

## **Multi-Authority Signature Block**

The authority signatures block disclosed in provisional application 64/050,895 binds a credentialed structural element's admissibility profile to the element's identity through the cryptographic signatures of one or more credentialing authorities. Each property surface of the profile, structural, thermal, energy storage, fire-performance, distribution, network, water-coupled, environmental, and carbon-sequestration, is independently credentialed by an authority recognized as competent within a declared scope, for example a structural engineering authority signing the structural surface and an environmental-credit authority signing the carbon-sequestration surface. The surfaces then compose through signed, versioned composition rules whose conflict-resolution policy resolves overlap, and authority revocation propagates through the element's lineage chain to be honored prospectively at admissibility-evaluation time. The signatures block is the mechanism by which the credentialed-materials framework keeps the competences of distinct authorities separately accountable while composing them into a single credentialed admissibility profile that travels with the element from manufacture through deployment and end of life.

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## **Mechanism: Authorities And Their Declared Scope**

The authority signatures block binds a credentialed structural element's admissibility profile to the identity of the element through one or more cryptographic signatures of credentialing authorities admitted to the architecture. A credentialed authority is an authority recognized by the architecture as competent to attest property surfaces or to admit operations within a declared scope. The disclosure enumerates credentialing authorities including, without limitation, manufacturer authorities, building-code authorities, utility authorities, environmental-credit authorities, fire-code authorities, electrical-code authorities, and marine or water-infrastructure authorities, along with the independent testing authority, the installer authority, the decommissioning authority, and the recycler authority that sign lifecycle transitions.

The admissibility profile comprises a plurality of property surfaces, each independently credentialed by an authority with declared scope. By way of example, a structural engineering authority signs the structural surface; a thermal-rating authority signs the thermal surface; a fire-marshal authority signs the fire-performance surface; a utility or building-code authority signs the energy storage surface; and an environmental-credit authority signs the carbon-sequestration surface. Each authority signs the surface it is competent to attest, so that the boundary between what each authority attests and what lies outside its competence is made explicit through the declared scope under which the authority is recognized.

As depicted in the disclosure, multi-authority credentialing of a credentialed structural-storage element is performed by a manufacturer authority, a building-code authority, a utility authority, a carbon-credit authority, and an independent testing authority to produce a composed admissibility profile by which the element is admitted into building-scale operations, building-code review, grid-services participation, carbon-credit issuance, and independent verification. The authority signatures block binds the entire profile to the credentialed structural element's identity, while each admissibility surface admits independently for its corresponding requirement. The cryptographic-

signature scheme follows the keyless-identity-through-continuity primitive of the related Identity Application, providing classical public-key signature compatibility while admitting continuity-based identity verification.

## **Operating Parameters: Declared Scope, Composition, And Revocation**

Each authority signs only the surface it is competent to attest, under the scope declared for the authority. A manufacturer authority signs the manufacturing-side credential and an embedded credentialed-identity tag is bound to the block's manufacturer-authority signature; an independent testing authority signs for independent verification; a utility or building-code authority signs the energy storage surface; an environmental-credit authority signs the carbon-sequestration surface. The architecture keeps the competences separately accountable by recognizing each authority only within its declared scope rather than admitting any one authority to attest the entire profile.

Overlap among surfaces is resolved through the composition-rule architecture rather than within the signatures block itself. Multi-property admissibility surfaces compose through a composition-rule registry holding signed and versioned composition-rule artifacts. Each composition rule is a credentialed and signed data artifact declaring a scope of property surfaces and conditions to which the rule applies, a composition logic specifying how the relevant surfaces interact, a version vector for deterministic conflict resolution, a conflict-resolution policy selected from latest-signed-rule, declared-precedence-table, and authority-rank-resolution, and an authority signature. The composition-rule registry is consumed by the building energy management system at admissibility-evaluation time, and each composition-rule artifact is signed by a composition-rule authority.

Representative composition rules include, without limitation, a fire-event rule reducing storage admissibility to zero when the fire-performance admissibility surface declares fire-event detection; a thermal-runaway prevention rule constraining storage dispatch

during high thermal admissibility surface readings; a structural-load-versus-storage-cycle rule reducing storage admissibility when the structural admissibility surface reports structural fatigue accumulation above a declared threshold; a wet-environment storage rule requiring water-coupled admissibility surface attestations to be current before admitting storage operations near wet surfaces; and a carbonation-tracked-state-of-health rule degrading the storage admissibility surface as a function of cumulative carbonation depth.

Authority revocation is handled through the credentialed-revocation primitive of the related Identity Application. Revocation events propagate through the lineage chain and are honored prospectively at admissibility-evaluation time. Profile versioning is maintained through monotonically increasing version vectors with conflict-resolution policies declared by the composition-rule architecture, so that the admissibility verdict applicable to an element can be evaluated against the credential state in force at the evaluation time.

## **Alternative Embodiments**

In a first alternative embodiment the admissibility profile carries additional property surfaces, each independently credentialed by a recognized authority. The profile may comprise at least two property surfaces selected from structural, thermal, energy storage, fire-performance, sound-transmission, vapor-permeability, environmental, distribution, network, water-coupled, thermal-coupling, and carbon-sequestration admissibility surfaces, each composing with the other surfaces through declared composition rules. New authorities are recognized within their declared scope under the same signature scheme.

In a further embodiment the signatures block records the lifecycle authorities that sign credentialed transitions in the element's cradle-to-cradle flow. A pre-installation credentialing state is entered through manufacturer-authority signature; an in-service credentialed operation state is entered through installation-authority signature; an

end-of-structural-life decommissioning state is signed by the decommissioning authority, which produces a demolition-recovery attestation declaring the recovered material's grade, mass, and physical state; and a recycling-grade re-credentialing state is signed by the recycler authority, which conducts recovered-material processing and produces a new admissibility profile at recycled grade.

In a further embodiment the architecture admits continuous re-credentialing across operational material flows during the element's in-service lifetime, including tuck-pointing replacement of mortar joints, surface-coating refresh, cavity-fill replacement, and substrate top-up. Each such material flow is a credentialed event signed by an installer authority and recorded in the lineage chain, and the composite admissibility profile is re-evaluated against the cumulative material flow rather than only at original installation. In a further embodiment biogenic carbon-credit attestations bound to the element migrate with it across material flows and across structural lifetimes, the migration being a credentialed transaction signed by an environmental-credit authority and recorded in the lineage chain.

## **Composition With The Admissibility Profile**

The authority signatures block binds the entire credentialed admissibility profile to the credentialed structural element's identity, while each admissibility surface admits independently for its corresponding requirement. The surfaces compose through the declared composition rules held in the signed, versioned composition-rule registry, which the building energy management system consumes at admissibility-evaluation time to produce a composite admissibility profile evaluable by a building-code authority and by the building energy management system. A composition rule reduces, constrains, or degrades a surface's admissibility according to its composition logic, for example reducing storage admissibility to zero on fire-event detection or degrading the storage surface as a function of cumulative freeze-thaw cycles or carbonation depth.

Composition spans the element's lifecycle. End-of-storage-life is a credentialed transition in which the realized energy storage capacity has degraded below a declared threshold; the credentialed admissibility profile is updated to reflect zero or reduced storage capacity while the structural admissibility surface continues to support the element's structural function. Under the metabolic-lifetime model, end-of-storage-life of the original substrate composition does not require demolition of the structural element; the element continues in service while incoming credentialed material flows refresh, augment, or substitute the storage substrate within the cumulative composite admissibility profile, supporting structural lifetimes substantially exceeding the storage-chemistry cycle life of any individual substrate composition.

Composition with the wider credentialed-materials framework extends to lineage retention and re-credentialing. Each lifecycle transition, each material flow, and each carbon-attestation migration is a credentialed event signed by an appropriate authority and recorded in the lineage chain, which forms a directed graph of credentialed transitions persistent across multiple structural lifetimes. Re-credentialing of an element whose surface set has fallen below requirements is performed by the authorities competent to re-attest the affected surfaces, with the recovered material independently re-credentialled by a recycler authority at recycled grade and the lineage record preserving both the prior state and the re-attested state.

## **Prior-Art Distinction**

Existing building codes recognize multiple material properties of building components, including structural load ratings, fire-resistance ratings, thermal insulation R-values, sound transmission ratings, and vapor permeability, but none recognize energy storage, electrical distribution, data networking, or carbon sequestration as material properties of structural building components. The disclosed authority signatures block addresses this gap by binding a credentialed admissibility profile, in which each such property is an independently credentialed surface, to the element's identity through the signatures of authorities each recognized within a declared scope. Rather than treating authority

separation administratively, the architecture binds each surface to the cryptographic signature of the authority competent to attest it and composes the surfaces through signed, versioned composition rules whose conflict-resolution policy resolves overlap. Revocation propagates through the element's lineage chain and is honored prospectively at admissibility-evaluation time, so that the competences of the manufacturer, building-code, utility, environmental-credit, and independent testing authorities remain separately accountable within a single credentialed admissibility profile.

## **Disclosure Scope**

This article describes subject matter disclosed in U.S. Provisional Application No. 64/050,895. The scope of the disclosure encompasses the authority signatures block that binds a credentialed admissibility profile to a credentialed structural element's identity, the credentialing authorities recognized within a declared scope, the independent credentialing of each property surface, the composition-rule architecture by which the surfaces compose, and the propagation of authority revocation through the element's lineage chain. The scope is not limited to any particular signature algorithm; the cryptographic-signature scheme follows the keyless-identity-through-continuity primitive of the related Identity Application, providing classical public-key signature compatibility while admitting continuity-based identity verification.

The scope further encompasses the lineage-recorded credentialing of lifecycle transitions, including pre-installation credentialing by a manufacturer authority, in-service operation entered through installation-authority signature, end-of-structural-life decommissioning signed by a decommissioning authority, and recycling-grade re-credentialing signed by a recycler authority, together with continuous re-credentialing across operational material flows and migrating carbon-credit attestations signed by an environmental-credit authority.

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# **Credentialed Surfaces** ([/credentialed-materials](#))

[All 40 steps](#) → ([/inventive-steps](#))

Building surfaces as credentialed agents that participate in the structure's networking and electrical systems.

Provisional application

## **PRIMARY TECHNICAL DISCLOSURE**

- [credentialed-building-materials-cryptographic-admissibility-for-structural-surfaces](#) ([/articles/credentialed-building-materials-cryptographic-admissibility-for-structural-surfaces](#)).

## **SECONDARY TECHNICAL**

- [credentialed-materials/carbon-sequestration-property-surface](#) ([/articles/credentialed-materials/carbon-sequestration-property-surface](#)).
- [Composition Rules Governing Surface Interactions](#) ([/articles/credentialed-materials/composition-rules](#)).
- [Decommissioning And Re-Credentialing Attestation](#) ([/articles/credentialed-materials/decommissioning-and-recredentialing](#)).
- [Electrical-Distribution Admissibility Surface](#) ([/articles/credentialed-materials/distribution-property-surface](#)).
- [credentialed-materials/end-of-storage-life-attestation](#) ([/articles/credentialed-materials/end-of-storage-life-attestation](#)).
- [credentialed-materials/energy-storage-property-surface](#) ([/articles/credentialed-materials/energy-storage-property-surface](#)).
- [Lineage Chain Across Material Lifecycle](#) ([/articles/credentialed-materials/lineage-chain-across-lifecycle](#)).
- [Master Credential Signature Binding All Property Surfaces](#) ([/articles/credentialed-materials/master-credential-binding](#)).
- [Multi-Authority Signature Block](#) ([/articles/credentialed-materials/multi-authority-signature-block](#)).
- [Data-Networking Admissibility Surface](#) ([/articles/credentialed-materials/network-property-surface](#)).
- [Profile Versioning Continuity](#) ([/articles/credentialed-materials/profile-versioning-continuity](#)).
- [credentialed-materials/structural-property-surface](#) ([/articles/credentialed-materials/structural-property-surface](#)).
- [credentialed-materials/thermal-property-surface](#) ([/articles/credentialed-materials/thermal-property-surface](#)).

- [Versioned Admissibility Profiles With Lineage Chain \(/articles/credentialed-materials/versioned-profiles-with-lineage\)](/articles/credentialed-materials/versioned-profiles-with-lineage).
- [credentialed-materials/water-coupled-property-surface \(/articles/credentialed-materials/water-coupled-property-surface\)](/articles/credentialed-materials/water-coupled-property-surface).

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[Credentialed Surfaces overview → \(/credentialed-materials\)](/credentialed-materials).