

From Individual Reviews to a Third Qualification Corpus: Evidence Architecture Across Engineering Reviews ER-201 to ER-299, State Variables, Scope Boundaries, Cross-Paper Couplings and Research Priorities

Juan Seguro

3Dresyns by Resyner Technologies S.L.

© 2026 Juan Seguro. All Rights Reserved.

Correspondence: info@3Dresyns.com · www.3Dresyns.com

ER-300 · Engineering Review · Version 0.2 · 23 September 2026

Statement of Significance

A technical-review century becomes useful only when its separate papers can be interpreted as a controlled evidence system. ER-300 closes ER-201 to ER-299 by identifying recurrent state variables, directional hand-offs and evidence gates while preserving the distinct scientific and documentary status of every constituent review.

Abstract

Engineering Reviews ER-201 to ER-299 form a bounded third corpus of 99 identifiers focused on measurement, formulation, process physics, biomedical and functional-device qualification, environmental/circular evidence, application-specific qualification and quality/evidence governance. ER-300 does not re-summarise the 99 papers. It asks what qualification architecture emerges when their declared ownership boundaries are read together. The dominant structure is a chain from identity and state definition, through delivered process conditions and measurement validity, to use-state performance, change control and evidence maturity. The same physical quantity can occupy different roles in different reviews: an input, a controlled state, a detection signal or an acceptance endpoint. This makes scope ownership and directional hand-offs essential. ER-300 identifies recurrent coupling chains, a corpus-level state object, evidence-to-decision gates and maintenance rules. It also separates scientific inclusion from publication state: a controlled candidate can inform the internal corpus architecture without being represented as a published or countersigned record. The synthesis is qualitative and architectural; it is not a pooled property database, product comparison, meta-analysis or repository-status statement.

Keywords: engineering reviews; qualification corpus; ER-201 to ER-299; evidence architecture; state variables; scope boundaries; cross-paper coupling; photopolymer manufacturing; research priorities

1. Purpose and corpus boundary

ER-300 is the closure paper for the third numbered block of the Engineering Review series. Its boundary is ER-201 through ER-299: 99 identifiers, with ER-300 reserved for synthesis and therefore outside the analysed set. The unit of analysis is the controlled identifier plus its declared ownership boundary and current controlled article state. Publication, independent-review and countersignature status are separate metadata fields and are not inferred from identifier presence.

1.1. Corpus boundary

The third corpus follows ER-100 [1] and ER-200 [2] as a structural synthesis layer. It does not move scope already owned by those corpora. The frozen ER-201 to ER-500 roadmap v0.5 [3] states that later roadmaps cannot move scope held by countersigned or published ERs and requires ER-300 to be drafted last within its century. This document therefore reads neighbouring ERs through their explicit boundaries rather than title similarity.

2. Methods and audit rules

Corpus synthesis uses a source hierarchy: frozen roadmap and ownership boundaries [3]; controlled article text; source/review ledgers; exact-byte review and countersignature records; repository state only when separately verified. Titles provide indexing, not sufficient evidence of scientific ownership. A coupling is recorded only when one review explicitly consumes, constrains or routes evidence to another. Research priorities are retained only when they follow from an unresolved measurement, transfer or evidence gap rather than editorial preference.

3. Corpus topology

The third corpus expands qualification from material/process characterization into production infrastructure and decision governance. The early band beginning at ER-201 concentrates on orthogonal material identity and property metrology rather than the superseded lot-equivalence/decision-limit wording of roadmap v0.4; that correction is controlled by roadmap v0.5 [3]. ER-251 to ER-280 extend biological, functional-device and environmental/circular decisions. ER-281 to ER-290 test application-specific transfer into reactors, analytical hardware, vacuum systems, tooling, cryogenic/radiation, food-contact and heritage contexts. ER-291 to ER-299 make the evidence chain itself the controlled object through digital thread, traceability, change control, supplier quality, FMEA, SPC, calibration, data integrity and maturity assessment.

4. Corpus-level state object

Across ER-201 to ER-299, a defensible claim can be represented as a linked state object with at least: material identity and lot; formulation and reactive state; machine/optical/thermal configuration; geometry and build orientation; wash/post-cure/finish; conditioning and service history; measurement-system identity; data/provenance state; requirement and configuration revision; and the decision being supported. No field is universally dominant. The required subset depends on the claim, but omitted load-bearing state variables prevent transfer.

5. Recurrent coupling chains

Five coupling chains recur. (1) Identity to formulation state to cure/working response to geometry/property. (2) Machine/output state to process signal to metrology to release. (3) Final article to exposure/service history to degradation/release to biological/environmental interpretation. (4) Recovery route to recovered-feedstock identity to reformulation to reprinting/property retention. (5) Requirement to configuration to process

history to inspection to release to change/requalification. These chains are directional: a downstream pass does not retrospectively prove every upstream state was controlled.

6. Evidence-to-decision architecture

The corpus repeatedly separates mechanism plausibility, controlled laboratory observation, process-specific verification, representative-use qualification and controlled-production evidence. A standard can define terminology, method or management architecture without proving a material-specific endpoint. A primary paper can demonstrate feasibility without establishing transfer to another resin, geometry or machine. A successful part can demonstrate manufacture without proving process capability. ISO/ASTM 52920:2023 [4] supplies industrial additive-manufacturing qualification context but does not itself prove a material-specific claim. Independent review, countersignature and repository publication are governance gates layered on top of scientific evidence, not substitutes for it.

7. Measurement and uncertainty as cross-corpus infrastructure

ER-201 to ER-299 increasingly treat measurement as part of the system under qualification. Calibration, method range, recovery, blanks, sampling, uncertainty, drift and data integrity determine whether a reported number can carry a decision. This is especially visible in analytical thresholds, particle/wastewater monitoring, RTD, vacuum performance, SPC and calibration management. The corpus therefore rejects nominal settings and unqualified proxies when the decision depends on delivered or measured state.

8. Change, reuse and time

A second recurring dimension is history. Resin ageing, machine drift, repeated cleaning, wear, environmental exposure, recycling cycles, tool reuse, cryogenic/radiation cycles and supplier/process changes all convert a nominally identical object into a new state. The third corpus therefore treats time and reuse count as configuration variables. Equivalence after change must be demonstrated by evidence capable of detecting the expected difference; it cannot be established by product name or unchanged CAD alone.

9. Quality and governance layer

ER-291 to ER-299 formalise controls that earlier scientific reviews often require implicitly: bidirectional requirement traceability, configuration identity, risk-based requalification, supplier evidence, failure-mode analysis, process monitoring, metrological control, raw-data provenance and maturity assessment. ISO 9001:2026 [5] provides current quality-management-system context, while ISO/ASTM 52920:2023 [4] provides industrial AM qualification context. Their function is not bureaucratic duplication: these controls preserve the relationship between a scientific claim and the exact material/process/evidence state that supported it, making later change impact and reuse auditable.

10. Cross-paper non-compensatory gates

Gate	Minimum evidence	Blocking failure
Identity	Material/configuration uniquely defined	Generic material or file name
Delivered state	Relevant process and history measured	Nominal settings substituted
Measurement validity	Calibrated/validated method and uncertainty	Unqualified proxy carries decision
Boundary ownership	Upstream/downstream scope explicit	Duplicate or silent scope transfer
Use/scale transfer	Representative bridge evidence	Lab feasibility generalized
Change control	Affected evidence traced and requalified	Closed evidence silently reused
Data provenance	Raw-to-result lineage reconstructable	Orphan result or overwritten history
Authority/status	Scientific, review, countersignature and publication states separated	One status inferred from another

11. Research priorities

The third corpus exposes priorities that are architectural rather than product-specific: validated cross-platform state transfer; stronger longitudinal evidence for machine/material drift; harmonised measurement of recovered and released material; direct terrestrial and chronic environmental evidence; application-specific long-term datasets for vacuum, cryogenic, radiation, tooling and food-contact use; multivariate process-control datasets tied to physical causes; and machine-actionable provenance that preserves raw-to-release traceability without equating data availability with data quality. Interlaboratory studies are particularly valuable where the current evidence depends on one printer, one resin or one laboratory.

12. Knowledge boundary

ER-300 is a synthesis of the controlled ER-201 to ER-299 architecture, not an empirical meta-analysis. It does not create pooled performance limits, publication status, countersignature status or repository facts for constituent reviews. Cross-paper couplings are retained only where the controlled scopes justify them; unresolved evidence gaps remain unresolved and cannot be closed by the synthesis layer itself.

13. Maintenance rule

ER-300 is not a mechanism for silently rewriting upstream papers. If an upstream ER changes version, ownership, evidence or status, the corpus map must be updated through an explicit maintenance record. A later ER may cite and extend a boundary but may not absorb an incumbent scope merely because it offers a newer example. Repository publication state must remain separately verified.

14. Conclusions

ER-201 to ER-299 form a coherent third qualification corpus when read as a network of state-resolved decisions rather than a catalogue of topics. The corpus-level invariant is conditionality: claims depend on a specific material-process-workflow-measurement-configuration history. The practical consequence is a non-compensatory evidence architecture in which identity, delivered state, measurement validity, use history, traceability and decision authority remain explicit. ER-300 closes the century structurally; it does not erase the scientific limits or documentary status of any constituent review.

References

1. Juan Segurola. From Individual Reviews to a Qualification Corpus: Evidence Architecture Across Engineering Reviews ER-01 to ER-99. ER-100. 3Dresyns Engineering Publications; 2026. Controlled corpus source.

2. Juan Seguro. From Individual Reviews to a Second Qualification Corpus: Evidence Architecture Across Engineering Reviews ER-101 to ER-199, State Variables, Scope Boundaries, Cross-Paper Couplings and Research Priorities. ER-200. 3Dresyns Engineering Publications; 2026. Controlled corpus source.
3. 3Dresyns Engineering Publications. ER201_ER500_MASTER_ROADMAP_v0.5_20260916.md. Frozen controlled roadmap for ER-201 to ER-500. SHA-256 151623a04db6a9c5ed1efcfc0819143500a86e87d566fb8ca1d9e38ca831dfed.
4. International Organization for Standardization and ASTM International. ISO/ASTM 52920:2023 Additive manufacturing — Qualification principles — Requirements for industrial additive manufacturing processes and production sites. 2023.
5. International Organization for Standardization. ISO 9001:2026 Quality management systems — Requirements. Geneva: ISO; 2026.

Copyright

© 2026 Juan Seguro. All Rights Reserved.