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Building-Product Compliance and Code Approval: Property-Surface Profiles as Machine-Evaluable Admissibility Evidence

Building-product approval still runs on paper data sheets, listing numbers, and PDF test reports that an inspector or authority having jurisdiction reads, cross-references, and trusts by hand, and that evidence does not travel with the physical material onto the job site. This application shows how that compliance problem is addressed by Credentialed Surfaces, disclosed in U.S. Provisional Application No. 64/050,895, in which each regulated property of a building component is carried as a signed, versioned, policy-evaluable admissibility surface bound to the part itself. It draws on the sibling Memory-Native Identity and Authentication application for the signature binding and on the Governed Spatial Mesh application for authority-to-authority settlement of inspection and acceptance.

What This Application Specifies

This application specifies how regulated building-product compliance, the process by which a structural component is reviewed against the building code, inspected on site, and approved for occupancy, is carried out against a machine-evaluable credentialed admissibility profile rather than a stack of paper data sheets. The home invention, Credentialed Surfaces (U.S. Provisional Application No. 64/050,895), discloses a credentialed admissibility profile that comprises a plurality of admissibility surfaces,

each surface declaring property-specific parameters and admission conditions for one declared building-code-recognized or operationally-recognized property category, and the plurality of surfaces composing through declared composition rules to produce a composite admissibility profile evaluable by a building-code authority.

The disclosure is explicit that the code recognizes multiple material properties today (structural load ratings, fire-resistance ratings, thermal insulation R-values, sound transmission ratings, and vapor permeability) but that none of these are carried as a single signed object bound to the part. The architecture inverts that. Each property becomes a credentialed surface: a structural admissibility surface declaring structural mechanical properties, a thermal admissibility surface, a fire-performance admissibility surface, a vapor-permeability surface, a sound-transmission surface, and so on, with energy storage, carbon-sequestration, distribution, and data-network surfaces available for the multi-function material class the same disclosure introduces. Each surface is independently credentialed 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. The signature scheme follows the keyless-identity-through-continuity primitive of the Identity Application, so the binding between a part, its profile, and the signing authorities is cryptographic, not clerical.

What an inspector or authority having jurisdiction evaluates, in this framing, is the composite admissibility profile, and what they evaluate it against is a set of signed, versioned composition rules held in a composition-rule registry. Each composition rule declares a scope of property surfaces and conditions, a composition logic, a version vector for deterministic conflict resolution, a conflict-resolution policy, and an authority signature. Policy is no longer a body of text a plan reviewer interprets; it is a credentialed artifact the profile is evaluated against.

Why It Matters

Building-product compliance fails in predictable, expensive ways, and every one of those failure modes is an artifact of evidence being separated from the material. A data sheet describes a product family, not the pour in front of the inspector. A listing certifies a model number, not the specific element after it has been cut, coated, or substituted in the field. A test report sits in an email thread, a submittal binder, or a manufacturer portal, and reconciling it against what was actually installed is manual, slow, and prone to the substitution and documentation gaps that drive rework, stop-work orders, and disputed certificates of occupancy.

The home disclosure attacks this at the root by making the credentialed admissibility profile travel with the material through manufacturing, installation, operation, and end-of-life processing. The profile is not a description of the part; it is bound to the part's identity. The disclosure specifies several identity classes for that binding: a tag-bonded identity class using an RFID, NFC, or optical tag bonded during manufacturing; a physical-fingerprint identity class deriving identity from a hash of observable physical characteristics such as a unique impedance signature or surface-texture pattern; and a per-batch-with-subdivision class in which a batch identity is subdivided into per-element identities through credentialed attestation by the installer authority at the point of installation. An inspector reading the part reads its actual, current profile, not a generic family document.

This matters because it changes who has to trust whom. Today an authority having jurisdiction extends trust to a manufacturer's paperwork and to the chain of intermediaries who handled it. Under the disclosed architecture, the multi-authority credentialing model means the structural surface is attested by a structural authority, the fire surface by a fire authority, an independent testing authority signs what it tested, and the building-code authority evaluates the composed result. The disclosure names exactly these roles, manufacturer authority, building-code authority, utility authority, environmental-credit authority, and independent testing authority,

producing a composed admissibility profile by which the element is admitted into building-code review. Trust is decomposed into scoped, signed attestations instead of bundled into one document.

How It Composes With the Domain

A code-approval workflow built on this architecture composes cleanly with the existing roles in the regulatory chain, because the architecture was designed around those roles rather than replacing them. Consider a credentialed structural element arriving at a job site.

At plan review, the authority having jurisdiction evaluates the element's composite admissibility profile against the jurisdiction's adopted composition rules. Because each composition rule carries a version vector and a conflict-resolution policy (selectable among latest-signed-rule, declared-precedence-table, and authority-rank-resolution), a reviewer can determine deterministically which version of which policy a given element was evaluated under, and a manufacturer can determine in advance whether a product will admit under a target jurisdiction's current rule set. The disclosure gives concrete composition rules that read like code provisions: a fire-event rule that reduces a storage surface to zero admissibility when the fire-performance surface declares fire-event detection; a wet-environment rule requiring water-coupled surface attestations to be current before admitting operations near wet surfaces; a structural-load-versus-cycle rule that derates one surface as another reports accumulated fatigue. These are the compositional interactions a plan reviewer reasons about informally today, expressed as signed, evaluable logic.

At inspection, the same profile is read off the physical part through its bound identity, so the inspector verifies that the element in the wall is the element that was credentialed, not merely that a matching data sheet exists somewhere. Field events that change compliance state, a cut, a coating refresh, a substitution, a repointing, are handled by the continuous re-credentialing primitive: each material flow is a

credentialed event signed by an installer authority and recorded in the lineage chain, and the composite profile is re-evaluated against the cumulative state rather than only against the original factory condition. The disclosure enumerates exactly such in-service flows (tuck-pointing, surface-coating refresh, drywall replacement, topping-slab augmentation), each a signed transition. An inspector therefore evaluates the as-built reality, with provenance, instead of an idealized original submittal.

At electrical and fire coordination, the architecture composes with the codes the disclosure names directly. It states that operating voltages typically below 60 volts DC qualify substrate operations as Class 2 or Class 3 wiring under NFPA 70 Article 725 and as compatible with NFPA 70 Article 680, and that the structural-to-electrical interface satisfies grounding, bonding, arc-flash and shock protection, fault isolation independent of the management system, and integration with fire-protection systems for coordinated de-energization. The electrical-code-compliance attestation is itself a declared element of the distribution admissibility surface. The compliance evidence an electrical inspector needs is a surface of the same profile, signed by an authority in scope.

Acceptance and settlement between authorities can run over the Spatial Mesh application's matched-pair settlement primitive, in which two credentialed parties, here an authority and a building's management agent, settle a transaction directly through their credentialed identities and a temporal proximity window, without an intermediary platform operator and without consensus across non-participants. An inspection sign-off, a conditional approval, or a re-credentialing acceptance becomes a credentialed bilateral event recorded in lineage.

What This Enables

Carrying compliance as a credentialed, versioned, machine-evaluable profile enables several capabilities that are awkward or impossible under paper-and-listing workflows. Deterministic, auditable approvals: because every admission decision is an evaluation

of a signed profile against a versioned rule, an approval can be replayed and audited, and a later dispute can be resolved by inspecting exactly which surfaces and which rule versions produced the determination. Multi-jurisdiction portability: a product family can be evaluated against multiple jurisdictions' composition-rule registries, and the same physical part can demonstrate admissibility wherever its surfaces satisfy the locally adopted rules, with the rule version recorded. Lifecycle compliance rather than point-in-time compliance: the lineage chain records pre-installation credentialing, in-service operation, end-of-storage-life or other functional-life transitions, decommissioning, and recycling-grade re-credentialing as signed events, so a building's compliance posture is a current, queryable state rather than a folder of original certificates that may no longer describe the as-built structure.

It also enables new categories of authority participation that the existing process accommodates poorly. An environmental-credit authority can sign a carbon-sequestration surface that travels and migrates with the material as a credentialed attestation, so a sustainability or embodied-carbon requirement in a code or procurement specification is evaluated against signed evidence on the same footing as a structural rating. An independent testing authority's results are bound as scoped attestations rather than transcribed into a manufacturer's literature. And for the multi-function material class the home disclosure introduces, where a single element may carry structural, thermal, fire, distribution, and storage surfaces at once, this is the only coherent way to present such a part for approval: a single composite profile that each relevant authority evaluates against its own surface, composed under shared rules, rather than a part that no single existing listing category describes.

Boundary Conditions

Several honest limits apply. First, U.S. Provisional Application No. 64/050,895 is an early-stage architectural disclosure. It describes a credentialing and admissibility-profile architecture; it does not assert that any product has been built, listed, certified, tested to a standard, or approved by any authority, and it asserts no specific

performance figure for any material. Treat every property value discussed here as an authority-attested declaration carried in a profile, never as a validated or benchmarked result.

Second, the underlying material behaviors are prior art. Structural cementitious composites, thermal mass, fire performance, vapor transport, carbon mineralization, and electrochemical storage on carbon are established science, and the carbonaceous and electrochemical details the disclosure references are pre-existing material chemistry. Nothing here claims a new material, a new bond, a new phase, or a basic-science breakthrough. The novelty lies in the credentialing and admissibility-profile architecture, the multi-authority signed surfaces, the signed and versioned composition rules, the lineage chain, and the resulting category of policy-evaluable compliance evidence bound to physical building products.

Third, the regulatory framing in this article is external context. Real building, electrical, and fire codes, the authority-having-jurisdiction structure, listing and labeling practice, and the named standards (NFPA 70 Articles 725 and 680 are referenced in the disclosure itself) are facts about the domain, not claims of the application. Whether and how any jurisdiction adopts machine-evaluable admissibility profiles into its code-adoption and product-approval process is a matter of policy and standards development beyond the scope of the filing. The application specifies an enabling architecture for that adoption; it does not assert that adoption has occurred.

Disclosure Scope

This article describes a domain application of the Credentialed Surfaces invention disclosed in U.S. Provisional Application No. 64/050,895, which specifies credentialed admissibility profiles composed of independently signed property surfaces, multi-authority credentialing, signed and versioned composition rules held in a composition-rule registry, a lineage chain of credentialed lifecycle events, and identity-binding consistent with the referenced Identity and Spatial Mesh applications. The building-

product compliance, code-approval, inspection, and authority-having-jurisdiction framing, together with references to real building, electrical, and fire codes and standards, is provided as external domain context to show an enabling implementation of the disclosed technology; it is not a patent claim, not legal or regulatory advice, and not a representation that any product, listing, certification, or jurisdictional approval exists. All material property values are authority-attested declarations within a credentialed profile, not validated performance claims.

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)

Credentialed Surfaces overview → (/credentialed-materials)