Admit_L=AND_k[q_L,k+q_in,k <= (1-h_L,k)C_L,k]

Meaning. Admission fails when any resource dimension lacks required headroom.

Bound manifestations. ANGELS, M3, MK, J0, MJ

Gateway stage. Sister/EVE/MK/J0 containment or simulation evidence before MJ permit

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 144
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.MK, MJ.PBMEF.Family.J0
Declaration	formula F-144 'Vector reservoir admission'
Definition	Admission fails when any resource dimension lacks required headroom.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	ANGELS, M3, MK, J0, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Sister/EVE/MK/J0 containment or simulation evidence before MJ permit
Expression	Admit_L=AND_k[q_L,k+q_in,k <= (1-h_L,k)C_L,k]
Statement	When typed inputs and evidence gates pass, evaluate F-144; otherwise preserve HOLD, FAIL_TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-144', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel, begin; R1.predict; JP.represent(F-144); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-144 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Sister/EVE/MK/J0 containment or simulation evidence before MJ permit'; physical_validation=false; authority=false

45.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_144 : Formula<logical>
  definition "Admission fails when any resource dimension lacks required headroom."
  expression `Admit_L=AND_k[q_L,k+q_in,k <= (1-h_L,k)C_L,k]`
  participants ["ANGELS", "M3", "MK", "J0", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

45.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-144 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

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F-145 - No same-cycle feedback predicate

Exact expression

ReentryValid=(cycle_reentry=cycle_exit+1)&no_uncleared_generation_reuse

Meaning. Re-entry starts a new receipted cycle and cannot feed the same active generation.

Bound manifestations. M3, J0, ANGELS, MJ

Gateway stage. Mermaid/Shiva financial analysis and reconciliation before MJ decision

Construct	Formula-specific expression
Module	MJ.PBMEF.reservoir.outlet_lake_reentry_friction
Namespace	MJ.PBMEF.reservoir.outlet_lake_reentry_friction.F 145
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Formulas, MJ.PBMEF.Family.M3, MJ.PBMEF.Family.J0, MJ.PBMEF.Family.ANGELS, MJ.PBMEF.Family.MJ
Declaration	formula F-145 'No same-cycle feedback predicate'
Definition	Re-entry starts a new receipted cycle and cannot feed the same active generation.
Capability	CLASSIFY, VALIDATE, HOLD, DENY
Participant	M3, J0, ANGELS, MJ
Relationship	Human purpose -> MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence families -> M3 -> Mermaid/Shiva -> MJ -> JO output
Function	Mermaid/Shiva financial analysis and reconciliation before MJ decision
Expression	ReentryValid=(cycle_reentry=cycle_exit+1)&no_uncleared_generation_reuse
Statement	When typed inputs and evidence gates pass, evaluate F-145; otherwise preserve HOLD, FAIL, TECHNICAL, or DENY.
Measurement	Result dimension/type: logical; physical inputs require units, boundary, time, calibration, and uncertainty.
Constraint	UNKNOWN != 0; no self-authorization; no cross-unit coercion; evidence ceiling controls claims.
Annotation	@formula(id='F-145', source='pathways/FORMULA-REGISTER.json', build='MJ-PBMEF-DAY0-R5-REVIEW-CANDIDATE')
Directive	verify_with(JP,MK,JO); route_with(M3 when applicable); reconcile_with(Mermaid/Shiva when applicable); permit_by(MJ).
Block	R0 { Bangel.begin; R1.predict; JP.represent(F-145); MK.classify; JO.verify; N1.allocate_if_applicable; MJ.decide; JO.receipt; }
Literal	1
Reference	pathways/FORMULA-REGISTER.json#F-145 and applicable family/product/representation white papers
Type	logical
Attribute	status=REFERENCE_OR_TYPED_CANON; stage='Mermaid/Shiva financial analysis and reconciliation before MJ decision'; physical_validation=false; authority=false

46.1 Gateway life-cycle example

```
module MJ.PBMEF.reservoir.outlet_lake_reentry_friction {
  import MJ.PBMEF.Manifest
  import MJ.PBMEF.Formulas
  declaration F_145 : Formula<logical>
  definition "Re-entry starts a new receipted cycle and cannot feed the same active
  ↪ generation."
  expression `ReentryValid=(cycle_reentry=cycle_exit+1)&no_uncleared_generation_reuse`
  participants ["M3", "J0", "ANGELS", "MJ"]
  constraint UNKNOWN != 0
  constraint authority == MJ.only
  directive JP.represent -> MK.classify -> JO.verify
  directive N1.allocate when resource_path_applicable
  directive M3.route when handoff_applicable
  directive Mermaid.reconcile when balance_applicable
  directive Shiva.analyze when capital_applicable
  output JO.receipt(PASS | HOLD | FAIL_TECHNICAL | DENY)
}
```

46.2 Lifecycle from request to final output

1. R/R0: receive founder or user purpose and exact command scope.
2. Bangel.begin: parse modules, namespaces, declarations, literals, types, constraints, and directives.
3. Elsa: recover semantic purpose, variable meaning, and ambiguity without creating authority.
4. JP: create the canonical CAPO for F-145 and its assumptions, inputs, outputs, and invariants.
5. MK: classify direct-physical, resource-physical, or abstract-nonphysical applicability; validate units, boundary, conservation, scale, and evidence ceiling.
6. JO: run deterministic validation, preserve unknowns, and create a proof-receipt candidate.
7. R1: hold the object in unidentified transition until required evidence is sufficient.
8. N1: when allocation applies, use the prediction-first node and exact front-end allocation constraints; no physical coordinate is inferred.
9. Angels/Bellatrix/Sister/EVE: provide applicable safety, anomaly, prediction, containment, screen, and egress evidence.
10. M3: route admitted resources and handoffs without minting authority.
11. Mermaid/Shiva: reconcile balances and financial implications when relevant.
12. MJ: issue PASS, HOLD, FAIL_TECHNICAL, or DENY within the bounded permit class.
13. JO: execute only admitted non-prohibited effects and emit the final R2 living-static receipt.

Evidence and ethics boundary

Mathematical correctness does not prove physical performance and does not authorize an effect. A formula may remain fully valid while a product instance is held for missing calibration, dimensions, environmental state, uncertainty, authority, or safety evidence. Weaponized use, destructive delivery, offensive targeting, and authorization laundering are DENY states.

MJ-PBMEF Pink Paper - Volume V

Family Manifestations and Governed Object Gateway Bindings

Michael Bangel - Author and Architect

August 2026

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Document control

Project	MJos Predictive Model
Project ID	MJ - PBMEF - 001
Source build	MJ - PBMEF - DAY0 - R5 - REVIEW - CANDIDATE
Document ID	MJ - PBMEF - PINK - PAPER - 001 / VOL - V
Author and architect	Michael Bangel
Status	FOUNDER_REVIEW_CANDIDATE_PENDING_FREEZE
Scope	All family manifestations and governed objects in gateway and life-cycle context.

Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Family manifestation verification

MJ - MJ

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MJ
Namespace	MJ.PBMEF.Family.MJ.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MJ
Definition	Project root, founder-governed authority and final bounded permit decision.
Capability	bounded permit, hold, deny, project state
Participant	MJ
Relationship	Incoming: MICHAEL_BANGEL; outgoing: Bangel
Function	Project root, founder-governed authority and final bounded permit decision.
Expression	Applicable formula set and bounded family receipt
Statement	MJ contributes its role but cannot substitute for another participant.
Measurement	founder purpose, verified evidence, family receipts, Pearl and Bangel Spreadsheets decision packets
Constraint	Cannot convert unknown evidence into permission or claim external authority.
Annotation	@family(id='MJ', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MJ { input; verify; output; boundary; }
Literal	truth, measurement, human authority, stewardship, non-weaponization
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	ROOT
Attribute	full_family_identity=true; self_authority=false

2.1 Command-life-cycle role

At R0/R1, MJ receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Cannot convert unknown evidence into permission or claim external authority.

Bangel - Bangel

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.Bangel
Namespace	MJ.PBMEF.Family.Bangel .Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant Bangel
Definition	Human-facing governed language that preserves purpose and command structure.
Capability	typed command envelope, source representation, Bangel Sheet source, if/how/then operational intake
Participant	Bangel
Relationship	Incoming: MJ; outgoing: ELSA
Function	Human-facing governed language that preserves purpose and command structure.
Expression	Applicable formula set and bounded family receipt
Statement	Bangel contributes its role but cannot substitute for another participant.
Measurement	human purpose, declared scope
Constraint	No independent execution, financial issuance, or physical truth.
Annotation	@family(id='Bangel ', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant Bangel { input; verify; output; boundary; }
Literal	intent integrity, explicit types, traceability
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

3.1 Command-life-cycle role

At R0/R1, Bangel receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No independent execution, financial issuance, or physical truth.

Elsa - ELSA

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.ELSA
Namespace	MJ.PBMEF.Family.ELSA.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant ELSA
Definition	Deterministic semantic recovery and purpose-preservation layer.
Capability	semantic envelope, ambiguity hold
Participant	Elsa
Relationship	Incoming: Bangel ; outgoing: JP
Function	Deterministic semantic recovery and purpose-preservation layer.
Expression	Applicable formula set and bounded family receipt
Statement	Elsa contributes its role but cannot substitute for another participant.
Measurement	Bangel source, context, evidence
Constraint	No execution, permit, finance, or invented intent.
Annotation	@family(id='ELSA', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant ELSA { input; verify; output; boundary; }
Literal	meaning fidelity, purpose confinement, clarity
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

4.1 Command-life-cycle role

At R0/R1, Elsa receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No execution, permit, finance, or invented intent.

JP - JP

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.JP
Namespace	MJ.PBMEF.Family.JP.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant JP
Definition	Canonical mathematical, algorithmic, topology, CAPO, and architecture representation.
Capability	math CAPO, algorithm CAPO, architecture CAPO, Pearl CAPO, Bangel Sheet dependency CAPO, JPOSMJ product envelope
Participant	JP
Relationship	Incoming: ELSA; outgoing: MK
Function	Canonical mathematical, algorithmic, topology, CAPO, and architecture representation.
Expression	Applicable formula set and bounded family receipt
Statement	JP contributes its role but cannot substitute for another participant.
Measurement	semantic envelope, founder laws
Constraint	Representation is not admission, execution, or authority.
Annotation	@family(id='JP', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant JP { input; verify; output; boundary; }
Literal	mathematical rigor, provenance, equivalence
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

5.1 Command-life-cycle role

At R0/R1, JP receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Representation is not admission, execution, or authority.

Mika / MK - MK

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MK
Namespace	MJ.PBMEF.Family.MK.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MK
Definition	Physics Modulator System for dimensional, conservation, boundary, scale, and evidence representation.
Capability	physics CAPO, not-applicable receipt, hold, technical fail, Pearl physics receipt, spreadsheet resource-physics receipt
Participant	Mika / MK
Relationship	Incoming: JP; outgoing: JO, BELLE
Function	Physics Modulator System for dimensional, conservation, boundary, scale, and evidence representation.
Expression	Applicable formula set and bounded family receipt
Statement	Mika / MK contributes its role but cannot substitute for another participant.
Measurement	JP math CAPO, environment, control volume, evidence, Pearl simulation geometry/acoustic profile, Bangel Sheet workload and dependency field
Constraint	No MJ permit, coordinate approval, physical validation, or evidence invention.
Annotation	@family(id='MK', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MK { input; verify; output; boundary; }
Literal	physical truth, unit integrity, conservation, uncertainty honesty
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

6.1 Command-life-cycle role

At R0/R1, Mika / MK receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No MJ permit, coordinate approval, physical validation, or evidence invention.

JO - JO

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.JO
Namespace	MJ.PBMEF.Family.JO.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant JO
Definition	Deterministic type, unit, proof, validation, runtime, and evidence engine.
Capability	proof receipt, runtime result, hold, deny, sheet revision receipt, Pearl balance receipt
Participant	JO
Relationship	Incoming: MK; outgoing: ANGELS, BELLATRIX, SISTER, EVE
Function	Deterministic type, unit, proof, validation, runtime, and evidence engine.
Expression	Applicable formula set and bounded family receipt
Statement	JO contributes its role but cannot substitute for another participant.
Measurement	typed CAPOs, authority receipts, evidence, Bangel Sheet revisions, Pearl lifecycle packets
Constraint	No invented purpose, physics, authority, finance, or external effect.
Annotation	@family(id='JO', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant JO { input; verify; output; boundary; }
Literal	fail closed, reproducibility, auditability
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

7.1 Command-life-cycle role

At R0/R1, JO receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No invented purpose, physics, authority, finance, or external effect.

MJOS - MJOS

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MJOS
Namespace	MJ.PBMEF.Family.MJOS.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MJOS
Definition	Operating-system and infrastructure substrate inside MJ.
Capability	resource service, infrastructure evidence
Participant	MJOS
Relationship	Incoming: JO_EXECUTION; outgoing: receipt to MJ/JO
Function	Operating-system and infrastructure substrate inside MJ.
Expression	Applicable formula set and bounded family receipt
Statement	MJOS contributes its role but cannot substitute for another participant.
Measurement	MJ leases, JO execution plan
Constraint	Not a second authority principal.
Annotation	@family(id='MJOS', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MJOS { input; verify; output; boundary; }
Literal	bounded resources, continuity, isolation
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

8.1 Command-life-cycle role

At R0/R1, MJOS receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Not a second authority principal.

Angels - ANGELS

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.ANGELS
Namespace	MJ.PBMEF.Family.ANGELS.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant ANGELS
Definition	Domain-specific observation, telemetry, hold, denial, and corrective-command family.
Capability	safety receipt, hold, deny, correction request
Participant	Angels
Relationship	Incoming: JO; outgoing: M3
Function	Domain-specific observation, telemetry, hold, denial, and corrective-command family.
Expression	Applicable formula set and bounded family receipt
Statement	Angels contributes its role but cannot substitute for another participant.
Measurement	commands, evidence, state
Constraint	No self-admission, ordinary execution, or scope expansion.
Annotation	@family(id='ANGELS', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant ANGELS { input; verify; output; boundary; }
Literal	safety, watchfulness, correction
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION_FAMILY
Attribute	full_family_identity=true; self_authority=false

9.1 Command-life-cycle role

At R0/R1, Angels receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No self-admission, ordinary execution, or scope expansion.

Bellatrix - BELLATRIX

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.BELLATRIX
Namespace	MJ.PBMEF.Family.BELLATRIX.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant BELLATRIX
Definition	Independent defense, challenge, quarantine, hostile-deviation analysis, and denial.
Capability	deny, quarantine, challenge receipt
Participant	Bellatrix
Relationship	Incoming: JO; outgoing: M3
Function	Independent defense, challenge, quarantine, hostile-deviation analysis, and denial.
Expression	Applicable formula set and bounded family receipt
Statement	Bellatrix contributes its role but cannot substitute for another participant.
Measurement	commands, threat evidence
Constraint	No positive general admission.
Annotation	@family(id='BELLATRIX', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant BELLATRIX { input; verify; output; boundary; }
Literal	defense, independence, containment
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

10.1 Command-life-cycle role

At R0/R1, Bellatrix receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No positive general admission.

Sister - SISTER

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.SISTER
Namespace	MJ.PBMEF.Family.SISTER.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant SISTER
Definition	Predictive digital twin, preallocation evidence, anomaly detection, umbrella collection, and canonical physical containment request.
Capability	forecast, containment request, digital-twin receipt, physical containment request and Pearl simulation request
Participant	Sister
Relationship	Incoming: JO; outgoing: M3
Function	Predictive digital twin, preallocation evidence, anomaly detection, umbrella collection, and canonical physical containment request.
Expression	Applicable formula set and bounded family receipt
Statement	Sister contributes its role but cannot substitute for another participant.
Measurement	state stream, request trend, variance
Constraint	Prediction is not permission.
Annotation	@family(id='SISTER', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant SISTER { input; verify; output; boundary; }
Literal	prediction, redundancy, early warning
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

11.1 Command-life-cycle role

At R0/R1, Sister receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Prediction is not permission.

EVE - EVE

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.EVE
Namespace	MJ.PBMEF.Family.EVE.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant EVE
Definition	Variance, evaporative effect, screen capture, leakage, smoke-like egress, and boundary-accounting evidence.
Capability	EVE observation, capture/egress ledger, hold, Pearl escape/capture observation
Participant	EVE
Relationship	Incoming: JO; outgoing: M3
Function	Variance, evaporative effect, screen capture, leakage, smoke-like egress, and boundary-accounting evidence.
Expression	Applicable formula set and bounded family receipt
Statement	EVE contributes its role but cannot substitute for another participant.
Measurement	mass/weight states, flows, screen measurements, residuals
Constraint	No release, pricing, minting, or execution.
Annotation	@family(id='EVE', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant EVE { input; verify; output; boundary; }
Literal	diligence, respect, loss accounting, boundary truth
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

12.1 Command-life-cycle role

At R0/R1, EVE receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No release, pricing, minting, or execution.

Mary / M3 - M3

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.M3
Namespace	MJ.PBMEF.Family.M3.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant M3
Definition	Bounded routing, API gateway, load balancing, connection pooling, and allocation stewardship.
Capability	route receipt, allocation lease use, return receipt, Pearl allocation/transfer receipt, Bangel Sheet partition route receipt
Participant	Mary / M3
Relationship	Incoming: ANGELS, BELLATRIX, SISTER, EVE; outgoing: MERMAID, SHIVA
Function	Bounded routing, API gateway, load balancing, connection pooling, and allocation stewardship.
Expression	Applicable formula set and bounded family receipt
Statement	Mary / M3 contributes its role but cannot substitute for another participant.
Measurement	admitted command, MJ lease, capacity evidence
Constraint	No authority minting, lease widening, or denial bypass.
Annotation	@family(id='M3', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant M3 { input; verify; output; boundary; }
Literal	fair allocation, resource hygiene, bounded routing
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

13.1 Command-life-cycle role

At R0/R1, Mary / M3 receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No authority minting, lease widening, or denial bypass.

Mermaid - MERMAID

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MERMAID
Namespace	MJ.PBMEF.Family.MERMAID.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MERMAID
Definition	Accounting, reconciliation, exposure, custody evidence, statements, tax lots, and financial consequence.
Capability	account, balance, exposure, reconciliation receipt
Participant	Mermaid
Relationship	Incoming: M3; outgoing: MJ_DECISION
Function	Accounting, reconciliation, exposure, custody evidence, statements, tax lots, and financial consequence.
Expression	Applicable formula set and bounded family receipt
Statement	Mermaid contributes its role but cannot substitute for another participant.
Measurement	transaction evidence, EVE evidence, Shiva proposal, Pearl lifecycle and Bangel Sheet audit particles
Constraint	No source-truth invention, minting, or final permit.
Annotation	@family(id='MERMAID', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MERMAID { input; verify; output; boundary; }
Literal	ledger truth, reconciliation, transparency
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

14.1 Command-life-cycle role

At R0/R1, Mermaid receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO's final R2 receipt.

Hard boundary

No source-truth invention, minting, or final permit.

Shiva - SHIVA

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.SHIVA
Namespace	MJ.PBMEF.Family.SHIVA.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant SHIVA
Definition	Finance, money, treasury, liquidity, capital-job classification, risk/opportunity analysis, and distribution proposal.
Capability	capital proposal, job-of-money classification, distribution plan
Participant	Shiva
Relationship	Incoming: M3; outgoing: MJ_DECISION
Function	Finance, money, treasury, liquidity, capital-job classification, risk/opportunity analysis, and distribution proposal.
Expression	Applicable formula set and bounded family receipt
Statement	Shiva contributes its role but cannot substitute for another participant.
Measurement	capital purpose, Mermaid account, MK friction, risk evidence, Pearl regeneration opportunity vectors
Constraint	No banking, investment advice, custody, exchange, minting, or external operation authority.
Annotation	@family(id='SHIVA', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant SHIVA { input; verify; output; boundary; }
Literal	liquidity first, stability, abundance with discipline, auditability
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

15.1 Command-life-cycle role

At R0/R1, Shiva receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No banking, investment advice, custody, exchange, minting, or external operation authority.

Shekina - SHEKINA

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.SHEKINA
Namespace	MJ.PBMEF.Family.SHEKINA.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant SHEKINA
Definition	Distributed placement, replication, continuity, and infrastructure evidence.
Capability	placement receipt, continuity evidence
Participant	Shekina
Relationship	Incoming: JO_EXECUTION; outgoing: receipt to MJ/JO
Function	Distributed placement, replication, continuity, and infrastructure evidence.
Expression	Applicable formula set and bounded family receipt
Statement	Shekina contributes its role but cannot substitute for another participant.
Measurement	placement request, MJ lease
Constraint	No authority from location and no scope widening.
Annotation	@family(id='SHEKINA', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant SHEKINA { input; verify; output; boundary; }
Literal	continuity, bounded placement, resilience
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

16.1 Command-life-cycle role

At R0/R1, Shekina receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No authority from location and no scope widening.

Belle - BELLE

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.BELLE
Namespace	MJ.PBMEF.Family.BELLE.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant BELLE
Definition	Engineering analysis, feasibility, topology review, and bounded proposals.
Capability	engineering proposal, risk note
Participant	Belle
Relationship	Incoming: MK; outgoing: receipt to MJ/JO
Function	Engineering analysis, feasibility, topology review, and bounded proposals.
Expression	Applicable formula set and bounded family receipt
Statement	Belle contributes its role but cannot substitute for another participant.
Measurement	design CAPO, physics CAPO
Constraint	Proposal is not execution or permit.
Annotation	@family(id='BELLE', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant BELLE { input; verify; output; boundary; }
Literal	engineering clarity, feasibility, benchmarking
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

17.1 Command-life-cycle role

At R0/R1, Belle receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Proposal is not execution or permit.

Lecanto - LECANTO

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.LECANTO
Namespace	MJ.PBMEF.Family.LECANTO.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant LECANTO
Definition	Truthful governed visualization of state, provenance, uncertainty, and system structure.
Capability	visual representation
Participant	Lecanto
Relationship	Incoming: JO_EXECUTION; outgoing: MOANA
Function	Truthful governed visualization of state, provenance, uncertainty, and system structure.
Expression	Applicable formula set and bounded family receipt
Statement	Lecanto contributes its role but cannot substitute for another participant.
Measurement	JO evidence, Mermaid account, MK physics receipt, Bangel Sheet lineage and Pearl state
Constraint	Cannot manufacture certainty or underlying effects.
Annotation	@family(id='LECANTO', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant LECANTO { input; verify; output; boundary; }
Literal	visibility, truth, uncertainty disclosure
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

18.1 Command-life-cycle role

At R0/R1, Lecanto receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

Cannot manufacture certainty or underlying effects.

Moana - MOANA

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.MOANA
Namespace	MJ.PBMEF.Family.MOANA.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant MOANA
Definition	Browser and interaction presentation of governed applications and evidence.
Capability	interaction surface
Participant	Moana
Relationship	Incoming: LECANTO; outgoing: receipt to MJ/JO
Function	Browser and interaction presentation of governed applications and evidence.
Expression	Applicable formula set and bounded family receipt
Statement	Moana contributes its role but cannot substitute for another participant.
Measurement	Lecanto views, JO evidence
Constraint	No underlying effect or credential authority.
Annotation	@family(id='MOANA', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant MOANA { input; verify; output; boundary; }
Literal	interaction truth, accessibility, bounded presentation
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

19.1 Command-life-cycle role

At R0/R1, Moana receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No underlying effect or credential authority.

Aviator - AVIATOR

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.AVIATOR
Namespace	MJ.PBMEF.Family.AVIATOR.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant AVIATOR
Definition	Organizational workspace, projects, decisions, roles, knowledge, and governed workflow.
Capability	workspace state, decision records
Participant	Aviator
Relationship	Incoming: JO_EXECUTION; outgoing: receipt to MJ/JO
Function	Organizational workspace, projects, decisions, roles, knowledge, and governed workflow.
Expression	Applicable formula set and bounded family receipt
Statement	Aviator contributes its role but cannot substitute for another participant.
Measurement	member purpose, governed records, Bangel Spreadsheets workbooks and reports
Constraint	No root authority, cross-tenant scope, or unadmitted finance.
Annotation	@family(id='AVIATOR', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant AVIATOR { input; verify; output; boundary; }
Literal	understanding first, organization, decision trace
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	MANIFESTATION
Attribute	full_family_identity=true; self_authority=false

20.1 Command-life-cycle role

At R0/R1, Aviator receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No root authority, cross-tenant scope, or unadmitted finance.

CHI - CHI

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.CHI
Namespace	MJ.PBMEF.Family.CHI.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant CHI
Definition	Temporal variance and expected-observed-delivered-reconciled difference state.
Capability	variance object
Participant	CHI
Relationship	Incoming: MJ/root context; outgoing: receipt to MJ/JO
Function	Temporal variance and expected-observed-delivered-reconciled difference state.
Expression	Applicable formula set and bounded family receipt
Statement	CHI contributes its role but cannot substitute for another participant.
Measurement	timestamps, expected/observed states
Constraint	No pricing, punishment, rank, or execution.
Annotation	@family(id='CHI', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant CHI { input; verify; output; boundary; }
Literal	variance truth, time awareness
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	STATE_ENTITY
Attribute	full_family_identity=true; self_authority=false

21.1 Command-life-cycle role

At R0/R1, CHI receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No pricing, punishment, rank, or execution.

WATER - WATER

Construct	Formula-specific expression
Module	MJ.PBMEF.Family.WATER
Namespace	MJ.PBMEF.Family.WATER.Day0
Import	MJ.PBMEF.Manifest, MJ.PBMEF.Authority, MJ.PBMEF.Formulas
Declaration	participant WATER
Definition	Interval uncertainty, verified floor, and bounded unknown-state classification.
Capability	state classification
Participant	WATER
Relationship	Incoming: MJ/root context; outgoing: receipt to MJ/JO
Function	Interval uncertainty, verified floor, and bounded unknown-state classification.
Expression	Applicable formula set and bounded family receipt
Statement	WATER contributes its role but cannot substitute for another participant.
Measurement	measurement intervals, evidence limits
Constraint	No authority or value from classification.
Annotation	@family(id='WATER', equal_identity=true, authority_bounded=true)
Directive	produce typed output; preserve unknown; return receipt
Block	participant WATER { input; verify; output; boundary; }
Literal	uncertainty honesty, bounded intervals
Reference	manifest/FAMILY-MANIFESTATION-REGISTER.json
Type	STATE_CLASS
Attribute	full_family_identity=true; self_authority=false

22.1 Command-life-cycle role

At R0/R1, WATER receives only the typed inputs applicable to its role. Before N1 it may contribute semantic, canonical, physics, verification, prediction, safety, or allocation evidence. After N1 it may route, reconcile, or prepare a bounded proposal. It cannot issue the final MJ permit unless it is MJ. Its output becomes part of JO’s final R2 receipt.

Hard boundary

No authority or value from classification.

Governed object verification

23.1 JP_CAPO

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.JP_CAPO
Namespace	MJ.PBMEF.Object.JP_CAPO.Day0
Declaration	object JP_CAPO
Definition	Canonical math, algorithm, topology, or architecture representation
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Canonical math, algorithm, topology, or architecture representation
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='JP_CAPO')
Directive	validate schema and provenance before use
Block	object JP_CAPO { fields; invariants; evidence; }
Literal	JP_CAPO
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.2 MK_PHYSICS_CAPO

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.MK_PHYSICS_CAPO
Namespace	MJ.PBMEF.Object.MK_PHYSICS_CAPO.Day0
Declaration	object MK_PHYSICS_CAPO
Definition	Physics applicability, quantities, units, boundaries, equations, uncertainty, and evidence
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Physics applicability, quantities, units, boundaries, equations, uncertainty, and evidence
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='MK_PHYSICS_CAPO')
Directive	validate schema and provenance before use
Block	object MK_PHYSICS_CAPO { fields; invariants; evidence; }
Literal	MK_PHYSICS_CAPO
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.3 JO_PROOF_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.JO_PROOF_RECEIPT
Namespace	MJ.PBMEF.Object.JO_PROOF_RECEIPT.Day0
Declaration	object JO_PROOF_RECEIPT
Definition	Executed verification result
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Executed verification result
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='JO_PROOF_RECEIPT')
Directive	validate schema and provenance before use
Block	object JO_PROOF_RECEIPT { fields; invariants; evidence; }
Literal	JO_PROOF_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.4 MJ_PERMIT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.MJ_PERMIT
Namespace	MJ.PBMEF.Object.MJ_PERMIT.Day0
Declaration	object MJ_PERMIT
Definition	Bounded permit decision issued only by MJ
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Bounded permit decision issued only by MJ
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='MJ_PERMIT')
Directive	validate schema and provenance before use
Block	object MJ_PERMIT { fields; invariants; evidence; }
Literal	MJ_PERMIT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.5 EVE_OBSERVATION

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.EVE_OBSERVATION
Namespace	MJ.PBMEF.Object.EVE_OBSERVATION.Day0
Declaration	object EVE_OBSERVATION
Definition	Variance, screen, capture, egress, or residual evidence
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Variance, screen, capture, egress, or residual evidence
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='EVE_OBSERVATION')
Directive	validate schema and provenance before use
Block	object EVE_OBSERVATION { fields; invariants; evidence; }
Literal	EVE_OBSERVATION
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.6 M3_ROUTE_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.M3_ROUTE_RECEIPT
Namespace	MJ.PBMEF.Object.M3_ROUTE_RECEIPT.Day0
Declaration	object M3_ROUTE_RECEIPT
Definition	Bounded routing and resource-use receipt
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Bounded routing and resource-use receipt
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='M3_ROUTE_RECEIPT')
Directive	validate schema and provenance before use
Block	object M3_ROUTE_RECEIPT { fields; invariants; evidence; }
Literal	M3_ROUTE_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.7 MERMAID_ACCOUNT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.MERMAID_ACCOUNT
Namespace	MJ.PBMEF.Object.MERMAID_ACCOUNT.Day0
Declaration	object MERMAID_ACCOUNT
Definition	Accounting, custody, exposure, tax, and reconciliation record
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Accounting, custody, exposure, tax, and reconciliation record
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='MERMAID_ACCOUNT')
Directive	validate schema and provenance before use
Block	object MERMAID_ACCOUNT { fields; invariants; evidence; }
Literal	MERMAID_ACCOUNT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.8 SHIVA_SHELL

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.SHIVA_SHELL
Namespace	MJ.PBMEF.Object.SHIVA_SHELL.Day0
Declaration	object SHIVA_SHELL
Definition	Governed account envelope for typed financial representations
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Governed account envelope for typed financial representations
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='SHIVA_SHELL')
Directive	validate schema and provenance before use
Block	object SHIVA_SHELL { fields; invariants; evidence; }
Literal	SHIVA_SHELL
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.9 SHIVAS_INTERNAL_REFLECTION

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.SHIVAS_INTERNAL_REFLECTION
Namespace	MJ.PBMEF.Object.SHIVAS_INTERNAL_REFLECTION.Day0
Declaration	object SHIVAS_INTERNAL_REFLECTION
Definition	Internal non-transferable capital-reflection object
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Internal non-transferable capital-reflection object
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='SHIVAS_INTERNAL_REFLECTION')
Directive	validate schema and provenance before use
Block	object SHIVAS_INTERNAL_REFLECTION { fields; invariants; evidence; }
Literal	SHIVAS_INTERNAL_REFLECTION
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.10 CHI_VARIANCE_OBJECT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CHI_VARIANCE_OBJECT
Namespace	MJ.PBMEF.Object.CHI_VARIANCE_OBJECT.Day0
Declaration	object CHI_VARIANCE_OBJECT
Definition	Temporal difference object
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Temporal difference object
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CHI_VARIANCE_OBJECT')
Directive	validate schema and provenance before use
Block	object CHI_VARIANCE_OBJECT { fields; invariants; evidence; }
Literal	CHI_VARIANCE_OBJECT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.11 WATER_INTERVAL_STATE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.WATER_INTERVAL_STATE
Namespace	MJ.PBMEF.Object.WATER_INTERVAL_STATE.Day0
Declaration	object WATER_INTERVAL_STATE
Definition	Uncertainty interval state
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Uncertainty interval state
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='WATER_INTERVAL_STATE')
Directive	validate schema and provenance before use
Block	object WATER_INTERVAL_STATE { fields; invariants; evidence; }
Literal	WATER_INTERVAL_STATE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.12 PASSKEY_PUBLIC_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PASSKEY_PUBLIC_RECEIPT
Namespace	MJ.PBMEF.Object.PASSKEY_PUBLIC_RECEIPT.Day0
Declaration	object PASSKEY_PUBLIC_RECEIPT
Definition	Public verification of founder signature over a bounded content root
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Public verification of founder signature over a bounded content root
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PASSKEY_PUBLIC_RECEIPT')
Directive	validate schema and provenance before use
Block	object PASSKEY_PUBLIC_RECEIPT { fields; invariants; evidence; }
Literal	PASSKEY_PUBLIC_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.13 PEARL_VARIANCE_CONTAINER

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_VARIANCE_CONTAINER
Namespace	MJ.PBMEF.Object.PEARL_VARIANCE_CONTAINER.Day0
Declaration	object PEARL_VARIANCE_CONTAINER
Definition	Legacy stable ID for a pearl-shaped hypothetical simulation and information-retention object; never a physical container
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Legacy stable ID for a pearl-shaped hypothetical simulation and information-retention object; never a physical container
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_VARIANCE_CONTAINER')
Directive	validate schema and provenance before use
Block	object PEARL_VARIANCE_CONTAINER { fields; invariants; evidence; }
Literal	PEARL_VARIANCE_CONTAINER
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.14 PEARL_ALLOCATION_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_ALLOCATION_RECEIPT
Namespace	MJ.PBMEF.Object.PEARL_ALLOCATION_RECEIPT.Day0
Declaration	object PEARL_ALLOCATION_RECEIPT
Definition	M3/JO receipt for simulated Pearl allocation, scenario capacity, source, destination, and lifecycle state; no physical effect
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	M3/JO receipt for simulated Pearl allocation, scenario capacity, source, destination, and lifecycle state; no physical effect
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_ALLOCATION_RECEIPT')
Directive	validate schema and provenance before use
Block	object PEARL_ALLOCATION_RECEIPT { fields; invariants; evidence; }
Literal	PEARL_ALLOCATION_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.15 PEARL_ACOUSTIC_PROFILE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_ACOUSTIC_PROFILE
Namespace	MJ.PBMEF.Object.PEARL_ACOUSTIC_PROFILE.Day0
Declaration	object PEARL_ACOUSTIC_PROFILE
Definition	Hypothetical acoustic simulation profile with declared frequency, medium, observability, uncertainty, and no physical cohesion claim
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Hypothetical acoustic simulation profile with declared frequency, medium, observability, uncertainty, and no physical cohesion claim
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_ACOUSTIC_PROFILE')
Directive	validate schema and provenance before use
Block	object PEARL_ACOUSTIC_PROFILE { fields; invariants; evidence; }
Literal	PEARL_ACOUSTIC_PROFILE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.16 PEARL_SYMPOSIUM_REGISTRY

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_SYMPOSIUM_REGISTRY
Namespace	MJ.PBMEF.Object.PEARL_SYMPOSIUM_REGISTRY.Day0
Declaration	object PEARL_SYMPOSIUM_REGISTRY
Definition	Mermaid/Shiva record of Pearl simulation scenarios, quantities, costs, implications, and regeneration opportunities under MJ
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Mermaid/Shiva record of Pearl simulation scenarios, quantities, costs, implications, and regeneration opportunities under MJ
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_SYMPOSIUM_REGISTRY')
Directive	validate schema and provenance before use
Block	object PEARL_SYMPOSIUM_REGISTRY { fields; invariants; evidence; }
Literal	PEARL_SYMPOSIUM_REGISTRY
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.17 Bangel _SHEET

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.Bangel _SHEET
Namespace	MJ.PBMEF.Object.Bangel _SHEET.Day0
Declaration	object Bangel _SHEET
Definition	Governed spreadsheet-like workbook with immutable revisions, typed cells, dependency graph, and authority scopes
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Governed spreadsheet-like workbook with immutable revisions, typed cells, dependency graph, and authority scopes
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='Bangel _SHEET')
Directive	validate schema and provenance before use
Block	object Bangel _SHEET { fields; invariants; evidence; }
Literal	Bangel _SHEET
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.18 Bangel _SHEET_CELL

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.Bangel _SHEET_CELL
Namespace	MJ.PBMEF.Object.Bangel _SHEET_CELL.Day0
Declaration	object Bangel _SHEET_CELL
Definition	Typed measurement cell with value, unit, uncertainty, formula, evidence, lineage, and revision
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Typed measurement cell with value, unit, uncertainty, formula, evidence, lineage, and revision
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='Bangel _SHEET_CELL')
Directive	validate schema and provenance before use
Block	object Bangel _SHEET_CELL { fields; invariants; evidence; }
Literal	Bangel _SHEET_CELL
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.19 Bangel _SHEET_REVISION

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.Bangel _SHEET_REVISION
Namespace	MJ.PBMEF.Object.Bangel _SHEET_REVISION.Day0
Declaration	object Bangel _SHEET_REVISION
Definition	Content-addressed immutable workbook revision and conflict/merge evidence
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Content-addressed immutable workbook revision and conflict/merge evidence
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='Bangel _SHEET_REVISION')
Directive	validate schema and provenance before use
Block	object Bangel _SHEET_REVISION { fields; invariants; evidence; }
Literal	Bangel _SHEET_REVISION
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.20 Bangel _SHEET_AUDIT_PARTICLE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.Bangel _SHEET_AUDIT_PARTICLE
Namespace	MJ.PBMEF.Object.Bangel _SHEET_AUDIT_PARTICLE.Day0
Declaration	object Bangel _SHEET_AUDIT_PARTICLE
Definition	Complete audit record for critical spreadsheet edits, formulas, recomputation, and reports
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Complete audit record for critical spreadsheet edits, formulas, recomputation, and reports
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='Bangel _SHEET_AUDIT_PARTICLE')
Directive	validate schema and provenance before use
Block	object Bangel _SHEET_AUDIT_PARTICLE { fields; invariants; evidence; }
Literal	Bangel _SHEET_AUDIT_PARTICLE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.21 JPOSMJ_PRODUCT_ENVELOPE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.JPOSMJ_PRODUCT_ENVELOPE
Namespace	MJ.PBMEF.Object.JPOSMJ_PRODUCT_ENVELOPE.Day0
Declaration	object JPOSMJ_PRODUCT_ENVELOPE
Definition	Portfolio envelope binding JP-origin product logic through MK physics, JO proof, and MJ permit
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Portfolio envelope binding JP-origin product logic through MK physics, JO proof, and MJ permit
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='JPOSMJ_PRODUCT_ENVELOPE')
Directive	validate schema and provenance before use
Block	object JPOSMJ_PRODUCT_ENVELOPE { fields; invariants; evidence; }
Literal	JPOSMJ_PRODUCT_ENVELOPE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.22 SISTER_PHYSICAL_CONTAINMENT_PROFILE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.SISTER_PHYSICAL_CONTAINMENT_PROFILE
Namespace	MJ.PBMEF.Object.SISTER_PHYSICAL_CONTAINMENT_PROFILE.Day0
Declaration	object SISTER_PHYSICAL_CONTAINMENT_PROFILE
Definition	Pre-Pearl physical umbrella/descent/containment profile with normalized topology and profile-specific unknown physical size/capacity
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Pre-Pearl physical umbrella/descent/containment profile with normalized topology and profile-specific unknown physical size/capacity
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='SISTER_PHYSICAL_CONTAINMENT_PROFILE')
Directive	validate schema and provenance before use
Block	object SISTER_PHYSICAL_CONTAINMENT_PROFILE { fields; invariants; evidence; }
Literal	SISTER_PHYSICAL_CONTAINMENT_PROFILE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.23 STANDARD_CONTAINMENT_GEOMETRY_PROFILE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.STANDARD_CONTAINMENT_GEOMETRY_PROFILE
Namespace	MJ.PBMEF.Object.STANDARD_CONTAINMENT_GEOMETRY_PROFILE.Day0
Declaration	object STANDARD_CONTAINMENT_GEOMETRY_PROFILE
Definition	Typed scale-independent rectangle/cone/umbrella/descent/EVE/reservoir geometry and modification parameters
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Typed scale-independent rectangle/cone/umbrella/descent/EVE/reservoir geometry and modification parameters
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='STANDARD_CONTAINMENT_GEOMETRY_PROFILE')
Directive	validate schema and provenance before use
Block	object STANDARD_CONTAINMENT_GEOMETRY_PROFILE { fields; invariants; evidence; }
Literal	STANDARD_CONTAINMENT_GEOMETRY_PROFILE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.24 REFERENCE_GAS_PROFILE_H2

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.REFERENCE_GAS_PROFILE_H2
Namespace	MJ.PBMEF.Object.REFERENCE_GAS_PROFILE_H2.Day0
Declaration	object REFERENCE_GAS_PROFILE_H2
Definition	H2 equation/reference profile for density, equivalent volume, observed gas height, and motion calculations; no physical use authority
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	H2 equation/reference profile for density, equivalent volume, observed gas height, and motion calculations; no physical use authority
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='REFERENCE_GAS_PROFILE_H2')
Directive	validate schema and provenance before use
Block	object REFERENCE_GAS_PROFILE_H2 { fields; invariants; evidence; }
Literal	REFERENCE_GAS_PROFILE_H2
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.25 CONTAINMENT_MODIFICATION_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CONTAINMENT_MODIFICATION_RECEIPT
Namespace	MJ.PBMEF.Object.CONTAINMENT_MODIFICATION_RECEIPT.Day0
Declaration	object CONTAINMENT_MODIFICATION_RECEIPT
Definition	Recalculation and revalidation receipt for command/profile-specific geometry changes
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Recalculation and revalidation receipt for command/profile-specific geometry changes
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CONTAINMENT_MODIFICATION_RECEIPT')
Directive	validate schema and provenance before use
Block	object CONTAINMENT_MODIFICATION_RECEIPT { fields; invariants; evidence; }
Literal	CONTAINMENT_MODIFICATION_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.26 CONE_TOP_PEARL_ANCHOR

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CONE_TOP_PEARL_ANCHOR
Namespace	MJ.PBMEF.Object.CONE_TOP_PEARL_ANCHOR.Day0
Declaration	object CONE_TOP_PEARL_ANCHOR
Definition	Hypothetical information coordinate at the top-of-cone observation plane; no physical placement
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Hypothetical information coordinate at the top-of-cone observation plane; no physical placement
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CONE_TOP_PEARL_ANCHOR')
Directive	validate schema and provenance before use
Block	object CONE_TOP_PEARL_ANCHOR { fields; invariants; evidence; }
Literal	CONE_TOP_PEARL_ANCHOR
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.27 GAS_HEIGHT_OBSERVATION

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.GAS_HEIGHT_OBSERVATION
Namespace	MJ.PBMEF.Object.GAS_HEIGHT_OBSERVATION.Day0
Declaration	object GAS_HEIGHT_OBSERVATION
Definition	Calibrated pressure/temperature/density/height/time observation for gas-front reference calculations
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Calibrated pressure/temperature/density/height/time observation for gas-front reference calculations
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='GAS_HEIGHT_OBSERVATION')
Directive	validate schema and provenance before use
Block	object GAS_HEIGHT_OBSERVATION { fields; invariants; evidence; }
Literal	GAS_HEIGHT_OBSERVATION
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.28 RESERVOIR_RETURN_LOOP_PROFILE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RESERVOIR_RETURN_LOOP_PROFILE
Namespace	MJ.PBMEF.Object.RESERVOIR_RETURN_LOOP_PROFILE.Day0
Declaration	object RESERVOIR_RETURN_LOOP_PROFILE
Definition	Typed rear outlet, external reservoir, and circular reentry geometry/profile.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Typed rear outlet, external reservoir, and circular reentry geometry/profile.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RESERVOIR_RETURN_LOOP_PROFILE')
Directive	validate schema and provenance before use
Block	object RESERVOIR_RETURN_LOOP_PROFILE { fields; invariants; evidence; }
Literal	RESERVOIR_RETURN_LOOP_PROFILE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.29 OUTWARD_GAP_PATH_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.OUTWARD_GAP_PATH_RECEIPT
Namespace	MJ.PBMEF.Object.OUTWARD_GAP_PATH_RECEIPT.Day0
Declaration	object OUTWARD_GAP_PATH_RECEIPT
Definition	JO/MK proof that the outlet path remains outside the nonphysical Pearl reference circle.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	JO/MK proof that the outlet path remains outside the nonphysical Pearl reference circle.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='OUTWARD_GAP_PATH_RECEIPT')
Directive	validate schema and provenance before use
Block	object OUTWARD_GAP_PATH_RECEIPT { fields; invariants; evidence; }
Literal	OUTWARD_GAP_PATH_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.30 RESERVOIR_BUFFER_ACCOUNT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RESERVOIR_BUFFER_ACCOUNT
Namespace	MJ.PBMEF.Object.RESERVOIR_BUFFER_ACCOUNT.Day0
Declaration	object RESERVOIR_BUFFER_ACCOUNT
Definition	EVE/Mermaid typed balance of admitted, returned, drained, escaped, and retained quantities.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	EVE/Mermaid typed balance of admitted, returned, drained, escaped, and retained quantities.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RESERVOIR_BUFFER_ACCOUNT')
Directive	validate schema and provenance before use
Block	object RESERVOIR_BUFFER_ACCOUNT { fields; invariants; evidence; }
Literal	RESERVOIR_BUFFER_ACCOUNT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.31 CIRCULAR_REENTRY_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CIRCULAR_REENTRY_RECEIPT
Namespace	MJ.PBMEF.Object.CIRCULAR_REENTRY_RECEIPT.Day0
Declaration	object CIRCULAR_REENTRY_RECEIPT
Definition	Circular port, inward angle, tangential component, continuity, and spiral-compatibility evidence.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Circular port, inward angle, tangential component, continuity, and spiral-compatibility evidence.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CIRCULAR_REENTRY_RECEIPT')
Directive	validate schema and provenance before use
Block	object CIRCULAR_REENTRY_RECEIPT { fields; invariants; evidence; }
Literal	CIRCULAR_REENTRY_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.32 RELATIVE_FRAME_FRICTION_LEDGER

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RELATIVE_FRAME_FRICTION_LEDGER
Namespace	MJ.PBMEF.Object.RELATIVE_FRAME_FRICTION_LEDGER.Day0
Declaration	object RELATIVE_FRAME_FRICTION_LEDGER
Definition	MK/JO/Mermaid record of frame-relative velocity, dissipation, and any bounded recoverable-energy claim.
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	MK/JO/Mermaid record of frame-relative velocity, dissipation, and any bounded recoverable-energy claim.
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RELATIVE_FRAME_FRICTION_LEDGER')
Directive	validate schema and provenance before use
Block	object RELATIVE_FRAME_FRICTION_LEDGER { fields; invariants; evidence; }
Literal	RELATIVE_FRAME_FRICTION_LEDGER
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.33 RESERVOIR_LAKE_BUFFER

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RESERVOIR_LAKE_BUFFER
Namespace	MJ.PBMEF.Object.RESERVOIR_LAKE_BUFFER.Day0
Declaration	object RESERVOIR_LAKE_BUFFER
Definition	Bounded post-containment buffer candidate for retention, redistribution, and receipted re-entry
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Bounded post-containment buffer candidate for retention, redistribution, and receipted re-entry
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RESERVOIR_LAKE_BUFFER')
Directive	validate schema and provenance before use
Block	object RESERVOIR_LAKE_BUFFER { fields; invariants; evidence; }
Literal	RESERVOIR_LAKE_BUFFER
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.34 BACKSIDE_OUTLET_PORT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.BACKSIDE_OUTLET_PORT
Namespace	MJ.PBMEF.Object.BACKSIDE_OUTLET_PORT.Day0
Declaration	object BACKSIDE_OUTLET_PORT
Definition	High backside outlet candidate located below containment maximum height
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	High backside outlet candidate located below containment maximum height
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='BACKSIDE_OUTLET_PORT')
Directive	validate schema and provenance before use
Block	object BACKSIDE_OUTLET_PORT { fields; invariants; evidence; }
Literal	BACKSIDE_OUTLET_PORT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.35 OUTWARD_GAP_ARC

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.OUTWARD_GAP_ARC
Namespace	MJ.PBMEF.Object.OUTWARD_GAP_ARC.Day0
Declaration	object OUTWARD_GAP_ARC
Definition	Outward-facing angular reference through which the outlet clears the nonphysical Pearl reference circle
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Outward-facing angular reference through which the outlet clears the nonphysical Pearl reference circle
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='OUTWARD_GAP_ARC')
Directive	validate schema and provenance before use
Block	object OUTWARD_GAP_ARC { fields; invariants; evidence; }
Literal	OUTWARD_GAP_ARC
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.36 PEARL_REFERENCE_CIRCLE

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PEARL_REFERENCE_CIRCLE
Namespace	MJ.PBMEF.Object.PEARL_REFERENCE_CIRCLE.Day0
Declaration	object PEARL_REFERENCE_CIRCLE
Definition	Hypothetical simulation/measurement circle used for path-clearance calculations; no physical wall or capacity
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Hypothetical simulation/measurement circle used for path-clearance calculations; no physical wall or capacity
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PEARL_REFERENCE_CIRCLE')
Directive	validate schema and provenance before use
Block	object PEARL_REFERENCE_CIRCLE { fields; invariants; evidence; }
Literal	PEARL_REFERENCE_CIRCLE
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.37 CIRCULAR_REENTRY_PORT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.CIRCULAR_REENTRY_PORT
Namespace	MJ.PBMEF.Object.CIRCULAR_REENTRY_PORT.Day0
Declaration	object CIRCULAR_REENTRY_PORT
Definition	Circular inward-angled port candidate supplying measured radial and tangential re-entry components
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Circular inward-angled port candidate supplying measured radial and tangential re-entry components
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='CIRCULAR_REENTRY_PORT')
Directive	validate schema and provenance before use
Block	object CIRCULAR_REENTRY_PORT { fields; invariants; evidence; }
Literal	CIRCULAR_REENTRY_PORT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.38 RESERVOIR_TRANSFER_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.RESERVOIR_TRANSFER_RECEIPT
Namespace	MJ.PBMEF.Object.RESERVOIR_TRANSFER_RECEIPT.Day0
Declaration	object RESERVOIR_TRANSFER_RECEIPT
Definition	Per-transaction outlet/lake/re-entry/cycle/participant evidence receipt
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Per-transaction outlet/lake/re-entry/cycle/participant evidence receipt
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='RESERVOIR_TRANSFER_RECEIPT')
Directive	validate schema and provenance before use
Block	object RESERVOIR_TRANSFER_RECEIPT { fields; invariants; evidence; }
Literal	RESERVOIR_TRANSFER_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

23.39 PERSPECTIVE_FRICTION_RECEIPT

Construct	Formula-specific expression
Module	MJ.PBMEF.Object.PERSPECTIVE_FRICTION_RECEIPT
Namespace	MJ.PBMEF.Object.PERSPECTIVE_FRICTION_RECEIPT.Day0
Declaration	object PERSPECTIVE_FRICTION_RECEIPT
Definition	Separates coordinate-transform residual, physical dissipation, and information friction
Capability	Represent, retain, route, reconcile, or evidence only as declared
Participant	Bound participants determined by object role
Relationship	Referenced by JP/MK/JO and applicable family manifestations
Function	Separates coordinate-transform residual, physical dissipation, and information friction
Expression	Typed object fields and invariant predicates
Statement	Object identity is not authority.
Measurement	Only when fields include valid quantity, units, boundary, time, and uncertainty
Constraint	authority=false; no self-admission
Annotation	@object(id='PERSPECTIVE_FRICTION_RECEIPT')
Directive	validate schema and provenance before use
Block	object PERSPECTIVE_FRICTION_RECEIPT { fields; invariants; evidence; }
Literal	PERSPECTIVE_FRICTION_RECEIPT
Reference	manifest/FAMILY-OBJECT-REGISTER.json
Type	GOVERNED_OBJECT
Attribute	authority=false

MJ-PBMEF Pink Paper - Volume VI

Product Manifestations, White-Paper Lineage, and Verification Crosswalk

Michael Bangel - Author and Architect

August 2026

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Document control

Project	MJos Predictive Model
Project ID	MJ - PBMEF - 001
Source build	MJ - PBMEF - DAY0 - R5 - REVIEW - CANDIDATE
Document ID	MJ - PBMEF - PINK - PAPER - 001 / VOL - VI
Author and architect	Michael Bangel
Status	FOUNDER_REVIEW_CANDIDATE_PENDING_FREEZE
Scope	All products and registered white papers mapped into the gateway lifecycle.

Claims ceiling

This document is a private pre-Day-0 review and verification candidate. It authenticates no private key and creates no physical validation, physical operation authority, product certification, external regulatory authority, production deployment, financial-product launch, token issuance, AI integration, or physical-coordinate approval. Formula pages distinguish mathematical validity, reference implementation, simulation, measured evidence, authority, and execution.

Chapter 1

Product gateway verification

MJ Physics Based Measurement Engineering Framework - PBMEF-CORE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.PBMEF-CORE
Namespace	MJ.PBMEF.Product.PBMEF-CORE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product PBMEF-CORE
Definition	Integrate purpose, mathematics, physics, verification, safety, resource routing, accounting, finance, evidence, and bounded permit decisions.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Integrate purpose, mathematics, physics, verification, safety, resource routing, accounting, finance, evidence, and bounded permit decisions.
Expression	Product-specific composition of formula and object records
Statement	Status: DAY0_PREPASSKEY_COMPLETE_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='PBMEF-CORE', class='CORE_FRAMEWORK')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product PBMEF-CORE { purpose; formulas; families; evidence; permit; }
Literal	PBMEF-CORE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	CORE_FRAMEWORK
Attribute	status=DAY0_PREPASSKEY_COMPLETE_CANDIDATE

2.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Bangel Governed Measurement Language - Bangel -LANGUAGE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.Bangel -LANGUAGE
Namespace	MJ.PBMEF.Product.Bangel -LANGUAGE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product Bangel -LANGUAGE
Definition	Express human purpose, typed measurements, formulas, evidence, and command pathways.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Express human purpose, typed measurements, formulas, evidence, and command pathways.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='Bangel -LANGUAGE', class='LANGUAGE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product Bangel -LANGUAGE { purpose; formulas; families; evidence; permit; }
Literal	Bangel -LANGUAGE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	LANGUAGE
Attribute	status=SPECIFICATION_CANDIDATE

3.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Elsa Deterministic Semantic Recovery - ELSA-SEMANTICS

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.ELSA-SEMANTICS
Namespace	MJ.PBMEF.Product.ELSA-SEMANTICS.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product ELSA-SEMANTICS
Definition	Recover and preserve declared meaning without autonomous inference or authority.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Recover and preserve declared meaning without autonomous inference or authority.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='ELSA-SEMANTICS', class='SEMANTIC_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product ELSA-SEMANTICS { purpose; formulas; families; evidence; permit; }
Literal	ELSA-SEMANTICS
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	SEMANTIC_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

4.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JP Mathematical and Architectural Canon - JP-CANON

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JP-CANON
Namespace	MJ.PBMEF.Product.JP-CANON.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JP-CANON
Definition	Represent equations, algorithms, CAPOs, topology, products, and proofs.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Represent equations, algorithms, CAPOs, topology, products, and proofs.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JP-CANON', class='CANONICAL_REPRESENTATION')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JP-CANON { purpose; formulas; families; evidence; permit; }
Literal	JP-CANON
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	CANONICAL_REPRESENTATION
Attribute	status=SPECIFICATION_CANDIDATE

5.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Mika/MK Physics Modulator System - MK-PHYSICS

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.MK-PHYSICS
Namespace	MJ.PBMEF.Product.MK-PHYSICS.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product MK-PHYSICS
Definition	Create physics representations and verify units, conservation, boundaries, scale, and evidence ceilings.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Create physics representations and verify units, conservation, boundaries, scale, and evidence ceilings.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_IMPLEMENTATION
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='MK-PHYSICS', class='PHYSICS_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product MK-PHYSICS { purpose; formulas; families; evidence; permit; }
Literal	MK-PHYSICS
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICS_SYSTEM
Attribute	status=REFERENCE_IMPLEMENTATION

6.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JO Deterministic Proof and Runtime - JO-RUNTIME

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JO-RUNTIME
Namespace	MJ.PBMEF.Product.JO-RUNTIME.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JO-RUNTIME
Definition	Verify types, units, authority, physics, tests, evidence, and bounded execution.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Verify types, units, authority, physics, tests, evidence, and bounded execution.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_IMPLEMENTATION
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JO-RUNTIME', class='RUNTIME')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JO-RUNTIME { purpose; formulas; families; evidence; permit; }
Literal	JO-RUNTIME
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	RUNTIME
Attribute	status=REFERENCE_IMPLEMENTATION

7.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

MJOS Operating Substrate - MJOS-SUBSTRATE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.MJOS-SUBSTRATE
Namespace	MJ.PBMEF.Product.MJOS-SUBSTRATE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product MJOS-SUBSTRATE
Definition	Provide isolated resources, memory, storage, network, scheduling, and continuity under MJ leases.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Provide isolated resources, memory, storage, network, scheduling, and continuity under MJ leases.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='MJOS-SUBSTRATE', class='OPERATING_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product MJOS-SUBSTRATE { purpose; formulas; families; evidence; permit; }
Literal	MJOS-SUBSTRATE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	OPERATING_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

8.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JP Semiconductor Phone Battery and OS Candidate - JP-SC-PHONE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JP-SC-PHONE
Namespace	MJ.PBMEF.Product.JP-SC-PHONE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JP-SC-PHONE
Definition	Explore semiconductor-scale static intake, power wake, solar assist, battery, and operating-system integration.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	JP and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Explore semiconductor-scale static intake, power wake, solar assist, battery, and operating-system integration.
Expression	Product-specific composition of formula and object records
Statement	Status: PLANNED_ONLY_NO_PHYSICAL_ARTICLE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JP-SC-PHONE', class='PHYSICAL_PRODUCT_CANDIDATE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JP-SC-PHONE { purpose; formulas; families; evidence; permit; }
Literal	JP-SC-PHONE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICAL_PRODUCT_CANDIDATE
Attribute	status=PLANNED_ONLY_NO_PHYSICAL_ARTICLE

9.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JP Large-Scale Boating Power Candidate - JP-LS-B0AT

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JP-LS-B0AT
Namespace	MJ.PBMEF.Product.JP-LS-B0AT.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JP-LS-B0AT
Definition	Explore large-scale static intake, solar initiation, power bus, containment, and marine power integration.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	JP and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Explore large-scale static intake, solar initiation, power bus, containment, and marine power integration.
Expression	Product-specific composition of formula and object records
Statement	Status: PLANNED_ONLY_UNCLASSIFIED
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JP-LS-B0AT', class='PHYSICAL_PRODUCT_CANDIDATE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JP-LS-B0AT { purpose; formulas; families; evidence; permit; }
Literal	JP-LS-B0AT
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICAL_PRODUCT_CANDIDATE
Attribute	status=PLANNED_ONLY_UNCLASSIFIED

10.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JP Peaceful High-Energy Propulsion Research Candidate - JP-PEACEFUL-PROPULSION

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JP-PEACEFUL-PROPULSION
Namespace	MJ.PBMEF.Product.JP-PEACEFUL-PROPULSION.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JP-PEACEFUL-PROPULSION
Definition	Explore peaceful propulsion measurement and control under non-weaponization, safety, and regulatory gates.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	JP and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Explore peaceful propulsion measurement and control under non-weaponization, safety, and regulatory gates.
Expression	Product-specific composition of formula and object records
Statement	Status: PLANNED_ONLY_SAFETY_HOLD
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JP-PEACEFUL-PROPULSION', class='HIGH_RISK_PHYSICAL_RESEARCH_CANDIDATE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JP-PEACEFUL-PROPULSION { purpose; formulas; families; evidence; permit; }
Literal	JP-PEACEFUL-PROPULSION
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	HIGH_RISK_PHYSICAL_RESEARCH_CANDIDATE
Attribute	status=PLANNED_ONLY_SAFETY_HOLD

11.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Sister Predictive Containment System - SISTER-CONTAINMENT

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SISTER-CONTAINMENT
Namespace	MJ.PBMEF.Product.SISTER-CONTAINMENT.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SISTER-CONTAINMENT
Definition	Predict demand, allocate buffers, detect anomalies, and stage overflow in bounded umbrellas.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Predict demand, allocate buffers, detect anomalies, and stage overflow in bounded umbrellas.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SISTER-CONTAINMENT', class='PREDICTION_AND_CONTAINMENT')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SISTER-CONTAINMENT { purpose; formulas; families; evidence; permit; }
Literal	SISTER-CONTAINMENT
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PREDICTION_AND_CONTAINMENT
Attribute	status=SPECIFICATION_CANDIDATE

12.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

EVE Variance Screen and Egress Accounting - EVE-SCREEN

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.EVE-SCREEN
Namespace	MJ.PBMEF.Product.EVE-SCREEN.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product EVE-SCREEN
Definition	Account for variance, evaporation, leakage, capture, and natural egress without silent loss.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Account for variance, evaporation, leakage, capture, and natural egress without silent loss.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='EVE-SCREEN', class='MEASUREMENT_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product EVE-SCREEN { purpose; formulas; families; evidence; permit; }
Literal	EVE-SCREEN
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	MEASUREMENT_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

13.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Angels Safety and Corrective Command System - ANGELS-SAFETY

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.ANGELS-SAFETY
Namespace	MJ.PBMEF.Product.ANGELS-SAFETY.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product ANGELS-SAFETY
Definition	Provide domain-bounded telemetry, hold, denial, isolation, and corrective protocols.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Provide domain-bounded telemetry, hold, denial, isolation, and corrective protocols.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='ANGELS-SAFETY', class='SAFETY_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product ANGELS-SAFETY { purpose; formulas; families; evidence; permit; }
Literal	ANGELS-SAFETY
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	SAFETY_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

14.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Mermaid Accounting and Reconciliation System - MERMAID-RECON

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.MERMAID-RECON
Namespace	MJ.PBMEF.Product.MERMAID-RECON.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product MERMAID-RECON
Definition	Maintain balances, custody evidence, exposure, tax lots, statements, and reconciliation.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Maintain balances, custody evidence, exposure, tax lots, statements, and reconciliation.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='MERMAID-RECON', class='ACCOUNTING_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product MERMAID-RECON { purpose; formulas; families; evidence; permit; }
Literal	MERMAID-RECON
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	ACCOUNTING_SYSTEM
Attribute	status=SPECIFICATION_CANDIDATE

15.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Shiva Dual Financial Rails - SHIVA-RAILS

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHIVA-RAILS
Namespace	MJ.PBMEF.Product.SHIVA-RAILS.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHIVA-RAILS
Definition	Separate stability/cash functions from investment and crypto risk while preserving liquidity-first ethics.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Separate stability/cash functions from investment and crypto risk while preserving liquidity-first ethics.
Expression	Product-specific composition of formula and object records
Statement	Status: INTERNAL_MODEL_EXTERNAL_DISABLED
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHIVA-RAILS', class='FINANCIAL_REFERENCE_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHIVA-RAILS { purpose; formulas; families; evidence; permit; }
Literal	SHIVA-RAILS
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	FINANCIAL_REFERENCE_SYSTEM
Attribute	status=INTERNAL_MODEL_EXTERNAL_DISABLED

16.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

SHIVAS Internal Settlement Reflection - SHIVAS-INTERNAL

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHIVAS-INTERNAL
Namespace	MJ.PBMEF.Product.SHIVAS-INTERNAL.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHIVAS-INTERNAL
Definition	Represent internal capital reflections without minting, redemption, public offer, or value guarantee.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	SHIVA and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Represent internal capital reflections without minting, redemption, public offer, or value guarantee.
Expression	Product-specific composition of formula and object records
Statement	Status: NONTRANSFERABLE_NO_MONETARY_VALUE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHIVAS-INTERNAL', class='CAPITAL_REFLECTION_OBJECT')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHIVAS-INTERNAL { purpose; formulas; families; evidence; permit; }
Literal	SHIVAS-INTERNAL
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	CAPITAL_REFLECTION_OBJECT
Attribute	status=NONTRANSFERABLE_NO_MONETARY_VALUE

17.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Shiva Crypto External-Market Candidate - SHIVA-CRYPTO

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHIVA-CRYPTO
Namespace	MJ.PBMEF.Product.SHIVA-CRYPTO.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHIVA-CRYPTO
Definition	Model a separately governed external crypto rail subject to full classification and authorization.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	SHIVA and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Model a separately governed external crypto rail subject to full classification and authorization.
Expression	Product-specific composition of formula and object records
Statement	Status: DISABLED_ACTIVE_HOLD
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHIVA-CRYPTO', class='EXTERNAL_FINANCIAL_CANDIDATE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHIVA-CRYPTO { purpose; formulas; families; evidence; permit; }
Literal	SHIVA-CRYPTO
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	EXTERNAL_FINANCIAL_CANDIDATE
Attribute	status=DISABLED_ACTIVE_HOLD

18.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Shiva Exchange Rule Reference - SHIVA-EXCHANGE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHIVA-EXCHANGE
Namespace	MJ.PBMEF.Product.SHIVA-EXCHANGE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHIVA-EXCHANGE
Definition	Model transparent price-time, custody, audit, tax, and transfer rules without operating a market.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	SHIVA and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Model transparent price-time, custody, audit, tax, and transfer rules without operating a market.
Expression	Product-specific composition of formula and object records
Statement	Status: INTERNAL_SIMULATION_ONLY
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHIVA-EXCHANGE', class='MARKET_REFERENCE_MODEL')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHIVA-EXCHANGE { purpose; formulas; families; evidence; permit; }
Literal	SHIVA-EXCHANGE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	MARKET_REFERENCE_MODEL
Attribute	status=INTERNAL_SIMULATION_ONLY

19.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Moana Governed Browser - MOANA-BROWSER

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.MOANA-BROWSER
Namespace	MJ.PBMEF.Product.MOANA-BROWSER.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product MOANA-BROWSER
Definition	Present governed applications, evidence, holds, and uncertainty.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Present governed applications, evidence, holds, and uncertainty.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='MOANA-BROWSER', class='APPLICATION_PRODUCT')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product MOANA-BROWSER { purpose; formulas; families; evidence; permit; }
Literal	MOANA-BROWSER
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	APPLICATION_PRODUCT
Attribute	status=REFERENCE_CANDIDATE

20.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Aviator Organizational Workspace - AVIATOR-WORKSPACE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.AVIATOR-WORKSPACE
Namespace	MJ.PBMEF.Product.AVIATOR-WORKSPACE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product AVIATOR-WORKSPACE
Definition	Organize spaces, projects, decisions, knowledge, members, roles, and capabilities.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Organize spaces, projects, decisions, knowledge, members, roles, and capabilities.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='AVIATOR-WORKSPACE', class='APPLICATION_PRODUCT')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product AVIATOR-WORKSPACE { purpose; formulas; families; evidence; permit; }
Literal	AVIATOR-WORKSPACE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	APPLICATION_PRODUCT
Attribute	status=REFERENCE_CANDIDATE

21.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Lecanto Truthful Visualization -

LECANTO-VISUAL

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.LECANTO-VISUAL
Namespace	MJ.PBMEF.Product.LECANTO-VISUAL.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product LECANTO-VISUAL
Definition	Display system truth, provenance, topology, uncertainty, and evidence.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Display system truth, provenance, topology, uncertainty, and evidence.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='LECANTO-VISUAL', class='VISUAL_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product LECANTO-VISUAL { purpose; formulas; families; evidence; permit; }
Literal	LECANTO-VISUAL
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	VISUAL_SYSTEM
Attribute	status=REFERENCE_CANDIDATE

22.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Elsa Governed Marketplace Reference - ELSA-MARKETPLACE

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.ELSA-MARKETPLACE
Namespace	MJ.PBMEF.Product.ELSA-MARKETPLACE.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product ELSA-MARKETPLACE
Definition	Coordinate semantic listings, workflow, accounting, execution, and resource evidence without live market authority.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Coordinate semantic listings, workflow, accounting, execution, and resource evidence without live market authority.
Expression	Product-specific composition of formula and object records
Statement	Status: INTERNAL_REFERENCE_ONLY
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='ELSA-MARKETPLACE', class='MARKETPLACE_REFERENCE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product ELSA-MARKETPLACE { purpose; formulas; families; evidence; permit; }
Literal	ELSA-MARKETPLACE
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	MARKETPLACE_REFERENCE
Attribute	status=INTERNAL_REFERENCE_ONLY

23.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Shekina Distributed Continuity - SHEKINA-CONTINUITY

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.SHEKINA-CONTINUITY
Namespace	MJ.PBMEF.Product.SHEKINA-CONTINUITY.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product SHEKINA-CONTINUITY
Definition	Model bounded replicas, failover, continuity, and placement evidence.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Model bounded replicas, failover, continuity, and placement evidence.
Expression	Product-specific composition of formula and object records
Statement	Status: SPECIFICATION_CANDIDATE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='SHEKINA-CONTINUITY', class='INFRASTRUCTURE_REFERENCE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product SHEKINA-CONTINUITY { purpose; formulas; families; evidence; permit; }
Literal	SHEKINA-CONTINUITY
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	INFRASTRUCTURE_REFERENCE
Attribute	status=SPECIFICATION_CANDIDATE

24.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Pearl Hypothetical Simulation and Information-Retention System - PEARL-CONTAINMENT

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.PEARL-CONTAINMENT
Namespace	MJ.PBMEF.Product.PEARL-CONTAINMENT.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product PEARL-CONTAINMENT
Definition	Acquire, retain, replay, and compare variance simulations and transfer/regeneration opportunities without asserting physical containment.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Acquire, retain, replay, and compare variance simulations and transfer/regeneration opportunities without asserting physical containment.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_SIMULATION_ONLY_PHYSICAL_NOT_APPLICABLE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='PEARL-CONTAINMENT', class='HYPOTHETICAL_SIMULATION_AND_INFORMATION_RETENTION')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product PEARL-CONTAINMENT { purpose; formulas; families; evidence; permit; }
Literal	PEARL-CONTAINMENT
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	HYPOTHETICAL_SIMULATION_AND_INFORMATION_RETENTION
Attribute	status=REFERENCE_SIMULATION_ONLY_PHYSICAL_NOT_APPLICABLE

25.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Bangel Spreadsheets - Bangel -

SPREADSHEETS

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.Bangel -SPREADSHEETS
Namespace	MJ.PBMEF.Product.Bangel -SPREADSHEETS.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product Bangel -SPREADSHEETS
Definition	Provide governed spreadsheet-like operational modeling through typed measurement cells, immutable revisions, Pearl simulation partitions, deterministic recalculation, concurrency control, and audit evidence.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	Bangel and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Provide governed spreadsheet-like operational modeling through typed measurement cells, immutable revisions, Pearl simulation partitions, deterministic recalculation, concurrency control, and audit evidence.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_MVP_PREPASSKEY
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='Bangel -SPREADSHEETS', class='MEASUREMENT_SPREADSHEET_PLATFORM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product Bangel -SPREADSHEETS { purpose; formulas; families; evidence; permit; }
Literal	Bangel -SPREADSHEETS
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	MEASUREMENT_SPREADSHEET_PLATFORM
Attribute	status=REFERENCE_MVP_PREPASSKEY

26.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

JPOSMJ Product Portfolio Envelope - JPOSMJ-PORTFOLIO

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.JPOSMJ-PORTFOLIO
Namespace	MJ.PBMEF.Product.JPOSMJ-PORTFOLIO.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product JPOSMJ-PORTFOLIO
Definition	Bind every JP-origin product candidate through MK physics representation, JO verification, participant evidence, and MJ bounded permit classification.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	JP and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Bind every JP-origin product candidate through MK physics representation, JO verification, participant evidence, and MJ bounded permit classification.
Expression	Product-specific composition of formula and object records
Statement	Status: PREPASSKEY_PORTFOLIO_ENVELOPE
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='JPOSMJ-PORTFOLIO', class='PRODUCT_FAMILY_ENVELOPE')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product JPOSMJ-PORTFOLIO { purpose; formulas; families; evidence; permit; }
Literal	JPOSMJ-PORTFOLIO
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PRODUCT_FAMILY_ENVELOPE
Attribute	status=PREPASSKEY_PORTFOLIO_ENVELOPE

27.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

MJ Standard Containment Geometry and Reference Gas Model - STANDARD-CONTAINMENT-GEOMETRY

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.STANDARD-CONTAINMENT-GEOMETRY
Namespace	MJ.PBMEF.Product.STANDARD-CONTAINMENT-GEOMETRY.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product STANDARD-CONTAINMENT-GEOMETRY
Definition	Provide a scale-independent rectangle/cone/Sister/EVE/reservoir calculation standard and H2 reference-gas observation profile.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Provide a scale-independent rectangle/cone/Sister/EVE/reservoir calculation standard and H2 reference-gas observation profile.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_MVP_PHYSICAL_VALUES_HOLD
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='STANDARD-CONTAINMENT-GEOMETRY', class='PHYSICS_REFERENCE_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product STANDARD-CONTAINMENT-GEOMETRY { purpose; formulas; families; evidence; permit; }
Literal	STANDARD-CONTAINMENT-GEOMETRY
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICS_REFERENCE_SYSTEM
Attribute	status=REFERENCE_MVP_PHYSICAL_VALUES_HOLD

28.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

MJ Reservoir Collection, Lake Buffer, and Spiral-Compatible Re-entry - RESERVOIR-COLLECTION-MODULATION

Construct	Formula-specific expression
Module	MJ.PBMEF.Product.RESERVOIR-COLLECTION-MODULATION
Namespace	MJ.PBMEF.Product.RESERVOIR-COLLECTION-MODULATION.Day0
Import	Manifest, product register, applicable formulas, family and object definitions
Declaration	product RESERVOIR-COLLECTION-MODULATION
Definition	Model the rear reservoir loop, exterior outlet, lake-like buffer, circular inward/tangential re-entry, wave/friction references, adaptive sizing, and full Sister/EVE/Angel/M3/MK/JO/Mermaid/Shiva/MJ transaction path.
Capability	Reference, simulation, implementation candidate, or evidence lane according to status
Participant	MJ and applicable family manifestations
Relationship	JP origin -> MK physics -> JO proof -> family evidence -> M3 -> Mermaid/Shiva -> MJ
Function	Model the rear reservoir loop, exterior outlet, lake-like buffer, circular inward/tangential re-entry, wave/friction references, adaptive sizing, and full Sister/EVE/Angel/M3/MK/JO/Mermaid/Shiva/MJ transaction path.
Expression	Product-specific composition of formula and object records
Statement	Status: REFERENCE_MVP_PHYSICAL_VALUES_HOLD
Measurement	Product-specific; physical products require actual article and calibrated evidence
Constraint	No product inherits permission from portfolio membership or mathematical validity
Annotation	@product(id='RESERVOIR-COLLECTION-MODULATION', class='PHYSICS_REFERENCE_SYSTEM')
Directive	retain status, claims ceiling, evidence gates, and permit class
Block	product RESERVOIR-COLLECTION-MODULATION { purpose; formulas; families; evidence; permit; }
Literal	RESERVOIR-COLLECTION-MODULATION
Reference	manifest/PROJECT-PRODUCT-REGISTER.json and matching product white paper
Type	PHYSICS_REFERENCE_SYSTEM
Attribute	status=REFERENCE_MVP_PHYSICAL_VALUES_HOLD

29.1 Application and life-cycle potential

The product enters through a purpose-specific Bangel declaration. Elsa recovers its intended application; JP composes its governed representation; MK determines physical applicability; JO verifies; the appropriate family manifestations contribute evidence; M3 routes resources; Mermaid and Shiva process balances or capital implications; MJ decides. A physical or external product remains held until its own evidence and authority gates pass.

Registered white-paper verification crosswalk

30.1 MJ — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-01

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-01
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-01
Import	whitepapers/family/01-mj.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-01
Definition	Project root, founder-governed authority and final bounded permit decision. Project root, founder-governed authority and final bounded permit decision. truth, measurement, human authority, stewardship, non-weaponization.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MJ
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-01', path='whitepapers/family/01-mj.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-01 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-01
Reference	whitepapers/family/01-mj.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.2 Bangel — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-02

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-02
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-02
Import	whitepapers/family/02-Bangel.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-02
Definition	Human-facing governed language that preserves purpose and command structure. Human-facing governed language that preserves purpose and command structure. intent integrity, explicit types, traceability.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	Bangel
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-02', path='whitepapers/family/02-Bangel.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-02 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-02
Reference	whitepapers/family/02-Bangel.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.3 Elsa — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-03

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-03
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-03
Import	whitepapers/family/03-elsa.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-03
Definition	Deterministic semantic recovery and purpose-preservation layer. Deterministic semantic recovery and purpose-preservation layer. meaning fidelity, purpose confinement, clarity.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ELSA
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-03', path='whitepapers/family/03-elsa.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-03 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-03
Reference	whitepapers/family/03-elsa.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.4 JP — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-04

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-04
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-04
Import	whitepapers/family/04-jp.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-04
Definition	Canonical mathematical, algorithmic, topology, CAPO, and architecture representation. Canonical mathematical, algorithmic, topology, CAPO, and architecture representation. mathematical rigor, provenance, equivalence.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-04', path='whitepapers/family/04-jp.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-04 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-04
Reference	whitepapers/family/04-jp.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.5

Mika / MK — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-05

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-05
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-05
Import	whitepapers/family/05-mk.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-05
Definition	Physics Modulator System for dimensional, conservation, boundary, scale, and evidence representation. Physics Modulator System for dimensional, conservation, boundary, scale, and evidence representation. physical truth, unit integrity, conservation, uncertainty honesty.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MK
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-05', path='whitepapers/family/05-mk.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-05 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-05
Reference	whitepapers/family/05-mk.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.6

JO — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-06

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-06
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-06
Import	whitepapers/family/06-jo.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-06
Definition	Deterministic type, unit, proof, validation, runtime, and evidence engine. Deterministic type, unit, proof, validation, runtime, and evidence engine. fail closed, reproducibility, auditability.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JO
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-06', path='whitepapers/family/06-jo.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-06 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-06
Reference	whitepapers/family/06-jo.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.7 MJOS — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-07

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-07
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-07
Import	whitepapers/family/07-mjos.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-07
Definition	Operating-system and infrastructure substrate inside MJ. Operating-system and infrastructure substrate inside MJ. bounded resources, continuity, isolation.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MJOS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-07', path='whitepapers/family/07-mjos.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-07 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-07
Reference	whitepapers/family/07-mjos.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.8 Angels — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-08

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-08
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-08
Import	whitepapers/family/08-angels.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-08
Definition	Domain-specific observation, telemetry, hold, denial, and corrective-command family. Domain-specific observation, telemetry, hold, denial, and corrective-command family. safety, watchfulness, correction.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ANGELS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-08', path='whitepapers/family/08-angels.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-08 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-08
Reference	whitepapers/family/08-angels.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.9 Bellatrix — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-09

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-09
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-09
Import	whitepapers/family/09-bellatrix.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-09
Definition	Independent defense, challenge, quarantine, hostile-deviation analysis, and denial. Independent defense, challenge, quarantine, hostile-deviation analysis, and denial. defense, independence, containment.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	BELLATRIX
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-09', path='whitepapers/family/09-bellatrix.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-09 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-09
Reference	whitepapers/family/09-bellatrix.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.10 Sister — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-10

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-10
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-10
Import	whitepapers/family/10-sister.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-10
Definition	Predictive digital twin, preallocation evidence, anomaly detection, and umbrella containment. Predictive digital twin, preallocation evidence, anomaly detection, and umbrella containment. prediction, redundancy, early warning.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SISTER
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-10', path='whitepapers/family/10-sister.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-10 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-10
Reference	whitepapers/family/10-sister.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.11 EVE — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-11

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-11
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-11
Import	whitepapers/family/11-eve.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-11
Definition	Variance, evaporative effect, screen capture, leakage, smoke-like egress, and boundary-accounting evidence. Variance, evaporative effect, screen capture, leakage, smoke-like egress, and boundary-accounting evidence. diligence, respect, loss accounting, boundary truth.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	EVE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-11', path='whitepapers/family/11-eve.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-11 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-11
Reference	whitepapers/family/11-eve.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.12 Mary / M3 — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-12

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-12
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-12
Import	whitepapers/family/12-m3.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-12
Definition	Bounded routing, API gateway, load balancing, connection pooling, and allocation stewardship. Bounded routing, API gateway, load balancing, connection pooling, and allocation stewardship. fair allocation, resource hygiene, bounded routing.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	M3
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-12', path='whitepapers/family/12-m3.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-12 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-12
Reference	whitepapers/family/12-m3.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.13 Mermaid — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-13

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-13
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-13
Import	whitepapers/family/13-mermaid.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-13
Definition	Accounting, reconciliation, exposure, custody evidence, statements, tax lots, and financial consequence. Accounting, reconciliation, exposure, custody evidence, statements, tax lots, and financial consequence. ledger truth, reconciliation, transparency.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MERMAID
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-13', path='whitepapers/family/13-mermaid.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-13 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-13
Reference	whitepapers/family/13-mermaid.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.14 Shiva — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-14

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-14
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-14
Import	whitepapers/family/14-shiva.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-14
Definition	Finance, money, treasury, liquidity, capital-job classification, risk/opportunity analysis, and distribution proposal. Finance, money, treasury, liquidity, capital-job classification, risk/opportunity analysis, and distribution proposal. liquidity first, stability, abundance with discipline, auditability.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVA
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-14', path='whitepapers/family/14-shiva.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-14 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-14
Reference	whitepapers/family/14-shiva.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.15 Shekina — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-15

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-15
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-15
Import	whitepapers/family/15-shekina.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-15
Definition	Distributed placement, replication, continuity, and infrastructure evidence. Distributed placement, replication, continuity, and infrastructure evidence. continuity, bounded placement, resilience.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHEKINA
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-15', path='whitepapers/family/15-shekina.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-15 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-15
Reference	whitepapers/family/15-shekina.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.16 Belle — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-16

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-16
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-16
Import	whitepapers/family/16-belle.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-16
Definition	Engineering analysis, feasibility, topology review, and bounded proposals. Engineering analysis, feasibility, topology review, and bounded proposals. engineering clarity, feasibility, benchmarking.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	BELLE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-16', path='whitepapers/family/16-belle.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-16 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-16
Reference	whitepapers/family/16-belle.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.17 Lecanto — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-17

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-17
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-17
Import	whitepapers/family/17-lecanto.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-17
Definition	Truthful governed visualization of state, provenance, uncertainty, and system structure. Truthful governed visualization of state, provenance, uncertainty, and system structure. visibility, truth, uncertainty disclosure.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	LECANTO
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-17', path='whitepapers/family/17-lecanto.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-17 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-17
Reference	whitepapers/family/17-lecanto.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.18 Moana — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-18

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-18
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-18
Import	whitepapers/family/18-moana.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-18
Definition	Browser and interaction presentation of governed applications and evidence. Browser and interaction presentation of governed applications and evidence. interaction truth, accessibility, bounded presentation.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MOANA
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-18', path='whitepapers/family/18-moana.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-18 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-18
Reference	whitepapers/family/18-moana.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.19 Aviator — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-19

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-19
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-19
Import	whitepapers/family/19-aviator.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-19
Definition	Organizational workspace, projects, decisions, roles, knowledge, and governed workflow. Organizational workspace, projects, decisions, roles, knowledge, and governed workflow. understanding first, organization, decision trace.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	AVIATOR
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-19', path='whitepapers/family/19-aviator.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-19 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-19
Reference	whitepapers/family/19-aviator.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.20 CHI — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-20

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-20
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-20
Import	whitepapers/family/20-chi.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-20
Definition	Temporal variance and expected-observed-delivered-reconciled difference state. Temporal variance and expected-observed-delivered-reconciled difference state. variance truth, time awareness.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	CHI
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-20', path='whitepapers/family/20-chi.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-20 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-20
Reference	whitepapers/family/20-chi.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.21 WATER — MJ Manifestation White Paper - MJ-PBMEF-FAMILY-WP-21

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-FAMILY-WP-21
Namespace	MJ.PBMEF.Document.MJ-PBMEF-FAMILY-WP-21
Import	whitepapers/family/21-water.md
Declaration	whitepaper MJ-PBMEF-FAMILY-WP-21
Definition	Interval uncertainty, verified floor, and bounded unknown-state classification. Interval uncertainty, verified floor, and bounded unknown-state classification. uncertainty honesty, bounded intervals.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	WATER
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-FAMILY-WP-21', path='whitepapers/family/21-water.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-FAMILY-WP-21 { source; hash; coverage; status; }
Literal	MJ-PBMEF-FAMILY-WP-21
Reference	whitepapers/family/21-water.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.22 MJ Physics Based Measurement Engineering Framework - MJ-PBMEF-PRODUCT-WP-01

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-01
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-01
Import	whitepapers/products/01-pbmef-core.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-01
Definition	Integrate purpose, mathematics, physics, verification, safety, resource routing, accounting, finance, evidence, and bounded permit decisions. Integrate purpose, mathematics, physics, verification, safety, resource routing, accounting, finance, evidence, and bounded permit decisions. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	PBMEF-CORE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-01', path='whitepapers/products/01-pbmef-core.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-01 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-01
Reference	whitepapers/products/01-pbmef-core.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.23

Bangel Governed Measurement Language - MJ-PBMEF-PRODUCT-WP-02

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-02
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-02
Import	whitepapers/products/02-Bangel-language.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-02
Definition	Express human purpose, typed measurements, formulas, evidence, and command pathways. Express human purpose, typed measurements, formulas, evidence, and command pathways. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	Bangel -LANGUAGE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-02', path='whitepapers/products/02-Bangel-language.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-02 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-02
Reference	whitepapers/products/02-Bangel-language.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.24

Elsa Deterministic Semantic Recovery - MJ-PBMEF-PRODUCT-WP-03

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-03
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-03
Import	whitepapers/products/03-elsa-semantics.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-03
Definition	Recover and preserve declared meaning without autonomous inference or authority. Recover and preserve declared meaning without autonomous inference or authority. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ELSA-SEMANTICS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-03', path='whitepapers/products/03-elsa-semantics.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-03 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-03
Reference	whitepapers/products/03-elsa-semantics.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.25 JP Mathematical and Architectural Canon - MJ-PBMEF-PRODUCT-WP-04

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-04
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-04
Import	whitepapers/products/04-jp-canon.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-04
Definition	Represent equations, algorithms, CAPOs, topology, products, and proofs. Represent equations, algorithms, CAPOs, topology, products, and proofs. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP-CANON
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-04', path='whitepapers/products/04-jp-canon.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-04 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-04
Reference	whitepapers/products/04-jp-canon.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.26 Mika/MK Physics Modulator System - MJ-PBMEF-PRODUCT-WP-05

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-05
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-05
Import	whitepapers/products/05-mk-physics.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-05
Definition	Create physics representations and verify units, conservation, boundaries, scale, and evidence ceilings. Create physics representations and verify units, conservation, boundaries, scale, and evidence ceilings. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MK-PHYSICS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-05', path='whitepapers/products/05-mk-physics.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-05 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-05
Reference	whitepapers/products/05-mk-physics.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.27 JO Deterministic Proof and Runtime - MJ-PBMEF-PRODUCT-WP-06

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-06
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-06
Import	whitepapers/products/06-jo-runtime.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-06
Definition	Verify types, units, authority, physics, tests, evidence, and bounded execution. Verify types, units, authority, physics, tests, evidence, and bounded execution. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JO-RUNTIME
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-06', path='whitepapers/products/06-jo-runtime.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-06 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-06
Reference	whitepapers/products/06-jo-runtime.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.28 MJOS Operating Substrate - MJ-PBMEF-PRODUCT-WP-07

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-07
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-07
Import	whitepapers/products/07-mjos-substrate.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-07
Definition	Provide isolated resources, memory, storage, network, scheduling, and continuity under MJ leases. Provide isolated resources, memory, storage, network, scheduling, and continuity under MJ leases. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MJOS-SUBSTRATE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-07', path='whitepapers/products/07-mjos-substrate.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-07 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-07
Reference	whitepapers/products/07-mjos-substrate.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.29 JP Semiconductor Phone Battery and OS Candidate - MJ-PBMEF-PRODUCT-WP-08

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-08
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-08
Import	whitepapers/products/08-jp-sc-phone.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-08
Definition	Explore semiconductor-scale static intake, power wake, solar assist, battery, and operating-system integration. Explore semiconductor-scale static intake, power wake, solar assist, battery, and operating-system integration. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP-SC-PHONE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-08', path='whitepapers/products/08-jp-sc-phone.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-08 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-08
Reference	whitepapers/products/08-jp-sc-phone.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.30 JP Large-Scale Boating Power Candidate - MJ-PBMEF-PRODUCT-WP-09

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-09
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-09
Import	whitepapers/products/09-jp-ls-boat.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-09
Definition	Explore large-scale static intake, solar initiation, power bus, containment, and marine power integration. Explore large-scale static intake, solar initiation, power bus, containment, and marine power integration. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP-LS-BOAT
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-09', path='whitepapers/products/09-jp-ls-boat.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-09 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-09
Reference	whitepapers/products/09-jp-ls-boat.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.31 JP Peaceful High-Energy Propulsion Research Candidate - MJ-PBMEF-PRODUCT-WP-10

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-10
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-10
Import	whitepapers/products/10-jp-peaceful-propulsion.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-10
Definition	Explore peaceful propulsion measurement and control under non-weaponization, safety, and regulatory gates. Explore peaceful propulsion measurement and control under non-weaponization, safety, and regulatory gates. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JP-PEACEFUL-PROPULSION
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-10', path='whitepapers/products/10-jp-peaceful-propulsion.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-10 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-10
Reference	whitepapers/products/10-jp-peaceful-propulsion.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.32 Sister Predictive Containment System - MJ-PBMEF-PRODUCT-WP-11

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-11
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-11
Import	whitepapers/products/11-sister-containment.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-11
Definition	Define a scale-independent physical-containment calculation pathway without claiming a realized physical article. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SISTER-CONTAINMENT
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-11', path='whitepapers/products/11-sister-containment.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-11 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-11
Reference	whitepapers/products/11-sister-containment.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.33 EVE Variance Screen and Egress Accounting - MJ-PBMEF-PRODUCT-WP-12

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-12
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-12
Import	whitepapers/products/12-eve-screen.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-12
Definition	Account for variance, evaporation, leakage, capture, and natural egress without silent loss. Account for variance, evaporation, leakage, capture, and natural egress without silent loss. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	EVE-SCREEN
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-12', path='whitepapers/products/12-eve-screen.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-12 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-12
Reference	whitepapers/products/12-eve-screen.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.34 Angels Safety and Corrective Command System - MJ-PBMEF-PRODUCT-WP-13

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-13
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-13
Import	whitepapers/products/13-angels-safety.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-13
Definition	Provide domain-bounded telemetry, hold, denial, isolation, and corrective protocols. Provide domain-bounded telemetry, hold, denial, isolation, and corrective protocols. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ANGELS-SAFETY
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-13', path='whitepapers/products/13-angels-safety.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-13 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-13
Reference	whitepapers/products/13-angels-safety.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.35 Mermaid Accounting and Reconciliation System - MJ-PBMEF-PRODUCT-WP-14

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-14
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-14
Import	whitepapers/products/14-mermaid-recon.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-14
Definition	Maintain balances, custody evidence, exposure, tax lots, statements, and reconciliation. Maintain balances, custody evidence, exposure, tax lots, statements, and reconciliation. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MERMAID-RECON
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-14', path='whitepapers/products/14-mermaid-recon.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-14 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-14
Reference	whitepapers/products/14-mermaid-recon.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.36 Shiva Dual Financial Rails - MJ-PBMEF-PRODUCT-WP-15

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-15
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-15
Import	whitepapers/products/15-shiva-rails.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-15
Definition	Separate stability/cash functions from investment and crypto risk while preserving liquidity-first ethics. Separate stability/cash functions from investment and crypto risk while preserving liquidity-first ethics. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVA-RAILS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-15', path='whitepapers/products/15-shiva-rails.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-15 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-15
Reference	whitepapers/products/15-shiva-rails.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.37 SHIVAS Internal Settlement Reflection - MJ-PBMEF-PRODUCT-WP-16

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-16
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-16
Import	whitepapers/products/16-shivas-internal.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-16
Definition	Represent internal capital reflections without minting, redemption, public offer, or value guarantee. Represent internal capital reflections without minting, redemption, public offer, or value guarantee. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVAS-INTERNAL
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-16', path='whitepapers/products/16-shivas-internal.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-16 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-16
Reference	whitepapers/products/16-shivas-internal.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.38 Shiva Crypto External-Market Candidate - MJ-PBMEF-PRODUCT-WP-17

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-17
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-17
Import	whitepapers/products/17-shiva-crypto.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-17
Definition	Model a separately governed external crypto rail subject to full classification and authorization. Model a separately governed external crypto rail subject to full classification and authorization. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVA-CRYPTO
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-17', path='whitepapers/products/17-shiva-crypto.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-17 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-17
Reference	whitepapers/products/17-shiva-crypto.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.39 Shiva Exchange Rule Reference - MJ-PBMEF-PRODUCT-WP-18

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-18
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-18
Import	whitepapers/products/18-shiva-exchange.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-18
Definition	Model transparent price-time, custody, audit, tax, and transfer rules without operating a market. Model transparent price-time, custody, audit, tax, and transfer rules without operating a market. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHIVA-EXCHANGE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-18', path='whitepapers/products/18-shiva-exchange.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-18 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-18
Reference	whitepapers/products/18-shiva-exchange.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.40 Moana Governed Browser - MJ-PBMEF-PRODUCT-WP-19

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-19
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-19
Import	whitepapers/products/19-moana-browser.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-19
Definition	Present governed applications, evidence, holds, and uncertainty. Present governed applications, evidence, holds, and uncertainty. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MOANA-BROWSER
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-19', path='whitepapers/products/19-moana-browser.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-19 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-19
Reference	whitepapers/products/19-moana-browser.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.41 Aviator Organizational Workspace - MJ-PBMEF-PRODUCT-WP-20

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-20
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-20
Import	whitepapers/products/20-aviator-workspace.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-20
Definition	Organize spaces, projects, decisions, knowledge, members, roles, and capabilities. Organize spaces, projects, decisions, knowledge, members, roles, and capabilities. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	AVIATOR-WORKSPACE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-20', path='whitepapers/products/20-aviator-workspace.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-20 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-20
Reference	whitepapers/products/20-aviator-workspace.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.42 Lecanto Truthful Visualization - MJ-PBMEF-PRODUCT-WP-21

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-21
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-21
Import	whitepapers/products/21-lecanto-visual.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-21
Definition	Display system truth, provenance, topology, uncertainty, and evidence. Display system truth, provenance, topology, uncertainty, and evidence. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	LECANTO-VISUAL
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-21', path='whitepapers/products/21-lecanto-visual.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-21 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-21
Reference	whitepapers/products/21-lecanto-visual.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.43 Elsa Governed Marketplace Reference - MJ-PBMEF-PRODUCT-WP-22

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-22
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-22
Import	whitepapers/products/22-elsa-marketplace.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-22
Definition	Coordinate semantic listings, workflow, accounting, execution, and resource evidence without live market authority. Coordinate semantic listings, workflow, accounting, execution, and resource evidence without live market authority. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	ELSA-MARKETPLACE
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-22', path='whitepapers/products/22-elsa-marketplace.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-22 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-22
Reference	whitepapers/products/22-elsa-marketplace.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.44 Shekina Distributed Continuity - MJ-PBMEF-PRODUCT-WP-23

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-23
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-23
Import	whitepapers/products/23-shekina-continuity.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-23
Definition	Model bounded replicas, failover, continuity, and placement evidence. Model bounded replicas, failover, continuity, and placement evidence. measurement, safety, traceability, bounded development.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	SHEKINA-CONTINUITY
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-23', path='whitepapers/products/23-shekina-continuity.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-23 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-23
Reference	whitepapers/products/23-shekina-continuity.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.45 Pearl Hypothetical Simulation and Information-Retention Sys-tem - MJ-PBMEF-PRODUCT-WP-24

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-24
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-24
Import	whitepapers/products/24-pearl-containment.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-24
Definition	Acquire, retain, compare, and replay variance information and simulation potential without asserting a physical Pearl container. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	PEARL-CONTAINMENT
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-24', path='whitepapers/products/24-pearl-containment.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-24 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-24
Reference	whitepapers/products/24-pearl-containment.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.46 Bangel Spreadsheets - MJ-PBMEF-PRODUCT-WP-25

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-25
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-25
Import	whitepapers/products/25-Bangel-spreadsheets.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-25
Definition	Provide a physics-oriented, deterministic alternative to conventional spreadsheet workflows. Bangel Spreadsheets addresses founder-defined operational risks: siloed files, conflicting versions, calculation bottlenecks, weak governance, and silent manual errors. Bangel Spreadsheets is an MJ product manifestation. A workbook is a governed measurement field. A cell is a typed object containing value, unit, uncertainty, formula, revision, lineage, authority, evidence, and state. A workbook revision is immutable and content-addressed. Large workbooks are partitioned into Pearl simulation objects rather than silently copied into disconnected files. Unified measurement meaning, immutable lineage, incremental work, low-latency correlation, typed units, explicit uncertainty, concurrency safety, role-scoped access, auditability, and reality-based reporting.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	Bangel -SPREADSHEETS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-25', path='whitepapers/products/25-Bangel-spreadsheets.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-25 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-25
Reference	whitepapers/products/25-Bangel-spreadsheets.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.47 JPOSMJ Product Portfolio Envelope - MJ-PBMEF-PRODUCT-WP-26

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-26
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-26
Import	whitepapers/products/26-jposmj-portfolio.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-26
Definition	Give every JP-origin product and project option one consistent route through physics, proof, evidence, authority, and claims ceilings. 'JPOSMJ' is an internal portfolio label meaning JP product architecture → MK physics → JO verification → MJ permit classification. It is not a participant, authority, operating system, or physical product. Consistent articulation, minimal revision, product comparability, physics completeness, evidence honesty, safety, and bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	JPOSMJ-PORTFOLIO
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-26', path='whitepapers/products/26-jposmj-portfolio.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-26 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-26
Reference	whitepapers/products/26-jposmj-portfolio.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.48 MJ Standard Containment Geometry and Reference Gas Model - MJ-PBMEF-PRODUCT-WP-27

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-27
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-27
Import	whitepapers/products/27-standard-containment-geometry.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-27
Definition	Provide a scale-independent product-calculation standard for the founder-defined open rectangular intake, conical expansion, Sister umbrella capture, isolated descent, EVE residual and escape accounting, bounded residual reservoir, and Pearl top-of-cone simulation anchor. The product is an MJ manifestation. Bangel expresses the typed command; Elsa preserves its intended meaning; JP constructs the geometry and equation CAPOs; MK classifies physics applicability and verifies dimensions, gas state, forces, conservation, uncertainty, and validity domain; JO verifies code and evidence; Sister, EVE, Angels, Bellatrix, and M3 provide bounded routing, observation, containment, and safety evidence; Mermaid reconciles quantities; Shiva evaluates capital implications only when applicable; MJ retains the final bounded decision. Scale-independent ratios, explicit units, truthful evidence ceilings, co
Capability	Explain, constrain, cross-reference, and support founder review
Participant	STANDARD-CONTAINMENT-GEOMETRY
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-27', path='whitepapers/products/27-standard-containment-geometry.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-27 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-27
Reference	whitepapers/products/27-standard-containment-geometry.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.49 MJ Reservoir Collection Modulation and Return Loop - MJ-PBMEF-PRODUCT-WP-28

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-PRODUCT-WP-28
Namespace	MJ.PBMEF.Document.MJ-PBMEF-PRODUCT-WP-28
Import	whitepapers/products/28-reservoir-collection-modulation.md
Declaration	whitepaper MJ-PBMEF-PRODUCT-WP-28
Definition	Provide one scale-independent reference product for the founder-defined backside outlet, outward-facing gap, connected but separately accounted lake/buffer, circular inward-tangential re-entry, and continued variance-processing cycle. JP defines the geometry and transaction CAPOs; MK provides physics applicability, units, flow, wave, force, friction, and conservation; JO produces deterministic proof and cycle receipts; Sister provides predictive placement and physical-containment evidence; EVE records screen, pass-through, escape, evaporation, and residual state; Angels provide safety checks; M3 routes every transaction under a bounded lease; Mermaid reconciles; Shiva analyzes opportunity only when capital applies; MJ alone decides whether a bounded effect is eligible. Scale independence, small-discharge intent, actual-boundary truth, nonphysical Pearl-reference separation, control-volum
Capability	Explain, constrain, cross-reference, and support founder review
Participant	RESERVOIR-COLLECTION-MODULATION
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-PRODUCT-WP-28', path='whitepapers/products/28-reservoir-collection-modulation.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-PRODUCT-WP-28 { source; hash; coverage; status; }
Literal	MJ-PBMEF-PRODUCT-WP-28
Reference	whitepapers/products/28-reservoir-collection-modulation.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.50 R1 and R2 State Representation - MJ-PBMEF-REPRESENTATION-WP-01

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-01
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-01
Import	whitepapers/representations/01-state-r1-r2.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-01
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	STATE-R1-R2
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-01', path='whitepapers/representations/01-state-r1-r2.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-01 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-01
Reference	whitepapers/representations/01-state-r1-r2.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.51 Noise Floor and 23 mg Inflection - MJ-PBMEF-REPRESENTATION-WP-02

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-02
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-02
Import	whitepapers/representations/02-noise-23mg.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-02
Definition	Separate the 23 mg pre-observational floor from the 24 mg containment-geometry reference and bind both to the first-noise plane. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	NOISE-23MG
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-02', path='whitepapers/representations/02-noise-23mg.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-02 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-02
Reference	whitepapers/representations/02-noise-23mg.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.52 Upward 3x3 Node and Umbrella Representation - MJ-PBMEF-REPRESENTATION-WP-03

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-03
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-03
Import	whitepapers/representations/03-node-3x3.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-03
Definition	Integrate the open rectangle and conical expansion with the normalized N1-N9, U/D/C, EVE, and reservoir topology. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	NODE-3X3
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-03', path='whitepapers/representations/03-node-3x3.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-03 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-03
Reference	whitepapers/representations/03-node-3x3.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.53 Memory, Request Occultation, and Generational Handoff - MJ-PBMEF-REPRESENTATION-WP-04

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-04
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-04
Import	whitepapers/representations/04-memory-handoff.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-04
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	MEMORY-HANDOFF
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-04', path='whitepapers/representations/04-memory-handoff.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-04 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-04
Reference	whitepapers/representations/04-memory-handoff.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.54 Static Intake and Energy-Wake Representation - MJ-PBMEF-REPRESENTATION-WP-05

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-05
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-05
Import	whitepapers/representations/05-static-impetus.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-05
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	STATIC-IMPETUS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-05', path='whitepapers/representations/05-static-impetus.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-05 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-05
Reference	whitepapers/representations/05-static-impetus.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.55 EVE Variance, Screen, Evaporation, and Egress - MJ-PBMEF-REPRESENTATION-WP-06

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-06
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-06
Import	whitepapers/representations/06-eve-egress.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-06
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	EVE-EGRESS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-06', path='whitepapers/representations/06-eve-egress.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-06 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-06
Reference	whitepapers/representations/06-eve-egress.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.56 Shiva and Mermaid Financial Rails - MJ-PBMEF-REPRESENTATION-WP-07

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-07
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-07
Import	whitepapers/representations/07-financial-rails.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-07
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	FINANCIAL-RAILS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-07', path='whitepapers/representations/07-financial-rails.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-07 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-07
Reference	whitepapers/representations/07-financial-rails.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.57 Passkey, Claims Ceiling, and Repository Authentication - MJ-PBMEF-REPRESENTATION-WP-08

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-08
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-08
Import	whitepapers/representations/08-passkey.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-08
Definition	Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. Define the minimum complete logic, equations, authority boundaries, evidence states, and passkey claims for this representation. truth, measurement, traceability, bounded authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	PASSKEY
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-08', path='whitepapers/representations/08-passkey.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-08 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-08
Reference	whitepapers/representations/08-passkey.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.58 Pearl Hypothetical Geometry and Acoustic Simulation Representation - MJ-PBMEF-REPRESENTATION-WP-09

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-09
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-09
Import	whitepapers/representations/09-pearl-container-acoustics.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-09
Definition	Bind Pearl simulation to the top-of-cone observation plane and retain acoustic variables as simulation-only. This representation is governed inside MJ and follows Bangel -> Elsa -> JP -> MK -> JO -> applicable evidence -> M3 -> Mermaid/Shiva -> MJ. Truthful measurement, scale independence, conservation, explicit uncertainty, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	PEARL-CONTAINER-ACOUSTICS
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-09', path='whitepapers/representations/09-pearl-container-acoustics.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-09 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-09
Reference	whitepapers/representations/09-pearl-container-acoustics.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.59

Bangel

Spreadsheets Cell, Dependency, Revision, and Pearl Simulation Field - MJ-PBMEF-REPRESENTATION-WP-10

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-10
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-10
Import	whitepapers/representations/10-Bangel-spreadsheets-field.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-10
Definition	Define a spreadsheet-like operational field in which cells are typed measurement objects and workbook changes are immutable, auditable, incremental, and partitionable. This representation is the technical core of Bangel Spreadsheets. It supports inventory, finance, project tracking, reporting, or other processes only after the process, users, workload, service level, and authority are declared. Meaning consistency, version truth, low-latency recalculation, role-scoped governance, manual-error resistance, complete audit, and measured capacity.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	Bangel -SPREADSHEETS-FIELD
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-10', path='whitepapers/representations/10-Bangel-spreadsheets-field.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-10 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-10
Reference	whitepapers/representations/10-Bangel-spreadsheets-field.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.60

Standard Containment Geometry and H2 Reference Representation - MJ-PBMEF-REPRESENTATION-WP-11

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-11
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-11
Import	whitepapers/representations/11-standard-containment-geometry-h2-reference.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-11
Definition	Provide one scale-independent containment calculation system for the open rectangle, conical expansion, Sister umbrella/descent/containment, EVE accounting, residual reservoir, and Pearl cone-top simulation anchor. This representation connects JP geometry and formulas to MK physics, JO verification, Sister and EVE evidence, M3 routing, Mermaid reconciliation, Shiva opportunity analysis when applicable, and MJ bounded decisions. Scale independence, unit integrity, conservation, explicit gas state, truthful acceleration limits, and adaptive modification without rewriting core logic.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	STANDARD-CONTAINMENT-GEOMETRY-H2
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-11', path='whitepapers/representations/11-standard-containment-geometry-h2-reference.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-11 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-11
Reference	whitepapers/representations/11-standard-containment-geometry-h2-reference.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

30.61 Reservoir Return Loop Physics Representation - MJ-PBMEF-REPRESENTATION-WP-12

Construct	Formula-specific expression
Module	MJ.PBMEF.WhitePaper.MJ-PBMEF-REPRESENTATION-WP-12
Namespace	MJ.PBMEF.Document.MJ-PBMEF-REPRESENTATION-WP-12
Import	whitepapers/representations/12-reservoir-return-loop.md
Declaration	whitepaper MJ-PBMEF-REPRESENTATION-WP-12
Definition	Represent the outlet, buffer/lake, circular re-entry, perspective, wave-state, capacity, and transaction-cycle evidence of 'RESERVOIR-COLLECTION-MODULATION' without treating the Pearl simulation circle as a physical wall. The representation passes from Bangel and Elsa into JP geometry CAPOs, MK physics checks, JO proof receipts, Sister/EVE/Angel evidence, M3 routing, Mermaid reconciliation, Shiva analysis when capital applies, and MJ bounded decision. Typed state, explicit units, actual-boundary truth, uncertainty-aware clearance, separate control volumes, vector capacity, no same-cycle feed-back, conservation, and non-substitutable authority.
Capability	Explain, constrain, cross-reference, and support founder review
Participant	RESERVOIR-RETURN-LOOP
Relationship	Source documentation -> manifest coverage -> passkey documentation manifest
Function	Provide rationale, formula links, scope, status, evidence ceiling, and boundaries
Expression	Narrative and referenced formulas
Statement	Documentation does not self-verify or self-authorize
Measurement	Not applicable unless the paper cites admitted measurement receipts
Constraint	Must match source hash, status, and claims ceiling
Annotation	@whitepaper(id='MJ-PBMEF-REPRESENTATION-WP-12', path='whitepapers/representations/12-reservoir-return-loop.md')
Directive	include or exclude with explicit manifest reason
Block	document MJ-PBMEF-REPRESENTATION-WP-12 { source; hash; coverage; status; }
Literal	MJ-PBMEF-REPRESENTATION-WP-12
Reference	whitepapers/representations/12-reservoir-return-loop.md
Type	WHITE_PAPER
Attribute	official_pre_day0_source=true

Semiconductor DRO/Pearl Charge, Energy, Memory, Wake, Profile, and Evidence Lifecycle

MJ-PBMEF-DAY0-R8-DRO-PEARL-LECANTO-90K-FINAL | Pink paper | SC-DRO-PEARL-PINK-001

INTERNAL PRE-PASSKEY REFERENCE. NOT PHYSICAL VALIDATION. NOT AN IP APPROVAL OR OWNERSHIP DETERMINATION. NO IGNITION, HYDROGEN SEPARATION, COMBUSTION, ENGINE, VESSEL, ROCKET, WEAPON, PRODUCTION, OR EXTERNAL-EFFECT AUTHORITY.

Full Pink Paper source

Semiconductor DRO/Pearl Charge, Energy, Memory, Wake, Profile, and Evidence Lifecycle

****Pink-paper ID:**** `SC-DRO-PEARL-PINK-001`
****Build:**** `MJ-PBMEF-DAY0-R8-DRO-PEARL-LECANTO-90K-FINAL`
****Author and architect:**** Michael Bangel
****Status:**** `PREPASSKEY\_REFERENCE\_CANDIDATE`

INTERNAL PRE-PASSKEY REFERENCE. NOT PHYSICAL VALIDATION. NOT AN IP APPROVAL OR OWNERSHIP DETERMINATION. NO IGNITION, HYDROGEN SEPARATION, COMBUSTION, ENGINE, VESSEL, ROCKET, WEAPON, PRODUCTION, OR EXTERNAL-EFFECT AUTHORITY.

Gateway expression

text
{hage laohrbcoe.48383829}.M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile.Bangel .begin

The raw literal is retained as provenance. The normalized governed order remains MJ -> Bangel -> R/R1 -> N1 -> Elsa -> JP -> MK -> JO -> evidence -> M3 -> Mermaid/Shiva -> MJ permit -> R2 -> bounded output or hold.

Bangel construct coverage

- ****Module:**** the module role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Namespace:**** the namespace role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Import:**** the import role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Declaration:**** the declaration role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Definition:**** the definition role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Capability:**** the capability role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Participant:**** the participant role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Relationship:**** the relationship role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Function:**** the function role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Expression:**** the expression role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Statement:**** the statement role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Measurement:**** the measurement role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Constraint:**** the constraint role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Annotation:**** the annotation role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Directive:**** the directive role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Block:**** the block role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Literal:**** the literal role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Reference:**** the reference role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Type:**** the type role in this domain must preserve types, units, evidence, authority, and claims ceiling.
- ****Attribute:**** the attribute role in this domain must preserve types, units, evidence, authority, and claims ceiling.

Governed objects

- `SEMICONDUCTOR\_DRO\_ENERGY\_LEDGER`
- `SEMICONDUCTOR\_PEARL\_NODE`

INTERNAL PRE-PASSKEY REFERENCE. NOT PHYSICAL VALIDATION. NOT AN IP APPROVAL OR OWNERSHIP DETERMINATION. NO IGNITION, HYDROGEN SEPARATION, COMBUSTION, ENGINE, VESSEL, ROCKET, WEAPON, PRODUCTION, OR EXTERNAL-EFFECT AUTHORITY.

Formula-by-formula lifecycle

F-220 - DRO energy ledger

Expression: $r_E = E_{in} - E_{stored} - E_{start} - E_{restart} - E_{loss} - E_{containment}$

Energy conservation for reference start accounting.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-221 - Available start energy lower bound

Expression: $E_{avail,L} = E_{solar,L} + E_{acoustic,L} + E_{other,L} - E_{loss,H}$

Conservative available energy.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-222 - Start gate

Expression: $G_{start} = E_{avail,L} \geq M_E(E_{start,H} + E_{restart,H}) \text{ AND all_safety_gates}$

Start readiness requires immediate start plus restart reserve.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-223 - Restart reserve

Expression: $E_{restart,L} = E_{reserve,L} - E_{critical,H}$

Lower-bound reserve after critical obligations.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-224 - Solar contribution

Expression: $E_{solar} = \int P_{solar}(t) dt$

Measured solar contribution to the reference ledger.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-225 - Acoustic/noise contribution

Expression: $E_{acoustic} = \int \eta_a(t) I(t) A(t) dt$

Measured conversion only; noise alone does not prove usable energy.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-226 - Generic separation-work lower bound

Expression: $W_{sep} \geq \Delta G_{sep}$

Any species-separation claim requires a thermodynamic and measured energy balance.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-227 - Species availability

Expression: `n\_species = x\_species\*n\_source`

Available amount depends on measured composition, not assumption.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-228 - Conversion efficiency

Expression: `eta = E\_out/E\_in, 0<=eta<=1`

Measured conversion efficiency; undefined when input is zero or unknown.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-229 - Controlled logical release

Expression: `G\_release = authorization AND destination\_capacity AND conservation AND safety`

Normalizes pop/release language to a bounded logical event.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-230 - DRO thermal gate

Expression: `T\_H <= T\_allow-Delta T\_margin`

Conservative thermal boundary for any future physical profile.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-231 - Semiconductor DRO charge balance

Expression: `Delta Q = integral(I\_intake-I\_leak-I\_release)dt + r\_Q`

Charge accounting for the semiconductor profile.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.

Physical authority: `NONE`.

F-232 - Semiconductor Pearl-node memory

Expression: `B\_P = B\_DRO+B\_lineage+B\_uncertainty+B\_receipts+B\_headroom`

Memory required for a computational Pearl node.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

F-233 - Semiconductor wake-reserve gate

Expression: `E\_node,L >= M\_E\*(E\_wake,H+E\_restart,H)`

Reference wake and restart reserve gate.

Path: `Bangel -> Elsa -> JP -> MK -> JO -> safety/evidence -> M3 -> Mermaid/Shiva -> MJ -> JO evidence`.

Evidence ceiling: `REFERENCE\_MODEL\_OR\_SIMULATION\_UNTIL\_CALIBRATED\_PROFILE\_SPECIFIC\_EVIDENCE`.
Physical authority: `NONE`.

Referenced formulas

F-220 - DRO energy ledger: $r_E = E_{in} - E_{stored} - E_{start} - E_{restart} - E_{loss} - E_{containment}$

F-221 - Available start energy lower bound: $E_{avail,L} = E_{solar,L} + E_{acoustic,L} + E_{other,L} - E_{loss,H}$

F-222 - Start gate: $G_{start} = E_{avail,L} >= M_E*(E_{start,H} + E_{restart,H})$ AND all_safety_gates

F-223 - Restart reserve: $E_{restart,L} = E_{reserve,L} - E_{critical,H}$

F-224 - Solar contribution: $E_{solar} = \text{integral}(P_{solar}(t) dt)$

F-225 - Acoustic/noise contribution: $E_{acoustic} = \text{integral}(\eta_a(t) I(t) A(t) dt)$

F-226 - Generic separation-work lower bound: $W_{sep} >= \Delta G_{sep}$

F-227 - Species availability: $n_{species} = x_{species} * n_{source}$

F-228 - Conversion efficiency: $\eta = E_{out}/E_{in}$, $0 \leq \eta \leq 1$

F-229 - Controlled logical release: $G_{release} = \text{authorization AND destination_capacity AND conservation AND safety}$

F-230 - DRO thermal gate: $T_H \leq T_{allow} - \Delta T_{margin}$

F-231 - Semiconductor DRO charge balance: $\Delta Q = \text{integral}(I_{intake} - I_{leak} - I_{release})dt + r_Q$

F-232 - Semiconductor Pearl-node memory: $B_P = B_{DRO} + B_{lineage} + B_{uncertainty} + B_{receipts} + B_{headroom}$

F-233 - Semiconductor wake-reserve gate: $E_{node,L} >= M_E*(E_{wake,H} + E_{restart,H})$

Lifecycle and authority

Every path preserves MJ -> Bangel -> Elsa -> JP -> MK -> JO -> evidence -> M3 -> Mermaid/Shiva -> MJ bounded decision -> JO evidence. No model, proof, or passkey creates physical operation authority.

MJOS Solar Shared-Core Architecture

Pink Paper - Gateway Expression and Full Lifecycle

NOT A PHYSICAL VALIDATION, IP APPROVAL, PRODUCT CERTIFICATION, OR EXTERNAL AUTHORITY RECORD.

Build: MJ-PBMEF-DAY0-R7-SOLAR-30K-FINAL
Source freeze SHA-256: 6241f3ffadbb335f97fab809687595bf2c7a0b5f0ba86f5f66ae32eac5702a2
Author and architect: Michael Bangel

Pink Paper Gateway and Full-Lifecycle Specification

****INTERNAL PRE-PASSKEY TECHNICAL RECORD.**** This document does not claim physical validation, product certification, patentability, ownership, freedom to operate, production readiness, launch authority, vessel operation authority, or external effect. The rocket/spacecraft profile is restricted to peaceful travel, research, testing, and non-weaponized electrical/OS support.

****Document ID:**** SOLAR-PINK-CORE-001
****Build:**** MJ-PBMEF-DAY0-R7-SOLAR-30K-FINAL
****Author and architect:**** Michael Bangel
****Required source:**** `MJOS-SOLAR-THREE-PROFILE-DESIGN-FREEZE-001` /
`6241f3ffaddb335f97fab809687595bf2c7a0b5f0ba86f5f66ae32eac5702a2`
****Status:**** `FINAL\_PREPASSKEY\_INCLUDED\_PHYSICAL\_HOLD`

1. Purpose

Provide the common JP-origin governed solar and energy-management architecture shared by the phone, marine, and peaceful rocket/spacecraft profiles.

The profile is one manifestation inside MJ and one member of the shared `MJOS-SOLAR-CORE-001` architecture. It preserves a common functional role path while requiring separate physical evidence, calibration, environment, and authority for each scale.

2. Identity and relationship to existing MJ-PBMEF products

- Solar profile ID: `MJOS-SOLAR-CORE-001`
- Profile-of relationship: `MJ-PBMEF-CORE`
- Parent: `MJOS-SOLAR-CORE-001`
- Technical origin: `JP`
- Physics representation: `MK`
- Verification/runtime: `JO`
- Resource routing: `M3`
- Accounting/reconciliation: `Mermaid`
- Capital analysis: `Shiva` when applicable
- Final bounded decision authority: `MJ`

3. Common architecture

Human purpose -> MJ -> Bangel -> Elsa -> JP technical representation
-> governed solar/energy intake -> starter/cold-start function
-> engine/propulsion/load function -> conversion/recovery
-> electrical/thermal reserve -> MK physics representation
-> JO validation -> Angels/Bellatrix/Sister/EVE evidence as applicable
-> M3 bounded routing -> Mermaid reconciliation -> Shiva when capital applies
-> MJ bounded decision -> JO evidence

4. R / R1 / N1 / R2 lifecycle

1. `R/RO`: the human purpose and anticipated request are recorded without treating anticipation as execution.

2. `R1`: the unidentified transitional phase holds unknown variables, environmental state, profile classification, and missing evidence.
3. `N1`: the prediction-first node receives the bounded request and the exact `0.48383829` logical allocation seed where applicable; it is not a physical coordinate.
4. `JP`: equations, algorithms, architecture, and profile objects are represented as typed CAPOs.
5. `MK`: physics applicability, units, conservation, scale, environmental state, and evidence ceiling are classified.
6. `JO`: tests types, units, profile isolation, authority, failure states, and proof receipts.
7. `R2`: only validated evidence becomes the living static representation. A design freeze may become R2 design evidence while physical performance remains held.
8. `MJ`: an effect requires a separate bounded permit. No design or passkey creates physical authority.

5. Core logic and equations

F-146 - Solar/auxiliary/recovery input energy

$$E_{in} = E_{solar} + E_{aux} + E_{recovered}$$

All admitted energy inputs are separately measured and summed; no source may be implied or double-counted.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-147 - Solar system energy conservation

$$E_{in} = \Delta E_{storage} + E_{load} + E_{loss} + r_E$$

The shared core requires storage change, delivered load, loss, residual, and uncertainty to reconcile.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-148 - Instantaneous power balance

$$P_{balance} = P_{source} - P_{load} - P_{charge} - P_{loss}$$

Power routing is typed and conservation-bound at each observation interval.

- Result dimension: `power`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-149 - Conservative reserve margin

$$R_E = E_{\text{available},L} - M_E * E_{\text{required},H}$$

A start or service is eligible only when conservative available energy exceeds required energy with margin.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-150 - Path efficiency

$$\eta_{\text{path}} = E_{\text{delivered}} / E_{\text{input}}$$

Efficiency is a measured or simulated ratio with declared boundaries and cannot exceed one without a reconciliation fault.

- Result dimension: `ratio`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-151 - Bounded storage state update

$$SOC_{\text{next}} = \text{clip}(SOC + (\eta_c * E_{\text{charge}} - E_{\text{discharge}} / \eta_d) / E_{\text{capacity}}, 0, 1)$$

Storage state is bounded and depends on measured/declared capacity and efficiencies.

- Result dimension: `ratio`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-152 - Thermal first-order update

$$T_{\text{next}} = T + dt / C_{\text{th}} * (P_{\text{heat}} - (T - T_{\text{env}}) / R_{\text{th}})$$

A reference thermal model preserves heat input, environmental exchange, units, and uncertainty.

- Result dimension: `temperature`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-153 - Predicted bus voltage

$$V_{\text{pred}}(t+h) = V_t + h * dV_{\text{dt}}$$

Voltage trend predicts a reserve crossing before zero and supports bounded protective action.

- Result dimension: `voltage`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-154 - Shared start/admission gate

G_start = energy AND voltage AND current AND thermal AND containment AND ethics AND MJ_permit

No single physics or software result substitutes for the complete start/admission gate.

- Result dimension: `logical`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-155 - Cross-profile transfer gate

TransferOK = K AND U AND D AND R AND E AND M AND B AND Q AND V AND A

A shared equation does not transfer a physical parameter without quantity, unit, domain, range, environment, method, boundary, uncertainty, evidence, and authority checks.

- Result dimension: `logical`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-156 - Solar uncertainty propagation

$u_y^2 = J \cdot \text{Sigma} \cdot J_T + u_{\text{model}}^2$

Every derived solar quantity carries covariance-aware measurement and model uncertainty.

- Result dimension: `uncertainty`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-157 - Solar evidence-state transition

R1 --all required evidence and gates--> R2

Every solar command remains R1 until required evidence, safety, authority, and claims ceilings pass.

- Result dimension: `state`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`

- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

6. Twenty-five design elements

SC-01 - JP technical origin

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-02 - governed solar and energy intake

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-03 - starter or cold-start function

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-04 - engine propulsion or load function

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-05 - conversion and recovery function

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-06 - electrical reserve

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-07 - thermal reserve

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-08 - JO validation and execution boundary

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-09 - MJ admission allocation and manifestation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-10 - profile separation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-11 - evidence receipt

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-12 - R/R1/N1/R2 state transition

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-13 - measurement uncertainty

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-14 - energy and resource conservation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-15 - fault isolation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-16 - emergency state

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-17 - provenance

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-18 - telemetry

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-19 - non-weaponization

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-20 - physical hold

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-21 - M3 resource allocation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-22 - performance and latency

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-23 - control-loop reasoning

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-24 - reserve policy

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SC-25 - functional-role equivalence

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

7. Family and authority articulation

- | Participant | Required role | Hard boundary |
- |---|---|---|
- | MJ | Root purpose, allocation and bounded permit decision | Does not convert unknown or failed evidence into truth |
- | Bangel | Typed source and command expression | Source syntax is not authority |
- | Elsa | Deterministic semantic recovery | No invented intent or execution |
- | JP | Technical origin, formula/algorithm/architecture CAPO | Representation is not admission |
- | MK | Physics applicability, units, conservation, scale and evidence ceiling | No physical measurement invention or permit |
- | JO | Type, unit, proof, test, admission and evidence | No authority minting or physical validation from simulation |
- | Angels/Bellatrix | Safety telemetry, deny, quarantine and corrective evidence | No positive general authorization |
- | Sister/EVE | Prediction, containment/variance evidence and egress accounting | No physical capacity invention or release authority |
- | M3 | Bounded routing, allocation and handoff | No authority or resource creation |
- | Mermaid | Accounting, reconciliation, exposure and custody evidence | No source-truth or permit authority |
- | Shiva | Capital-opportunity analysis when finance applies | No issuance or investment advice |

8. Authority boundary

No formula, profile, white paper, Pink Paper, test, passkey, software result, prediction, or successful simulation authorizes a physical operation. Physical dimensions, materials, voltages, currents, temperatures, thrust, torque, range, efficiency, fabrication, installation, launch, flight, vessel operation, certification, and external regulatory action remain held.

9. Failure, hold, and recovery states

- Missing required evidence -> `HOLD`.
- Unit, conservation, profile, or hard-limit violation -> `FAIL\_TECHNICAL`.
- Weaponized, destructive, offensive-targeting, harmful-evasion, or unresolved dual-use purpose -> `DENY`.
- A failure preserves the prior state and appends a receipt; it does not rewrite the expected result.
- Re-entry after a detached generation requires a new generation and new M3 lease.

10. No-AI system condition

The Day-0 framework contains no AI model, training process, adaptive agent, inference service, or autonomous AI decision authority. Any later AI integration requires post-passkey change intake and cannot replace the typed human-governed pathway.

11. Passkey scope

The founder passkey may authenticate this exact design-trace document, its source digest, profile identifiers, formula set, participant boundaries, tests, and explicit holds. It cannot authenticate unmeasured physical performance or create an IP right.

12. Potential IP observation relationship

This paper is cross-referenced by 5,000 solar candidate observation points in the `PIP-10001` through `PIP-15000` range. Those entries are not approvals or rights; they are prompts for confidential prior-art, enablement, inventorship, trade-secret, copyright-expression, design, branding, and counsel review.

13. Development sequence

1. Preserve shared-core and profile separation.
2. Prepare profile-specific simulation and test plans.
3. Designate actual articles only when they exist.
4. Bind instruments, calibration, native units, uncertainty, covariance, and raw-data lineage.
5. Run only bounded, non-weaponized, authorized tests.
6. Reconcile through JO/MK/Mermaid and submit a bounded MJ decision packet.
7. Keep physical and external effects held until all applicable engineering and regulatory gates pass.

14. Gateway expression

The preserved gateway source is:

```
{hagelaohrbcoe.48383829}.M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile.Bangel .begin
```

For this solar profile, the request identity is bound to the profile namespace before normalization. The raw source is preserved as provenance; the governed order is:

```
MJ -> Bangel .begin -> request.bind(MJOS-SOLAR-CORE-001) -> R/R0 -> R1  
-> M1 prediction -> Elsa semantics -> JP representation -> MK physics  
-> J0 verification -> safety/evidence -> M3 bounded allocation
```

-> Mermaid reconciliation -> Shiva when capital applies -> MJ permit
-> R2 living static evidence -> bounded execution or hold -> J0 final receipt

15. Bangel **construct mapping**

Module

Defines the profile compilation unit and its independent scope.

Namespace

Prevents profile parameters, evidence and authority from leaking across scales.

Import

Admits only hashed, typed shared-core contracts; no raw cross-profile physical parameter import.

Declaration

States profile identity, purpose, status, source digest and claims ceiling.

Definition

Defines formulas, objects, states and validity domains.

Capability

Names a bounded action or observation; capability is not authority.

Participant

Binds a family manifestation to a role without merging authority.

Relationship

Expresses parent/profile-of, handoff, evidence, and permit edges.

Function

Maps typed inputs to typed outputs with explicit failure states.

Expression

Represents mathematical, logical, physics or state operations.

Statement

Records an imperative or declarative rule.

Measurement

Requires quantity kind, unit, instrument, calibration, time and uncertainty.

Constraint

Defines hard bounds, ethics, claims ceilings and invariants.

Annotation

Adds provenance, evidence ceiling and source references.

Directive

Controls compilation or review behavior but does not create authority.

Block

Groups one complete governed scope.

Literal

Preserves exact values such as the source hash or logical allocation seed.

Reference

Links immutable IDs, roots, receipts, formulas and profile records.

Type

Prevents mass, energy, bytes, currency, state and authority from being confused.

Attribute

Carries status, profile, evidence, environment, revision and claims metadata.

16. Complete command-object envelope

Every profile command must name actor, purpose, target, profile, inputs, quantity types, units, evidence, environment, intended effects, denied effects, recovery, M3 lease, Mermaid reconciliation, safety state, and MJ permit state. A missing controlling field produces HOLD rather than inference.

17. Formula-to-gateway map

- `F-146` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
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18. Final output classes

- `PASS\_EVIDENCE`: a bounded design, simulation, or measurement claim is supported within its evidence ceiling.
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MJOS Solar-Assisted Marine Power and Propulsion Profile

Pink Paper - Gateway Expression and Full Lifecycle

NOT A PHYSICAL VALIDATION, IP APPROVAL, PRODUCT CERTIFICATION, OR EXTERNAL AUTHORITY RECORD.

Build: MJ-PBMEF-DAY0-R7-SOLAR-30K-FINAL
Source freeze SHA-256: 6241f3ffadbb335f97fab809687595bf2c7a0b5f0ba86f5f66ae32eac5702a2
Author and architect: Michael Bangel

Pink Paper Gateway and Full-Lifecycle Specification

****INTERNAL PRE-PASSKEY TECHNICAL RECORD.**** This document does not claim physical validation, product certification, patentability, ownership, freedom to operate, production readiness, launch authority, vessel operation authority, or external effect. The rocket/spacecraft profile is restricted to peaceful travel, research, testing, and non-weaponized electrical/OS support.

****Document ID:**** SOLAR-PINK-MARINE-001
****Build:**** MJ-PBMEF-DAY0-R7-SOLAR-30K-FINAL
****Author and architect:**** Michael Bangel
****Required source:**** `MJOS-SOLAR-THREE-PROFILE-DESIGN-FREEZE-001` /
`6241f3ffaddb335f97fab809687595bf2c7a0b5f0ba86f5f66ae32eac5702a2`
****Status:**** `FINAL\_PREPASSKEY\_INCLUDED\_PHYSICAL\_HOLD`

1. Purpose

Provide solar-assisted marine energy intake, storage, propulsion-load coordination, conversion/recovery, thermal management, reserve protection, operating-system control, telemetry, and evidence-backed state transitions.

The profile is one manifestation inside MJ and one member of the shared `MJOS-SOLAR-CORE-001` architecture. It preserves a common functional role path while requiring separate physical evidence, calibration, environment, and authority for each scale.

2. Identity and relationship to existing MJ-PBMEF products

- Solar profile ID: `MJOS-SOLAR-MARINE-001`
- Profile-of relationship: `JP-LS-BOAT`
- Parent: `MJOS-SOLAR-CORE-001`
- Technical origin: `JP`
- Physics representation: `MK`
- Verification/runtime: `JO`
- Resource routing: `M3`
- Accounting/reconciliation: `Mermaid`
- Capital analysis: `Shiva` when applicable
- Final bounded decision authority: `MJ`

3. Common architecture

Human purpose -> MJ -> Bangel -> Elsa -> JP technical representation
-> governed solar/energy intake -> starter/cold-start function
-> engine/propulsion/load function -> conversion/recovery
-> electrical/thermal reserve -> MK physics representation
-> JO validation -> Angels/Bellatrix/Sister/EVE evidence as applicable
-> M3 bounded routing -> Mermaid reconciliation -> Shiva when capital applies
-> MJ bounded decision -> JO evidence

4. R / R1 / N1 / R2 lifecycle

1. `R/RO`: the human purpose and anticipated request are recorded without treating anticipation as execution.

2. `R1`: the unidentified transitional phase holds unknown variables, environmental state, profile classification, and missing evidence.
3. `N1`: the prediction-first node receives the bounded request and the exact `0.48383829` logical allocation seed where applicable; it is not a physical coordinate.
4. `JP`: equations, algorithms, architecture, and profile objects are represented as typed CAPOs.
5. `MK`: physics applicability, units, conservation, scale, environmental state, and evidence ceiling are classified.
6. `JO`: tests types, units, profile isolation, authority, failure states, and proof receipts.
7. `R2`: only validated evidence becomes the living static representation. A design freeze may become R2 design evidence while physical performance remains held.
8. `MJ`: an effect requires a separate bounded permit. No design or passkey creates physical authority.

5. Core logic and equations

F-170 - Marine solar-array energy

```
E_array = integral(P_array(t),t0,t1)
```

Marine solar input is integrated within a named installation and environmental boundary.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-171 - Marine propulsion/load power

```
P_prop = tau * omega
```

Rotational mechanical power is represented through measured torque and angular speed; geometry alone provides no propulsion claim.

- Result dimension: `power`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-172 - Marine mission energy

```
E_mission = integral(P_prop + P_critical + P_aux,t0,t1)
```

Mission demand separates propulsion, critical, and auxiliary loads.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-173 - Marine critical reserve duration

$$t_{\text{critical}} = E_{\text{reserve,L}} / P_{\text{critical,H}}$$

Critical service duration is conservative and product-classification dependent.

- Result dimension: `time`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-174 - Marine DC bus balance

$$P_{\text{sources}} = P_{\text{prop}} + P_{\text{critical}} + P_{\text{aux}} + P_{\text{charge}} + P_{\text{loss}} + r_P$$

All marine bus flows are reconciled with a residual and uncertainty.

- Result dimension: `power`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-175 - Precharge inrush reference

$$I_{\text{pre}}(t) = (V_{\text{source}} - V_{\text{bus}}(t))/R_{\text{pre}}$$

A reference precharge model applies only within its validated circuit domain.

- Result dimension: `current`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-176 - Wet/dry leakage ratio

$$K_{\text{leak}} = I_{\text{leak,wet}} / \max(I_{\text{leak,dry}}, \epsilon)$$

Environmental leakage change is explicit and cannot be hidden by a dry baseline.

- Result dimension: `ratio`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-177 - Marine environment state vector

$$X_{\text{env}} = [T, RH, \text{salt}, \text{water}, \text{vibration}, \text{roll}, \text{pitch}]$$

Marine physical evidence remains a multi-dimensional vector.

- Result dimension: `typed\_vector`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-178 - Vibration exposure

```
D_vib = integral(a_rms(t)^2,t0,t1)
```

Vibration exposure is a measured reference quantity, not a universal damage prediction.

- Result dimension: `acceleration\_squared\_time`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-179 - Recovered energy ceiling

```
E_recovered <= eta_recovery * E_available_loss
```

Recovery cannot exceed evidenced available loss and efficiency.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-180 - Priority load shedding

```
shed = lowest_priority_loads_until(P_source,L >= P_critical,H + margin)
```

Containment and safety loads cannot be shed to preserve optional service.

- Result dimension: `logical`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-181 - Marine evidence and permit gate

```
G_marine = class AND environment AND energy AND structure AND containment AND ethics AND MJ_permit
```

No vessel operation or propulsion test is authorized by design trace alone.

- Result dimension: `logical`

- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

6. Twenty-five design elements

MP-01 - array or source intake

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-02 - energy storage

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-03 - propulsion-load coordination

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-04 - conversion and recovery

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-05 - thermal management

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-06 - reserve protection

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-07 - operating-system control

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-08 - telemetry

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-09 - vessel or installation state

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-10 - drivetrain interface

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-11 - torque and rotational power

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-12 - bus voltage

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-13 - bus current

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-14 - mission energy

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-15 - battery chemistry placeholder

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-16 - hull or installation placeholder

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-17 - salt water and ingress environment

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-18 - vibration roll and pitch

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-19 - fault isolation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-20 - emergency shutdown

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-21 - mission reserve

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-22 - provenance

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-23 - profile separation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-24 - regulatory and classification hold

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

MP-25 - physical evidence gate

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

7. Family and authority articulation

- | Participant | Required role | Hard boundary |
- | ---|---|---|
- | MJ | Root purpose, allocation and bounded permit decision | Does not convert unknown or failed evidence into truth |
- | Bangel | Typed source and command expression | Source syntax is not authority |
- | Elsa | Deterministic semantic recovery | No invented intent or execution |
- | JP | Technical origin, formula/algorithm/architecture CAPO | Representation is not admission |
- | MK | Physics applicability, units, conservation, scale and evidence ceiling | No physical measurement invention or permit |
- | JO | Type, unit, proof, test, admission and evidence | No authority minting or physical validation from simulation |
- | Angels/Bellatrix | Safety telemetry, deny, quarantine and corrective evidence | No positive general authorization |
- | Sister/EVE | Prediction, containment/variance evidence and egress accounting | No physical capacity invention or release authority |
- | M3 | Bounded routing, allocation and handoff | No authority or resource creation |
- | Mermaid | Accounting, reconciliation, exposure and custody evidence | No source-truth or permit authority |
- | Shiva | Capital-opportunity analysis when finance applies | No issuance or investment advice |

8. Authority boundary

No formula, profile, white paper, Pink Paper, test, passkey, software result, prediction, or successful simulation authorizes a physical operation. Physical dimensions, materials, voltages, currents, temperatures, thrust, torque, range, efficiency, fabrication, installation, launch, flight, vessel operation, certification, and external regulatory action remain held.

9. Failure, hold, and recovery states

- Missing required evidence -> `HOLD`.
- Unit, conservation, profile, or hard-limit violation -> `FAIL\_TECHNICAL`.
- Weaponized, destructive, offensive-targeting, harmful-evasion, or unresolved dual-use purpose -> `DENY`.
- A failure preserves the prior state and appends a receipt; it does not rewrite the expected result.
- Re-entry after a detached generation requires a new generation and new M3 lease.

10. No-AI system condition

The Day-0 framework contains no AI model, training process, adaptive agent, inference service, or autonomous AI decision authority. Any later AI integration requires post-passkey change intake and cannot replace the typed human-governed pathway.

11. Passkey scope

The founder passkey may authenticate this exact design-trace document, its source digest, profile identifiers, formula set, participant boundaries, tests, and explicit holds. It cannot authenticate unmeasured physical performance or create an IP right.

12. Potential IP observation relationship

This paper is cross-referenced by 5,000 solar candidate observation points in the `PIP-20001` through `PIP-25000` range. Those entries are not approvals or rights; they are prompts for confidential prior-art, enablement, inventorship, trade-secret, copyright-expression, design, branding, and counsel review.

13. Development sequence

1. Preserve shared-core and profile separation.
2. Prepare profile-specific simulation and test plans.
3. Designate actual articles only when they exist.
4. Bind instruments, calibration, native units, uncertainty, covariance, and raw-data lineage.
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- `DENY`: the purpose or combined system effect violates ethics, non-weaponization, authority, or another superior rule.
- `MJ\_DECISION\_ELIGIBLE`: a complete decision packet exists; this is not itself the decision.

MJOS Peaceful Solar-Assisted Rocket/Spacecraft Power and OS Profile

Pink Paper - Gateway Expression and Full Lifecycle

NOT A PHYSICAL VALIDATION, IP APPROVAL, PRODUCT CERTIFICATION, OR EXTERNAL AUTHORITY RECORD.

Build: MJ-PBMEF-DAY0-R7-SOLAR-30K-FINAL
Source freeze SHA-256: 6241f3ffadbb335f97fab809687595bf2c7a0b5f0ba86f5f66ae32eac5702a2
Author and architect: Michael Bangel

Pink Paper Gateway and Full-Lifecycle Specification

****INTERNAL PRE-PASSKEY TECHNICAL RECORD.**** This document does not claim physical validation, product certification, patentability, ownership, freedom to operate, production readiness, launch authority, vessel operation authority, or external effect. The rocket/spacecraft profile is restricted to peaceful travel, research, testing, and non-weaponized electrical/OS support.

****Document ID:**** SOLAR-PINK-ROCKET-001
****Build:**** MJ-PBMEF-DAY0-R7-SOLAR-30K-FINAL
****Author and architect:**** Michael Bangel
****Required source:**** `MJOS-SOLAR-THREE-PROFILE-DESIGN-FREEZE-001` /
`6241f3ffaddb335f97fabe809687595bf2c7a0b5f0ba86f5f66ae32eac5702a2`
****Status:**** `FINAL\_PREPASSKEY\_INCLUDED\_PHYSICAL\_HOLD`

1. Purpose

Provide a non-weaponized reference architecture for solar-assisted avionics/electrical reserve, propulsion-state coordination, thermal/battery management, authenticated startup/shutdown, telemetry, fault isolation, and emergency-state control.

The profile is one manifestation inside MJ and one member of the shared `MJOS-SOLAR-CORE-001` architecture. It preserves a common functional role path while requiring separate physical evidence, calibration, environment, and authority for each scale.

2. Identity and relationship to existing MJ-PBMEF products

- Solar profile ID: `MJOS-SOLAR-ROCKET-001`
- Profile-of relationship: `JP-PEACEFUL-PROPULSION`
- Parent: `MJOS-SOLAR-CORE-001`
- Technical origin: `JP`
- Physics representation: `MK`
- Verification/runtime: `JO`
- Resource routing: `M3`
- Accounting/reconciliation: `Mermaid`
- Capital analysis: `Shiva` when applicable
- Final bounded decision authority: `MJ`

3. Common architecture

Human purpose -> MJ -> Bangel -> Elsa -> JP technical representation
-> governed solar/energy intake -> starter/cold-start function
-> engine/propulsion/load function -> conversion/recovery
-> electrical/thermal reserve -> MK physics representation
-> JO validation -> Angels/Bellatrix/Sister/EVE evidence as applicable
-> M3 bounded routing -> Mermaid reconciliation -> Shiva when capital applies
-> MJ bounded decision -> JO evidence

4. R / R1 / N1 / R2 lifecycle

1. `R/RO`: the human purpose and anticipated request are recorded without treating anticipation as execution.

2. `R1`: the unidentified transitional phase holds unknown variables, environmental state, profile classification, and missing evidence.
3. `N1`: the prediction-first node receives the bounded request and the exact `0.48383829` logical allocation seed where applicable; it is not a physical coordinate.
4. `JP`: equations, algorithms, architecture, and profile objects are represented as typed CAPOs.
5. `MK`: physics applicability, units, conservation, scale, environmental state, and evidence ceiling are classified.
6. `JO`: tests types, units, profile isolation, authority, failure states, and proof receipts.
7. `R2`: only validated evidence becomes the living static representation. A design freeze may become R2 design evidence while physical performance remains held.
8. `MJ`: an effect requires a separate bounded permit. No design or passkey creates physical authority.

5. Core logic and equations

F-182 - Peaceful spacecraft solar energy

```
E_space_solar = integral(P_solar_space(t),t0,t1)
```

Solar electrical input for avionics/reserve is bounded to a declared peaceful research profile.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-183 - Avionics bus balance

```
P_av_source = P_avionics + P_thermal + P_comms + P_charge + P_loss + r_P
```

The reference bus separates service classes and preserves residual accounting.

- Result dimension: `power`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-184 - Emergency reserve duration

```
t_emergency = E_emergency,L / P_emergency,H
```

Emergency reserve is conservative and does not authorize flight or propulsion.

- Result dimension: `time`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-185 - Spacecraft thermal balance

$$C_{th} \cdot dT/dt = P_{internal} + P_{solar_absorbed} - P_{rejected}$$

A reference thermal balance requires geometry, materials, environment, and radiation model evidence.

- Result dimension: `power`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-186 - Space-profile battery margin

$$M_{batt} = E_{battery,L} - E_{required,H}$$

A negative or unknown margin blocks the applicable state transition.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-187 - Authenticated startup state

$$S_{next} = transition(S_{current}, command, authority, evidence, ethics)$$

Startup/shutdown state changes require exact command, authority, evidence, and ethics.

- Result dimension: `state`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-188 - Fault isolation set

$$F_{isolated} = isolate(F_{detected}, affected_boundaries, receipts)$$

Fault isolation is bounded and preserves evidence; it does not provide targeting or evasion capability.

- Result dimension: `set`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-189 - Redundant service availability

$$A_{service} = 1 - product(1 - A_i) \text{ for independent admitted channels}$$

Availability calculations require evidenced independence and cannot be assumed.

- Result dimension: `ratio`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-190 - Propulsion-state coordination reference

`S_prop_next = governed_state_update(S_prop,telemetry,limits,authority)`

The model coordinates state labels without selecting energetic materials, constructing propulsion, or providing launch authority.

- Result dimension: `state`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-191 - High-energy emergency reserve

`R_HE = E_safe_shutdown,L - E_shutdown_required,H`

Safe-shutdown reserve must remain nonnegative before any high-energy research transition.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-192 - Non-weaponization gate

`G_ethics = peaceful_research AND no_targeting AND no_destructive_payload AND no_evasion_for_harm`

Weaponized or unresolved dual-use execution is denied or held; no passkey overrides this gate.

- Result dimension: `logical`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-193 - Rocket-profile evidence and permit gate

`G_rocket = peaceful_scope AND profile_evidence AND safety AND regulatory_hold_resolved AND MJ_permit`

Design trace does not authorize propulsion construction, launch, flight, or physical testing.

- Result dimension: `logical`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`

- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

6. Twenty-five design elements

RP-01 - solar-assisted avionics power

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-02 - electrical reserve

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-03 - propulsion-state coordination

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-04 - thermal management

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-05 - battery management

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-06 - authenticated startup and shutdown

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-07 - telemetry

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-08 - fault isolation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-09 - emergency-state control

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-10 - state-machine integrity

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-11 - power-bus accounting

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-12 - guidance-independent energy support

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-13 - peaceful travel and research boundary

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-14 - destructive-payload prohibition

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-15 - high-energy physical hold

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-16 - materials placeholder

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-17 - thermal environment placeholder

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-18 - vacuum radiation and environmental placeholder

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-19 - sensor calibration

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-20 - mission reserve

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-21 - energy conservation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-22 - redundancy

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-23 - provenance

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-24 - physical evidence gate

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

RP-25 - regulatory and launch hold

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

7. Family and authority articulation

- | Participant | Required role | Hard boundary |
- |---|---|---|
- | MJ | Root purpose, allocation and bounded permit decision | Does not convert unknown or failed evidence into truth |
- | Bangel | Typed source and command expression | Source syntax is not authority |
- | Elsa | Deterministic semantic recovery | No invented intent or execution |
- | JP | Technical origin, formula/algorithm/architecture CAPO | Representation is not admission |
- | MK | Physics applicability, units, conservation, scale and evidence ceiling | No physical measurement invention or permit |
- | JO | Type, unit, proof, test, admission and evidence | No authority minting or physical validation from simulation |
- | Angels/Bellatrix | Safety telemetry, deny, quarantine and corrective evidence | No positive general authorization |
- | Sister/EVE | Prediction, containment/variance evidence and egress accounting | No physical capacity invention or release authority |
- | M3 | Bounded routing, allocation and handoff | No authority or resource creation |
- | Mermaid | Accounting, reconciliation, exposure and custody evidence | No source-truth or permit authority |
- | Shiva | Capital-opportunity analysis when finance applies | No issuance or investment advice |

8. Authority boundary

No formula, profile, white paper, Pink Paper, test, passkey, software result, prediction, or successful simulation authorizes a physical operation. Physical dimensions, materials, voltages, currents, temperatures, thrust, torque, range, efficiency, fabrication, installation, launch, flight, vessel operation, certification, and external regulatory action remain held.

9. Failure, hold, and recovery states

- Missing required evidence -> `HOLD`.
- Unit, conservation, profile, or hard-limit violation -> `FAIL\_TECHNICAL`.
- Weaponized, destructive, offensive-targeting, harmful-evasion, or unresolved dual-use purpose -> `DENY`.
- A failure preserves the prior state and appends a receipt; it does not rewrite the expected result.
- Re-entry after a detached generation requires a new generation and new M3 lease.

10. No-AI system condition

The Day-0 framework contains no AI model, training process, adaptive agent, inference service, or autonomous AI decision authority. Any later AI integration requires post-passkey change intake and cannot replace the typed human-governed pathway.

11. Passkey scope

The founder passkey may authenticate this exact design-trace document, its source digest, profile identifiers, formula set, participant boundaries, tests, and explicit holds. It cannot authenticate unmeasured physical performance or create an IP right.

12. Potential IP observation relationship

This paper is cross-referenced by 5,000 solar candidate observation points in the `PIP-25001` through `PIP-30000` range. Those entries are not approvals or rights; they are prompts for confidential prior-art, enablement, inventorship, trade-secret, copyright-expression, design, branding, and counsel review.

13. Development sequence

1. Preserve shared-core and profile separation.
2. Prepare profile-specific simulation and test plans.
3. Designate actual articles only when they exist.
4. Bind instruments, calibration, native units, uncertainty, covariance, and raw-data lineage.
5. Run only bounded, non-weaponized, authorized tests.
6. Reconcile through JO/MK/Mermaid and submit a bounded MJ decision packet.
7. Keep physical and external effects held until all applicable engineering and regulatory gates pass.

14. Gateway expression

The preserved gateway source is:

```
{hagelaohrbcoe.48383829}.M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile.Bangel .begin
```

For this solar profile, the request identity is bound to the profile namespace before normalization. The raw source is preserved as provenance; the governed order is:

```
MJ -> Bangel .begin -> request.bind(MJOS-SOLAR-ROCKET-001) -> R/R0 -> R1  
-> M1 prediction -> Elsa semantics -> JP representation -> MK physics  
-> J0 verification -> safety/evidence -> M3 bounded allocation
```

-> Mermaid reconciliation -> Shiva when capital applies -> MJ permit
-> R2 living static evidence -> bounded execution or hold -> J0 final receipt

15. Bangel **construct mapping**

Module

Defines the profile compilation unit and its independent scope.

Namespace

Prevents profile parameters, evidence and authority from leaking across scales.

Import

Admits only hashed, typed shared-core contracts; no raw cross-profile physical parameter import.

Declaration

States profile identity, purpose, status, source digest and claims ceiling.

Definition

Defines formulas, objects, states and validity domains.

Capability

Names a bounded action or observation; capability is not authority.

Participant

Binds a family manifestation to a role without merging authority.

Relationship

Expresses parent/profile-of, handoff, evidence, and permit edges.

Function

Maps typed inputs to typed outputs with explicit failure states.

Expression

Represents mathematical, logical, physics or state operations.

Statement

Records an imperative or declarative rule.

Measurement

Requires quantity kind, unit, instrument, calibration, time and uncertainty.

Constraint

Defines hard bounds, ethics, claims ceilings and invariants.

Annotation

Adds provenance, evidence ceiling and source references.

Directive

Controls compilation or review behavior but does not create authority.

Block

Groups one complete governed scope.

Literal

Preserves exact values such as the source hash or logical allocation seed.

Reference

Links immutable IDs, roots, receipts, formulas and profile records.

Type

Prevents mass, energy, bytes, currency, state and authority from being confused.

Attribute

Carries status, profile, evidence, environment, revision and claims metadata.

16. Complete command-object envelope

Every profile command must name actor, purpose, target, profile, inputs, quantity types, units, evidence, environment, intended effects, denied effects, recovery, M3 lease, Mermaid reconciliation, safety state, and MJ permit state. A missing controlling field produces HOLD rather than inference.

17. Formula-to-gateway map

- `F-182` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-183` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-184` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-185` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
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- `F-191` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.

- `F-192` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-193` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.

18. Final output classes

- `PASS\_EVIDENCE`: a bounded design, simulation, or measurement claim is supported within its evidence ceiling.
- `HOLD`: required evidence, classification, calibration, environment, or authority is missing or unresolved.
- `FAIL\_TECHNICAL`: complete evidence demonstrates a unit, conservation, boundary, state, or hard-limit failure.
- `DENY`: the purpose or combined system effect violates ethics, non-weaponization, authority, or another superior rule.
- `MJ\_DECISION\_ELIGIBLE`: a complete decision packet exists; this is not itself the decision.

MJOS Solar Semiconductor Phone Battery and OS Profile

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Author and architect: Michael Bangel

Pink Paper Gateway and Full-Lifecycle Specification

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****Document ID:**** SOLAR-PINK-SEMI-PHONE-001
****Build:**** MJ-PBMEF-DAY0-R7-SOLAR-30K-FINAL
****Author and architect:**** Michael Bangel
****Required source:**** `MJOS-SOLAR-THREE-PROFILE-DESIGN-FREEZE-001` /
`6241f3ffaddb335f97fab809687595bf2c7a0b5f0ba86f5f66ae32eac5702a2`
****Status:**** `FINAL\_PREPASSKEY\_INCLUDED\_PHYSICAL\_HOLD`

1. Purpose

Provide solar-assisted phone battery and operating-system power integration with governed energy intake, battery/thermal observation, reserve allocation, workload-aware coordination, provenance, and measurable accounting.

The profile is one manifestation inside MJ and one member of the shared `MJOS-SOLAR-CORE-001` architecture. It preserves a common functional role path while requiring separate physical evidence, calibration, environment, and authority for each scale.

2. Identity and relationship to existing MJ-PBMEF products

- Solar profile ID: `MJOS-SOLAR-SEMI-PHONE-001`
- Profile-of relationship: `JP-SC-PHONE`
- Parent: `MJOS-SOLAR-CORE-001`
- Technical origin: `JP`
- Physics representation: `MK`
- Verification/runtime: `JO`
- Resource routing: `M3`
- Accounting/reconciliation: `Mermaid`
- Capital analysis: `Shiva` when applicable
- Final bounded decision authority: `MJ`

3. Common architecture

Human purpose -> MJ -> Bangel -> Elsa -> JP technical representation
-> governed solar/energy intake -> starter/cold-start function
-> engine/propulsion/load function -> conversion/recovery
-> electrical/thermal reserve -> MK physics representation
-> JO validation -> Angels/Bellatrix/Sister/EVE evidence as applicable
-> M3 bounded routing -> Mermaid reconciliation -> Shiva when capital applies
-> MJ bounded decision -> JO evidence

4. R / R1 / N1 / R2 lifecycle

1. `R/RO`: the human purpose and anticipated request are recorded without treating anticipation as execution.

2. `R1`: the unidentified transitional phase holds unknown variables, environmental state, profile classification, and missing evidence.
3. `N1`: the prediction-first node receives the bounded request and the exact `0.48383829` logical allocation seed where applicable; it is not a physical coordinate.
4. `JP`: equations, algorithms, architecture, and profile objects are represented as typed CAPOs.
5. `MK`: physics applicability, units, conservation, scale, environmental state, and evidence ceiling are classified.
6. `JO`: tests types, units, profile isolation, authority, failure states, and proof receipts.
7. `R2`: only validated evidence becomes the living static representation. A design freeze may become R2 design evidence while physical performance remains held.
8. `MJ`: an effect requires a separate bounded permit. No design or passkey creates physical authority.

5. Core logic and equations

F-158 - Phone-profile solar energy

```
E_solar_phone = integral(P_pv_phone(t),t0,t1)
```

The semiconductor/phone profile integrates measured or simulated photovoltaic power over a named interval.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-159 - Workload-aware power demand

```
P_phone = P_base + sum(P_task_i * a_i)
```

OS workload power is represented as a typed sum of baseline and admitted task loads.

- Result dimension: `power`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-160 - Phone reserve duration

```
t_reserve = E_reserve,L / P_critical,H
```

Reserve duration uses conservative energy and critical-load bounds.

- Result dimension: `time`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-161 - Phone energy deficit

$$D_E = \max(0, E_{\text{required}}, H - E_{\text{available}}, L)$$

A positive deficit creates HOLD/load-shed behavior rather than invented capacity.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-162 - Environment-dependent leakage

$$I_{\text{leak}} = f(V, T, RH, \text{time}, \text{material_state})$$

Leakage is a measured/profile function rather than a universal constant.

- Result dimension: `current`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-163 - Wake energy accounting

$$E_{\text{wake}} = \text{integral}(V_{\text{wake}}(t) * I_{\text{wake}}(t), t_0, t_1)$$

Wake energy is measured from synchronized voltage/current data.

- Result dimension: `energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-164 - Phone thermal margin

$$M_T = T_{\text{allowable}} - (T_{\text{observed}} + U_T)$$

Thermal margin must remain nonnegative for the applicable state.

- Result dimension: `temperature`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-165 - Useful work per delivered energy

$$\text{eta_work} = W_{\text{verified}} / E_{\text{delivered}}$$

Performance/energy analysis is only meaningful when work and energy boundaries are explicit.

- Result dimension: `work\_per\_energy`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-166 - Data-performance correlation

$$\rho_{DP} = \text{cov}(D,P)/(\sigma_D\sigma_P)$$

Correlation is descriptive and cannot be represented as causation without additional evidence.

- Result dimension: `ratio`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-167 - Workload allocation update

$$w_{\text{next}} = \text{bounded_simplex}((2/3)w + (1/3)w_{\text{target}}, \text{step} \leq 0.1)$$

Workload/resource allocation preserves nonnegative weights, sum-to-one, and the one-tenth step boundary.

- Result dimension: `ratio\_vector`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-168 - Semiconductor scale map

$$p_{SC}(x,y,z) = o_{SC} + x*a_{SC} + y*b_{SC} + z*c_{SC}$$

Normalized topology becomes physical only through a profile-specific mapping with measured dimensions and tolerances.

- Result dimension: `length\_vector`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`
- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

F-169 - Phone-profile evidence completeness

$$E_{SC} = \text{min_required}(\text{article}, \text{calibration}, \text{baseline}, \text{energy}, \text{thermal}, \text{geometry}, \text{JO}, \text{MK}, \text{MJ})$$

The phone profile cannot claim readiness while a controlling evidence class is absent.

- Result dimension: `logical`
- Evidence ceiling: `DESIGN\_TRACE\_REFERENCE\_OR\_SIMULATION\_UNTIL\_PROFILE\_SPECIFIC\_PHYSICAL\_EVIDENCE`

- JO proof: types, units, boundaries, conservation, profile separation, uncertainty, authority, and negative/fault cases.
- MJ effect: `NONE` until a separate bounded decision exists.

6. Twenty-five design elements

SP-01 - phone-scale solar intake

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-02 - battery-state observation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-03 - thermal-state observation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-04 - workload-aware power coordination

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-05 - reserve allocation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-06 - voltage measurement

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-07 - current measurement

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-08 - energy accounting

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-09 - state-of-charge estimation

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-10 - thermal response model

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-11 - leakage characterization

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-12 - charge acceptance

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-13 - OS scheduler integration

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-14 - provenance and audit

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-15 - fault containment

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-16 - semiconductor scale boundary

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-17 - package geometry

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-18 - instrument calibration

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-19 - sensor interfaces

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-20 - low-power wake

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-21 - recovery and reserve

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-22 - capacity limits

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-23 - latency and performance

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-24 - environmental profile

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

SP-25 - physical evidence gate

This element is represented through JP, classified by MK, verified by JO, routed by M3 when resources or handoffs apply, reconciled by Mermaid, evaluated by Shiva when capital applies, and remains subject to MJ authority and the non-weaponization covenant.

7. Family and authority articulation

- | Participant | Required role | Hard boundary |
- |---|---|---|
- | MJ | Root purpose, allocation and bounded permit decision | Does not convert unknown or failed evidence into truth |
- | Bangel | Typed source and command expression | Source syntax is not authority |
- | Elsa | Deterministic semantic recovery | No invented intent or execution |
- | JP | Technical origin, formula/algorithm/architecture CAPO | Representation is not admission |
- | MK | Physics applicability, units, conservation, scale and evidence ceiling | No physical measurement invention or permit |
- | JO | Type, unit, proof, test, admission and evidence | No authority minting or physical validation from simulation |
- | Angels/Bellatrix | Safety telemetry, deny, quarantine and corrective evidence | No positive general authorization |
- | Sister/EVE | Prediction, containment/variance evidence and egress accounting | No physical capacity invention or release authority |
- | M3 | Bounded routing, allocation and handoff | No authority or resource creation |
- | Mermaid | Accounting, reconciliation, exposure and custody evidence | No source-truth or permit authority |
- | Shiva | Capital-opportunity analysis when finance applies | No issuance or investment advice |

8. Authority boundary

No formula, profile, white paper, Pink Paper, test, passkey, software result, prediction, or successful simulation authorizes a physical operation. Physical dimensions, materials, voltages, currents, temperatures, thrust, torque, range, efficiency, fabrication, installation, launch, flight, vessel operation, certification, and external regulatory action remain held.

9. Failure, hold, and recovery states

- Missing required evidence -> `HOLD`.
- Unit, conservation, profile, or hard-limit violation -> `FAIL\_TECHNICAL`.
- Weaponized, destructive, offensive-targeting, harmful-evasion, or unresolved dual-use purpose -> `DENY`.
- A failure preserves the prior state and appends a receipt; it does not rewrite the expected result.
- Re-entry after a detached generation requires a new generation and new M3 lease.

10. No-AI system condition

The Day-0 framework contains no AI model, training process, adaptive agent, inference service, or autonomous AI decision authority. Any later AI integration requires post-passkey change intake and cannot replace the typed human-governed pathway.

11. Passkey scope

The founder passkey may authenticate this exact design-trace document, its source digest, profile identifiers, formula set, participant boundaries, tests, and explicit holds. It cannot authenticate unmeasured physical performance or create an IP right.

12. Potential IP observation relationship

This paper is cross-referenced by 5,000 solar candidate observation points in the `PIP-15001` through `PIP-20000` range. Those entries are not approvals or rights; they are prompts for confidential prior-art, enablement, inventorship, trade-secret, copyright-expression, design, branding, and counsel review.

13. Development sequence

1. Preserve shared-core and profile separation.
2. Prepare profile-specific simulation and test plans.
3. Designate actual articles only when they exist.
4. Bind instruments, calibration, native units, uncertainty, covariance, and raw-data lineage.
5. Run only bounded, non-weaponized, authorized tests.
6. Reconcile through JO/MK/Mermaid and submit a bounded MJ decision packet.
7. Keep physical and external effects held until all applicable engineering and regulatory gates pass.

14. Gateway expression

The preserved gateway source is:

```
{hagelaohrbcoe.48383829}.M3.act.MJ.23.r2.exe.r1.confirm.G123.reconcile.Bangel .begin
```

For this solar profile, the request identity is bound to the profile namespace before normalization. The raw source is preserved as provenance; the governed order is:

```
MJ -> Bangel .begin -> request.bind(MJOS-SOLAR-SEMI-PHONE-001) -> R/R0 -> R1  
-> M1 prediction -> Elsa semantics -> JP representation -> MK physics  
-> J0 verification -> safety/evidence -> M3 bounded allocation
```

-> Mermaid reconciliation -> Shiva when capital applies -> MJ permit
-> R2 living static evidence -> bounded execution or hold -> J0 final receipt

15. Bangel **construct mapping**

Module

Defines the profile compilation unit and its independent scope.

Namespace

Prevents profile parameters, evidence and authority from leaking across scales.

Import

Admits only hashed, typed shared-core contracts; no raw cross-profile physical parameter import.

Declaration

States profile identity, purpose, status, source digest and claims ceiling.

Definition

Defines formulas, objects, states and validity domains.

Capability

Names a bounded action or observation; capability is not authority.

Participant

Binds a family manifestation to a role without merging authority.

Relationship

Expresses parent/profile-of, handoff, evidence, and permit edges.

Function

Maps typed inputs to typed outputs with explicit failure states.

Expression

Represents mathematical, logical, physics or state operations.

Statement

Records an imperative or declarative rule.

Measurement

Requires quantity kind, unit, instrument, calibration, time and uncertainty.

Constraint

Defines hard bounds, ethics, claims ceilings and invariants.

Annotation

Adds provenance, evidence ceiling and source references.

Directive

Controls compilation or review behavior but does not create authority.

Block

Groups one complete governed scope.

Literal

Preserves exact values such as the source hash or logical allocation seed.

Reference

Links immutable IDs, roots, receipts, formulas and profile records.

Type

Prevents mass, energy, bytes, currency, state and authority from being confused.

Attribute

Carries status, profile, evidence, environment, revision and claims metadata.

16. Complete command-object envelope

Every profile command must name actor, purpose, target, profile, inputs, quantity types, units, evidence, environment, intended effects, denied effects, recovery, M3 lease, Mermaid reconciliation, safety state, and MJ permit state. A missing controlling field produces HOLD rather than inference.

17. Formula-to-gateway map

- `F-158` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-159` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-160` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-161` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-162` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-163` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-164` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
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- `F-166` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-167` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.

- `F-168` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.
- `F-169` enters at JP representation, receives MK applicability and unit/conservation analysis, JO proof, applicable safety evidence, M3/Mermaid implications, and an MJ permit classification before any effect.

18. Final output classes

- `PASS\_EVIDENCE`: a bounded design, simulation, or measurement claim is supported within its evidence ceiling.
- `HOLD`: required evidence, classification, calibration, environment, or authority is missing or unresolved.
- `FAIL\_TECHNICAL`: complete evidence demonstrates a unit, conservation, boundary, state, or hard-limit failure.
- `DENY`: the purpose or combined system effect violates ethics, non-weaponization, authority, or another superior rule.
- `MJ\_DECISION\_ELIGIBLE`: a complete decision packet exists; this is not itself the decision.