Title

CQE Why■Files — Necessity Proofs (v0.1)

What these are: short, reproducible “why” demonstrations that show each CQE rule isn’t stylistic—it’s forced by parity, symmetry, and replay.

Each card = What it answers → Minimal experiment → Receipts (4■bit) → Pass/Fail signal → Why it matters.

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WHY■1 — n=4→5 forces the octad (the hinge)

What it answers Eight views aren’t a style choice; they’re forced at the first nontrivial lift.

Minimal experiment 1) Draw a 4×4 parity board and place the canonical palindromic n=4 covering. 2) Attempt to insert symbol “5” in each of 16 cells; allow ≤1 local Δ■lift; require determinism, mirror lock, idempotence. 3) Quotient by dihedral symmetries while preserving parity lanes.

Receipts (4■bit) b1=octet covered, b2=mirror equality, b3=Δ■lift used (≤1), b4=strict tightened → typical pass 1101.

Pass/Fail Exactly eight inequivalent insertion classes survive. One re■palindromizes; seven stabilize as invariant non■palindromes.

Why it matters Once 8 is forced, E8 at n=8, Golay/Leech legality at 24, and two■slice codec at 32 are the unique stable continuations under the same constraints.

WHY■2 — Why 4 bits suffice (minimal receipt)

What it answers Why a 4■bit commit is enough to gate propagation across domains.

Minimal experiment Define four independent gates: (G1) Octet coverage, (G2) Mirror rest, (G3) Monotone Δ■lift, (G4) Strict ratchet. Run any workflow (e.g., bug■repro or optics bench), flip one gate at a time; show each gate independently catches a distinct failure mode.

Receipts (4■bit) b1..b4 = {G1..G4}. Require Hamming distance ≥2 among active classes to prevent accidental collisions.

Pass/Fail All four gates independently detect their targeted failure; removal of any one admits a counterexample.

Why it matters 16 classes cover stage maturity; promotion to 8/64 bits is optional for namespace or sharding, not correctness.

WHY■3 — Delayed semantics (stand■ins until commit)

What it answers Binding meaning late prevents brittle over■fit.

Minimal experiment Run a two■arm analysis (A=simulation, B=experiment). Keep tokens as stand■ins through mirror/octal checks; bind units and names only after 4■bit pass. Show that premature binding yields contradictory “truths” under rotation/pose while delayed binding remains pose■invariant.

Receipts b1=octet, b2=mirror, b3=Δ■lift, b4=strict → need b1=b2=1 before naming.

Pass/Fail If naming early changes outcomes under symmetry, fail.

Why it matters Form (geometry) first; meaning (labels) second → reproducible across labs.

WHY■4 — Mirror test (forward■inverse≈identity) is necessary

What it answers One■way pipelines hide bias; mirrors expose it.

Minimal experiment Pick any transform pair (encode/decode, train/eval). Show that forward■only can pass while forward↔inverse fails on the same data unless a local Δ■lift repairs it.

Receipts Require b2=1 (mirror) before any promotion.

Pass/Fail Forward■only pass with mirror fail ⇒ pipeline incomplete; apply Δ■lift until b2 flips to 1.

Why it matters Deletes direction bias and enforces replayability.

WHY■5 — Octet coverage prevents A/B illusions

What it answers Two views can “win” for the wrong reasons.

Minimal experiment Construct 8 materially independent views (modalities/slices/regimes). Show an A vs B winner flips when C..H are present unless the runner■up is Δ■lifted and strict tightened.

Receipts b1=1 only when 8 views pass thresholds.

Pass/Fail If the winner changes sign when adding more views, earlier decision was under■covered.

Why it matters Coverage first; choice second.

WHY■6 — ∆■lift must be local and monotone

What it answers Repairs that change global meaning are confounds.

Minimal experiment Allow only local identity■preserving rewrites (e.g., phase■only Zernike tweak, unit normalization). Track OPE/FCE debts and require non■regression receipts.

Receipts b3=1 only if debts↓ and no other view regresses.

Pass/Fail Any repair that changes ledger identity or increases debt fails.

Why it matters Keeps fixes surgical and auditable.

WHY■7 — Strict ratchet encodes maturity (no backslides)

What it answers Why thresholds only tighten after a passing replay.

Minimal experiment Set initial loose bounds; after a pass, lower ceilings / raise floors (e.g., AR≤1.7 dB→1.5 dB). Try to pass later runs with looser historical bounds—must fail by design.

Receipts b4=1 when a new stricter bound is adopted and met.

Pass/Fail If older looser bounds are still accepted after promotion, ratchet is broken.

Why it matters Encodes progress; prevents quiet drift.

WHY■8 — Ledger & Merkle receipts enable 1:1 replay

What it answers How two teams can rebuild the same answer exactly.

Minimal experiment Record {form_id, automorphism id, octet map, DNA■10, thresholds, 4■bit receipt, page hash}. Hand the pack to a second team; require identical four■bit and receipts within tolerance.

Receipts Hash over (rest_hash, fourbit, thresholds, seed).

Pass/Fail Non■matching commits under identical pack ⇒ process not deterministic.

Why it matters Reproducibility by construction, not persuasion.

WHY■9 — Form vs Meaning (Construction■A + automorphisms)

What it answers E8/Leech/Monster aren’t “picked”—they’re the stable shells.

Minimal experiment Build E8 via Construction■A (binary Hamming) and show that automorphism actions generate isomorphic forms while meaning packs swap with no geometry change.

Receipts b1=b2=1 ensure shell legality before binding.

Pass/Fail If swapping meaning alters geometric receipts, your mapping isn’t form■separated.

Why it matters Stable scaffolds; portable semantics.

WHY■10 — Safety: bad data can’t ‘know a home’

What it answers Why unsafe/irrelevant tokens don’t propagate.

Minimal experiment Feed adversarial/irrelevant tokens; require they annihilate into the Non■Working album with breadcrumbs only (no influence on Working paths).

Receipts 4■bit row never set for non■working items; only a tombstone hash stored.

Pass/Fail Any influence from annihilated paths to Working ledger is failure.

Why it matters Defense■in■depth: gates, receipts, annihilation.