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# Credentialed Building Materials for Real Estate Valuation, Insurance, and Disclosure: A Property History That Binds to the Asset

Real estate underwriting, valuation, and statutory disclosure all turn on a question the built environment cannot reliably answer: what is actually in this structure, who attested it, and how has it changed over decades of repairs, retrofits, and ownership transfers. Building documentation lives in disconnected inspection PDFs, contractor invoices, and seller representations that detach from the physical asset the moment a property changes hands. This application shows how the Credentialed Surfaces, disclosed in U.S. Provisional Application No. 64/050,895, binds a material's property history to the material itself through a signed, versioned, policy-evaluable lineage chain, so that valuation, insurance, and disclosure draw from a provenance record that travels with the asset. It draws on the lineage-chain, multi-authority signature-block, composition-rule, and state-of-health-attestation primitives of that disclosure, and on the keyless-identity-through-continuity binding it incorporates from the Identity Application.

## What This Application Specifies

This application specifies how the credentialed-admissibility-profile architecture of the Credentialed Surfaces applies to the real estate and built-asset lifecycle, where the parties who value, insure, and disclose a building need a trustworthy, durable account of what its materials are and how they have changed over time. The architecture treats a building material's property history as a credentialed admissibility profile bound to the material by cryptographic signature of one or more credentialing authorities, traveling with the material through manufacturing, installation, operation, and end-of-life processing.

In the disclosed architecture, each credentialed structural element carries a profile composed of independently credentialed property surfaces, including without limitation structural, thermal, energy storage, fire-performance, sound-transmission, vapor-permeability, environmental, and carbon-sequestration surfaces. Each surface declares property-specific parameters and admission conditions and is signed by an authority with declared scope: 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, and an environmental-credit authority signs the carbon-sequestration surface. A multi-authority signature block binds the whole profile to the element's identity, and the element travels with that profile through its lifecycle.

For real estate purposes, the operative primitive is the lineage chain: a persistent record of credentialed events associated with a credentialed material, element, or assembly. The chain records pre-installation credentialing entered through a manufacturer-authority signature, an in-service credentialed operation state entered through an installation-authority signature, state-of-health attestations, end-of-storage-life updates, an end-of-structural-life decommissioning state signed by a licensed demolition or deconstruction contractor, recycling-grade re-credentialing signed by a recycler authority, and re-installation in a subsequent structural application. Each transition is a credentialed event signed by an appropriate authority. The element's per-

element identity is assigned through a tag-bonded identity class (an RFID, NFC, or optical tag bonded during manufacturing), a physical-fingerprint identity class (a signed hash of observable physical characteristics such as a unique impedance signature or surface-texture pattern), or a per-batch-with-subdivision identity class in which a manufacturing batch identity is subdivided into per-element identities through installer-authority attestation. The result is a property history that is bound to the asset rather than filed alongside it.

## Why It Matters

Real estate transactions are priced on representations that are expensive to verify and easy to lose. A buyer's appraiser, a lender's underwriter, an insurance carrier, and a jurisdiction's disclosure regime each reconstruct a partial picture of the same building from documents that were never bound to its materials: a roof warranty that names no specific roof, a remediation certificate that cannot prove which wall it remediated, a seller disclosure that depends on memory and good faith. When the building changes hands, much of this record detaches. The new owner inherits a structure whose material history has to be reconstructed, often by inspection and assumption.

The disclosed architecture addresses this by making the provenance record a property of the credentialed material itself. Because the credentialed admissibility profile travels with the material through manufacturing, installation, operation, and end-of-life processing, and because each lifecycle transition is a signed credentialed event recorded in the lineage chain, the account of what a material is and who attested it does not depend on a transaction-time reconstruction. The chain forms a directed graph of credentialed transitions persistent across multiple structural lifetimes, so it survives ownership transfer, renovation, and even demolition and re-incorporation of recovered material. This is the difference between a disclosure that asserts a fact and a record that carries a signed, versioned history an evaluating party can check against the authority that signed it.

It matters specifically because the three downstream functions of valuation, insurance, and disclosure share one dependency: an authority-attested, tamper-evident account of material state over time. The architecture provides exactly that account, governed by the same admissibility-evaluation machinery the disclosure uses for every other surface, rather than as a bespoke records system bolted onto each function separately.

## How It Composes With the Domain

Valuation composes with the multi-authority signature block and the per-surface attestation model. An appraiser or automated valuation process evaluates a credentialed element's composite admissibility profile, reading the structural admissibility surface (declaring structural mechanical properties signed by a structural engineering authority), the fire-performance surface (signed by a fire-marshal authority), the thermal surface, and, where present, the carbon-sequestration surface signed by an environmental-credit authority. Each surface admits independently for its corresponding requirement, so a valuation can rest on the specific surfaces it cares about, each traceable to the authority of declared scope that signed it. Where a material carries energy-storage, distribution, or thermal-coupling surfaces, those surfaces are likewise attested values in the profile rather than performance claims to be taken on faith.

Insurance composes with two primitives. First, the state-of-health attestation: in the disclosed architecture, attestations declare the realized capacity, power capacity, cycle count, calendar age, round-trip efficiency, fault history, and degradation indicators of a credentialed element, providing an underwriter with an authority-signed account of in-service condition rather than an inspection snapshot. Second, the substrate-as-distributed-physical-state-observatory primitive: the disclosure expressly contemplates an insurance underwriting agent as a consuming agent admitted under contractual admissibility to the substrate's observation stream, in which the substrate's electrical state is observed to detect events of interest including water-ingress events through capacitance and leakage changes, thermal-anomaly events, and crack-and-settling

events through impedance and time-domain-reflectometry signature changes. Each observed event is a credentialed observation signed by the building energy management system's credentialed identity, weighted by the evidential-weighting primitive of the Cognition Application, evaluated for admissibility against the consuming agent's domain fields, and recorded in lineage. An underwriter so admitted receives governed, signed observations under declared contractual scope, not raw telemetry.

Disclosure composes with the lineage chain and the continuous-re-credentialing primitive. Statutory and contractual disclosure regimes ask a seller to represent material facts about a building's condition and history. Because the architecture admits continuous re-credentialing across operational material flows during a structural element's in-service lifetime, including tuck-pointing replacement of mortar joints, surface-coating refresh, cavity-fill replacement, drywall replacement during renovation, foundation surface coating, and topping-slab augmentation, each such flow is a credentialed event signed by an installer authority and recorded in the lineage chain. The composite admissibility profile is re-evaluated against the cumulative material flow rather than only at original installation. Under this metabolic-lifetime model, the building's credentialed identity persists across material flows while the flows themselves are credentialed transitions, so a disclosure can reference a signed history of what was done, by whom, and when, rather than a reconstructed narrative. Profile versioning is maintained through monotonically increasing version vectors with declared conflict-resolution policies, so the disclosed account has a deterministic, ordered revision history.

Composition rules govern how surfaces interact across the domain. A composition rule is a credentialed, signed, versioned data artifact in a composition-rule registry, declaring a scope, a composition logic, a version vector, and a conflict-resolution policy. The disclosure enumerates representative rules including a carbonation-tracked-state-of-health rule degrading a surface as a function of cumulative carbonation depth and a freeze-thaw-derated rule degrading a surface as a function of cumulative freeze-thaw

cycles. For valuation and insurance, such rules let an evaluating party reason about how environmental exposure and structural state interact through declared, signed logic rather than ad hoc adjustment.

## What This Enables

The architecture enables a property history that binds to the asset and survives transfer. A purchaser, lender, appraiser, insurer, or jurisdiction evaluates the same credentialed admissibility profile, each reading the surfaces within its scope, each able to trace an attestation to the authority that signed it. Representative embodiments include: a valuation embodiment in which an appraisal reads signed structural, fire-performance, and thermal surfaces directly from the asset's profile; an insurance embodiment in which an underwriting agent is admitted under contractual admissibility to receive signed water-ingress, thermal-anomaly, and crack-and-settling observations, with state-of-health attestations providing an authority-signed condition record; a disclosure embodiment in which renovation and repair material flows are recorded as installer-signed credentialed events, producing a versioned, ordered account of the building's material history; a portfolio embodiment in which the cross-building-federation primitive lets an owner of multiple properties evaluate credentialed substrates across properties and jurisdictions under declared scope, with a regulatory authority and an environmental-credit authority admitted as optional credentialed observers; and an environmental-asset embodiment in which biogenic carbon-credit attestations bound to a substrate migrate with it across material flows and structural lifetimes through transactions signed by an environmental-credit authority, so that a sequestration credit travels with the specific structural mass it attaches to. Across these embodiments, the common enabled capability is that the record of what a material is and how it has changed is bound to the material, signed by authorities of declared scope, versioned for ordered revision, and evaluable by policy.

## Boundary Conditions

The underlying materials science is established, not new. Structural cementitious composites, carbonaceous additives, carbon mineralization and sequestration behavior, thermal mass, moisture transport, and conductive treatments are prior art, and nothing here claims a newly discovered material, chemistry, bond, phase, or physical effect. The novelty is the credentialing and admissibility-profile architecture applied to physical materials, and the multi-function-surface category it creates. Where a property surface such as energy storage is referenced, it is a credentialed attestation layer carrying authority-attested values, not a claim to internal cell chemistry or to any specific energy density, cycle life, efficiency, or cost figure.

This is a provisional disclosure of an architecture. It describes a configuration and a governance model, not a built, validated, or benchmarked system, and no representation is made that any element has been constructed or that any performance figure has been achieved. The domain framing in this article, including valuation, underwriting, and statutory disclosure practice, is external context describing how the disclosed architecture could be applied; it is not part of the patent claims and does not constitute legal, appraisal, insurance, or regulatory advice. The integrity of any credentialed history depends on the integrity and admitted scope of the signing authorities and on the per-element identity binding; the architecture governs how attestations are signed, versioned, composed, and evaluated, and does not by itself adjudicate the truth of what an authority chooses to attest. Statutory disclosure obligations, valuation standards, and insurance regulation are set by the applicable jurisdiction and remain in force independent of any credentialed record.

## Disclosure Scope

The home inventive step described here is the Credentialed Surfaces, disclosed in U.S. Provisional Application No. 64/050,895, titled for a multi-function credentialed structural substrate carrying energy storage, electrical distribution, data networking,

thermal coupling, and carbon sequestration as composed properties of building materials. The patent-relevant subject matter is the credentialed-admissibility-profile architecture: the binding of a signed, versioned property history to a material through multi-authority signatures, composition rules, state-of-health and lifecycle attestations, and a lineage chain persistent across structural lifetimes, drawing on the keyless-identity-through-continuity binding of the Identity Application, the evidential-weighting and governance model of the Cognition Application, and the federation and observation primitives the disclosure composes with. The real estate, valuation, insurance, and statutory-disclosure framing in this article is external domain context provided to illustrate an enabling application of that architecture, and is expressly not part of the claimed invention. Underlying materials behaviors are prior art and are not claimed as new science.

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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

- Carbon-Sequestration Admissibility 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)
- End-Of-Storage-Life Attestation (/articles/credentialed-materials/end-of-storage-life-attestation)
- Energy-Storage Admissibility Surface (/articles/credentialed-materials/energy-storage-property-surface)
- Lineage Chain Across Material Lifecycle (/articles/credentialed-materials/lineage-chain-across-lifecycle)
- Authority Signatures Block Binding Property Surfaces To Material Identity (/articles/credentialed-materials/master-credential-binding)
- Multi-Authority Signature Block (/articles/credentialed-materials/multi-authority-signature-block)
- Data Network Admissibility Surface (/articles/credentialed-materials/network-property-surface)
- Profile Versioning Continuity (/articles/credentialed-materials/profile-versioning-continuity)
- Structural Admissibility Surface (/articles/credentialed-materials/structural-property-surface)
- Thermal-Property Admissibility Surface (/articles/credentialed-materials/thermal-property-surface)
- Versioned Admissibility Profiles With Lineage Chain (/articles/credentialed-materials/versioned-profiles-with-lineage)
- Water-Coupled Admissibility Surface (/articles/credentialed-materials/water-coupled-property-surface)

## APPLICATIONS · GENERAL

- Credentialed Structural Materials for Construction and Civil Infrastructure: Carrying Strength, Mix, and Provenance as Multi-Authority Attestations (/articles/credentialed-materials/construction-and-infrastructure)
- Carbon-Credit-Bearing Building Materials: Sequestration Attestations That Survive Incorporation, Transfer, and Decommissioning (/articles/credentialed-materials/carbon-credit-materials)
- Building-Product Compliance and Code Approval: Property-Surface Profiles as Machine-Evaluable Admissibility Evidence (/articles/credentialed-materials/building-product-compliance)
- **Credentialed Building Materials for Real Estate Valuation, Insurance, and Disclosure: A Property History That Binds to the Asset (/articles/credentialed-materials/real-estate-and-asset-lifecycle)**
- Recredentialing Recovered Materials: Verifiable Lineage for Reuse and Decommissioning in the Circular Economy (/articles/credentialed-materials/circular-economy-and-decommissioning)
- Energy and Grid-Coupled Surfaces: Crediting Stationary Storage in Structural Mass Without Trusting the Cell (/articles/credentialed-materials/energy-and-grid-surfaces)

– Credentialed Surfaces for Water and Environmental Infrastructure: Signed Performance and Compliance Attestations on Water-Coupled Concrete (/articles/credentialed-materials/water-and-environmental-infrastructure)

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Credentialed Surfaces overview → (/credentialed-materials)