Online exclusive

Conundrums in Stucco Codes and Standards

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ESSENTIALS OF THE BUILDING CODE: 2021 IBC

For this paper, references to the building code refer to the *2021 International Building Code*[1] (IBC), the model building code generally adopted and enforced in many states in the US. The building code both broadly and specifically establishes the minimum requirements for providing a reasonable level of safety, health, and general welfare for building construction. It requires a reasonable level of life safety and property protection from hazards such as fire, by providing a reasonable level of safety to fire fighters and emergency responders during emergency operations.[2] Building codes rely on the expertise of industry professionals expressed in code-adopted reference standards which are developed by specialized industry professionals through consensus organizations such as ASTM, ANSI, and NFPA.

Reference standards for stucco are developed following the consensus process, by industry stakeholders consisting mostly of product and material manufacturers, designers, and stucco trade partners. The benefits of building code—adopted reference standards to the construction industry are vast. They include improvements to economic, training and expertise, material and product uniformity, inspection, and craftsmanship. In other words, reference standards benefit construction quality, establish the minimum expectations of building construction stakeholders, and support the purpose of the building code as previously described.

The IBC is the generic model code promulgated by the International Code Council which is largely adopted and enforced by most local building construction regulatory jurisdictions in the US and currently reaches into a few international jurisdictions such as for Abu Dhabi, United Arab Emirates. Where adopted, the IBC is often locally revised to best accommodate local conditions for local enforcement. The building construction community including building code officials, designers, stucco trade partners, and manufacturers are required by various laws and regulations to comply with building code minimum requirements, which are law.

Regarding our topic of conundrums in stucco codes and standards, it needs to be clearly stated and understood that not all stucco is the same. Stucco exterior-wall cladding is an assembly of many different materials and products installed and applied in different ways to achieve the intended quality and performance which varies as specified, from project to project. The IBC in Chapter 25[3] describes several specific stucco cladding requirements such as for approved substrates including gypsum sheathing over framing and cementitious "solid" bases. Over framed substrates a water-resistive barrier is required under lath and cement plaster to function as a drainage plane, whereas cement plaster direct applied to solid bases function as barrier walls due to their mass and ability to accommodate a minimum amount of water penetration. The IBC describes additional specific requirements such as for weep screeds at the drainage plane, and the most recent requirements for drainage layers under cement plaster in wetter climates and for continuous insulation under certain stucco claddings.

As required in the IBC, stucco claddings for building exteriors are required to be 1) portland cement-based plaster (not lime-based or any other type of plaster), and 2) that cement plaster be applied over an approved, mechanically fastened lath or directly bonded to approved cementitious solid bases. Most significantly, the IBC requires that portland cement-based plaster for building exteriors comply with the prescriptive requirements of ASTM reference standards: C926 for Plastering Application,

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C1063 for Lathing Installation, and C1861 for Lathing Accessories, and additionally the specified lathing and product standards and material standards such as for C150 portland cement. The IBC-adopted ASTM reference standards describe the minimum requirements for stucco cladding as individual components and of the completed, functional assembly.

As with stucco, architectural building designs and construction projects are not always the same, and designers and stucco trade partners occasionally seek more than the prescriptive solutions in the IBC and reference standards to comply with the building code requirements. The local building official is ultimately responsible for local building code enforcement. Approval from building officials for using atypical materials, products, and stucco cladding systems typically follows the routine requirements, a review and approval process similar, if not identical, to that required by the IBC 104.11[4] for Alternatives. This process is routine for using certain proprietary materials and systems with a code evaluation report and known by the building official and design professionals, but sometimes stucco trade partners are not aware of the requirements or approval process for Alternatives. Receiving approval for Alternatives requires building official evaluation of the proposed Alternative for quality, strength, effectiveness, fire resistance, durability, and safety. The evaluation is based on the approval of research reports from approved sources and testing by approved agencies.

ESSENTIALS OF THE ASTM STUCCO STANDARDS—C926, C1063, C1861

Where the IBC text states a limited number of actual technical requirements for stucco claddings, it most significantly adopts by reference and requires building official enforcement of the minimum requirements contained in the adopted reference standards for stucco claddings which are much more comprehensive. The primary reference standards for stucco are ASTM 926[5] and C1063,[6] and the IBC building code adoption requirements for reference standards are detailed in *ICC Reference Standards Guide*[7] and ICC Council Policy document *CP #28-05 Code Development (CP28)*.[8] Among the basic and essential requirements for the IBC building code codified reference standards to be enforceable, the requirements of reference standards must be 1) stated in mandatory language (to establish enforceability), and 2) shall not state that its provisions govern whenever the referenced standard is in conflict with the requirements of the referencing code (to establish a hierarchy of authority).

Each of these codified reference standards includes by internal reference, the requirements of second-tier reference standards such as ASTM C847, C933, and C1032 for lathing products, and C1861 for lathing accessories and fasteners.[9] Second-tier reference standards are equally codified minimum building code requirements and are enforceable by building officials.

ASTM coordinates the development of industry reference standards categorized as Classification, Guide, Practice, Specification, Terminology, and Test Method. Note that the primary ASTM stucco standards are Specifications. ASTM Specification standards are developed following ASTM requirements described in the document *Form and Style of ASTM Standards (Form and Style)*.[10] *Form and Style* requires that Specifications be "an explicit set of requirements to be satisfied by a material, product, system, or service." Enforceable, codified requirements are stated in explicit, mandatory language, not vague, ambiguous language which is subject to multiple interpretations. Mandatory language requirements use the term "shall" and not "should" or "may." All terms shall be defined when they deviate from an ordinary accepted meaning or a dictionary definition.

ASTM reference standard Specifications for stucco claddings follow a consistent organization for ease of use: Scope, Referenced Documents, Terminology, Delivery and Storage of Materials, Materials, Substrate Requirements, Installation (or Application) Requirements, Keywords, and optionally an Annex and Appendix.

An interesting aspect of ASTM stucco standards, as Specifications, is a conundrum which is frequently misunderstood in their scope, which is stated in Section 1.1 of each standard. For example, this is from ASTM C1063, but other stucco Specifications are similar:

> 1.1 This specification covers the minimum technical requirements for lathing and furring for the application of exterior and interior portland cement-based plaster, as in Specifications C841 or C926. These requirements do not by default define a unit of work or assign responsibility for contractual purposes, which is the purview of a contract or contracts made between contracting entities.

The scope of the ASTM stucco Specification describes the requirements for stucco cladding as a system. The scope is not solely a scope of work defining the work required of a specific craftsperson unless the general contractor designates and coordinates the work of all of the stucco Specification requirements to a specific trade partner. For example, ASTM stucco Specifications include requirements for gapping wood-based sheathing panel edges as substrates for stucco, which is more appropriately designated to the carpentry trade which installs the panels. Likewise, requirements for framing member deflections are an engineering design responsibility. The sealant application requirements specified in C926 may best be performed by a sealant trade partner. Other conundrums as far as assigning contractual responsibilities include requirements such as wood-based framing installation tolerances, substrate moisture content verification, and trade coordination for utilities and flashings. These requirements specified in ASTM stucco standards are for the general contractor in charge of coordinating and allocating the work amongst various trade partners to define, determine, and coordinate. Even ASTM stucco standards whose titles begin with "Installation of" or "Application of" are much more than merely construction how-to requirements for sole use by craftspeople. ASTM stucco standards state requirements for materials and products by manufacturers, for stucco designers, which are relied upon by inspectors, which collectively determine the requirements and expectations for quality.

Content in the ASTM stucco standards Annex and Appendix sections has proven to be problematic in the industry due to the use of conflicting terminology that causes misinterpretations and misapplications. Fundamentally, ASTM requires that Annex information be stated in mandatory language and contain mandatory, enforceable requirements. *Form and Style* requires Annexes to be subtitled Mandatory Information and defines Annex information as "any detailed information such as that an apparatus or material that is a mandatory part of the specification; but too lengthy for inclusion in the main text." Further, *CP28* states that "mandatory language is applicable to the standard or the portion of a standard that is intended to be enforced."

To illustrate a few conundrums, please review the ASTM C926 Annex, subtitled Mandatory Information. Conflict and disagreements arise around the use of the sections titled "Information" (not "Requirements") and "A2. Design Considerations" (again, not "Requirements"). Consider that these titles are mere section titles and not technical content. ASTM C926 Annex technical content includes

requirements for conditions such as the fire resistance of cement-plastered assemblies; substrate requirements for solid bases to receive cement plaster; slope requirements to prevent water, snow, or ice from accumulating; coordination of flashings; the sealing of cement-plaster panel edges to prevent the entry of water; drainage provisions behind cement plaster; requirements for ornamental features; and much more. Clearly, the technical content stated in mandatory language of the conditions addressed in C926 are enforceable requirements in spite of their unfortunate section titles. Be assured that ASTM committee C11 overseeing ASTM stucco standards is in the process of rectifying these conundrums to state requirements in clear, unambiguous, explicit language, including their titles.

In contrast, ASTM C926 Appendix information is stated in non-mandatory language. Its information is not enforceable. *Form and Style* requires Appendix information to be subtitled "Nonmandatory Information," to which the ASTM C926 Appendix conforms. *CP28* further clarifies that information in the Appendix are not enforceable requirements as long as they are not stated in mandatory language and "clearly and conspicuously identified as not being a mandatory part of the standard." The ASTM C926 Appendix includes technical content such as optional finish-coat texture descriptions, optional fiber additive information, and guidance for critical lighting evaluation, which are informational but are not enforceable requirements.

Other conflicts and division within the stucco industry are not yet addressed by the building code or its reference standards. Examples of some of these issues are driven by differences in climate, regional practice, installer preference, or to some extent an interest in minimizing costs. Examples include requirements for minimum redundancies such as sealant around windows/ doors to "prevent the entry of water." Stucco cladding by itself is not waterproof, as explicitly stated in ASTM C926 Annex A2.1.1, as some amount of bulk water gets through stucco cracks and around stucco panel edges at joints and openings, such as windows, doors, and penetrations.

The reality for stucco claddings is that in all climates, including arid climates, where stucco cladding is used, wind-driven rain occurs if not frequently, then at least sporadically. The minimum requirements for a vapor-permeable water-resistive barrier behind stucco, a dry-lapped membrane with countless lath fastener penetrations remains the minimum requirement for stucco claddings intended to protect water-sensitive substrates and assemblies. Preventing bulk water from penetrating around the exposed ends and edges of cement-plaster panels of stucco cladding with sealant joints as required in ASTM C926 Annex A2.1.3 is a mandatory requirement too often overlooked, as it benefits the water management function of the stucco-clad drainage plane. Arguments to omit sealant "to prevent the entry of water" in dry climates are ill-founded—as proof, consider recent weather extremes throughout the US, including in arid climates. Death, taxes, and wind-driven rain are unavoidable wherever one may reside.

Inexplicitly worded text in ASTM C926 continues to cause industry conflict. Challenges to achieving consensus include a host of reasons such as differences in regional preferences and practices, climatic variations, fear of litigation, and other influences. ASTM Committee C11, responsible for developing ASTM stucco standards, conforms to a rigorous process to achieve consensus in the development of stucco industry standards that are codified in our building code. The following are some example passages that Committee C11 continues to attempt to resolve:

ASTM C926 at 7.3.4: "Separation shall be provided where plaster abuts dissimilar construction materials or openings." The definition of "dissimilar construction materials" is subject to various interpretations. Is a casing bead a dissimilar material to the plaster, or is it part of the plaster assembly?

ASTM C926 at A1.5.2: "Lathing accessories shall be installed prior to the application of plaster; therefore, their type, location, ground dimension, and orientation shall be included in the contract documents." What does "orientation" mean? Some think of orientation in terms of vertical and horizontal, while others consider orientation to be the layering of a construction assembly.

ASTM C926 at A2.1.1: "Sufficient slope on faces of plastered surfaces shall be provided to prevent water, snow, or ice from accumulating or standing." What is sufficient slope? For sheet metal, it could be as little as simple positive slope. For an articulated textured cement-plaster surface, a steeper slope is needed, but how much steeper? For example, proprietary acrylic-finish coatings require a 6:12 minimum pitch.

ASTM C1063 at 7.10.1.5: "Lath shall not be continuous through control joints, but shall be stopped and tied at each side." This oft-quoted requirement is probably the most ignored and unenforced requirement in the stucco industry, and yet control joints with discontinuous lath, where effectively used, are known to reduce stucco cracking by 50%.[11,12] The text is inadequate by not explicitly stating all requirements for installing control-joint lathing accessories where the edges of discontinuous lath must be fastened to framing members to prevent cement-plaster panel- edge curling—the framing and attachment is rarely detailed.

ASTM C1063 at 7.11.7: "*Casing Bead*—Install a casing bead lathing accessory or other suitable means, at locations to separate cement plaster from dissimilar materials, penetrating elements, load bearing members and to avoid transfer of structural loads." Exactly what does "other suitable means" describe? Some opine that separation refers to the cement plaster shrinking away from windows and doors creating the separation, but that narrow gap allows bulk water entry behind the hardened stucco cladding, and the gap is too narrow to be effectively sealed against the "entry of water" as required elsewhere in ASTM C926.

Another point—when the requirements of the building code and ASTM reference standards conflict, which governs? This is an easy one, and it is very clear. The IBC building code states at 102.4.1: "Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply."

ASTM C926—THE EOS CLAUSES

As previously established, ASTM C926 and C1063 are the specifications prescribed by the code for the installation of cement-based plaster. According to the code, C926 and C1063 establish the **minimum** requirements.

While ASTM C1063 generally addresses specifications for the installation of lathing and furring to receive cement-based plaster, and ASTM C926 generally addresses specifications for the application of cement-based plaster, ASTM C926 does include some specifications regarding the installation of lathing accessories and fasteners, including:

- 6.1 Metal plaster bases, lathing accessories, furring accessories and fasteners used to receive plaster shall be installed in conformance with Specification C1063, ***except as otherwise specified***.
- A1.5.1 Metal plaster bases, backing, attachment, and lathing accessories to receive plaster shall be examined to determine if the applicable requirements of Specification C1063 have been met ***unless otherwise required by the contract specifications***.

Additionally, ASTM C1063 includes the following:

- 7.10.1.3 Lath shall be installed with the long dimension at right angles to the framing members, ***unless otherwise specified***.

It should be noted that the term "specifier" is also used within ASTM C926, but it is not explicitly defined within the standard.

The phrase "except as otherwise specified" and similar wording within ASTM C926 and C1063 have been misinterpreted and misapplied by some who are specifying conditions that do not comply with C1063.

One part of their argument is that the "specifier," in their view, has the right to provide alternative installation materials or methods as they see fit, without the review and approval of the building official or the authority having jurisdiction (AHJ).

Another part of their argument includes the opinion that ASTM C926 and C1063 are "application standards," not "design standards," and thus the "except as otherwise specified" clauses were added to allow the "specifier" to make those substitutions.

This statement is simply not true, as ASTM C926 includes a "Mandatory" section titled "Design Considerations," which includes requirements for the designer.

An additional factor in their argument is the opinion that different regions and climates require different installation methods, which they say are not factored into the "international" codes and standards, and therefore they must be specified on a case-by-case basis.

Some of the "alternative methods" we have seen specified and/or installed include but are not limited to:

- Omission of control joints
- Excessive distance/area between control joints
- Omission of casing beads and/ or sealant at windows, doors, and other wall openings
- Installation of window frames with integral stucco keys without perimeter sealant
- Omission of sealant at lathing accessory joint splices/ intersections/transitions
- Installation of weep/drip screeds over the water-resistive barrier (not lapping the water-resistive barrier over the weep screed attachment flange)
- Omission of weep/drip screeds where horizontal and vertical surfaces intersect
- Omission of foundation weep screeds when wood-framed construction is over solid-base construction
- Installation of lath continuous through control joints
- Metal lath not installed backing on backing and metal on metal
- Fastening down of lath laps between framing members rather than wire-tying
- Installation of "face barrier" systems where control joints and weep/drip screeds are eliminated altogether

This misinterpretation or misapplication of the "except as otherwise specified" clauses has caused or contributed to property damage, such as water intrusion, structural wood framing member decay, microbial growth, etc., in some cases creating dangerous or unsafe conditions.

"EXCEPT AS OTHERWISE SPECIFIED" VS. THE CODE

The code makes the following clear:

- Any alternative material, design, or method of construction shall comply with the intent of the provisions of the code.
- The material, method, or work offered shall be not less than the equivalent of that prescribed in the code in quality, strength, effectiveness, fire resistance, durability, and safety.
- Any alternative material, design, or method of construction needs to be approved by the building official or the AHJ.

This has been further affirmed by the Building Officials Association of Florida (BOAF) Informal Interpretation Report No. 8088,[13] in which the following question is posed: "Does the 'unless otherwise specified' in C926 and C1063 allow a designer to specify something in their plans that is less than the equivalent of that prescriptively prescribed in the code or code-referenced standards in quality, strength, effectiveness, fire resistance, durability and safety?"

The BOAF's response: "No, an alternate method or material **must be approved by the building official** and must be **equal to or better** than specified in the code or standard" (emphasis added).

The phrase "except as otherwise specified" in ASTM C926 has been problematic from a code-enforcement perspective, in that it is vague and ambiguous and does not include explicit language.

In fact, this ambiguity is in violation of *CP28*. The ICC Reference Standards Guide, which provides guidance with regard to *CP28*, states:

> "A standard or portions of a standard intended to be enforced shall be written in **mandatory** language … The standard must be presented so that the **application and the intent are clear** to all readers. The use of recommendations, advisory comments, and permissive, non-mandatory terms fails to provide sufficient, specifically enforceable direction to all users. **A potential result is non-uniform interpretation or misapplication of the requirements**" (emphasis added).

Criteria for the "specifier" are not provided in the ASTM C926 and ASTM C1063 standards. Nothing stops any party in the design or construction process from declaring himself or herself a "specifier" and providing specifications or installation which is not in accordance with the ASTM standards. This ambiguity has allowed for those with a potential conflict of interest to design or construct a project in a manner that suits their interests more than those of the eventual building owner.

We have also seen the "except as otherwise specified" clauses employed as an excuse when the designer or builder gets caught not following the ASTM standards.

The code states: "102.5 Partial invalidity. In the event that any part or provision of this code is held to be illegal or void, this shall not have the effect of making void or illegal any of the other parts or provisions."[14]

The building official or AHJ should consider that the "except as otherwise specified" clauses satisfy the requirements of this "partial invalidity" code section, but they shall not have the effect of making void or illegal any of the other parts or provisions of the code or reference standards, including ASTM C926, C1063, or lower-tier standards they reference.

At the very least, the "specifier" does not have the authority to specify anything other than full compliance with the code or to override the building official's or AHJ's authority and duty to enforce the code requirements, including those in ASTM C926 and C1063.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

As long as the "except as otherwise specified" clauses exist in ASTM C926 and C1063, there will be misinterpretation and misapplication of the standards.

To combat this, industry professionals and building officials or AHJs need to become informed and make some changes in their approach.

Building officials and AHJs should strive towards thoroughly understanding and enforcing the code for stucco cladding.

Design professionals should strive towards creating complete, consistent, and clear construction documents for the project. They should either become familiar with stucco cladding and its components or they should retain a specialist advisor who can advise them in their design of the stucco cladding and its components. Additionally, design professionals

Figure 1. *Example of damage resulting, at least in part, from fasteners installed between framing members , violating ASTM C1063 7.9.1, 7.10.2.2.*

Figure 3. *Example of damage resulting, at least in part, from the fastening down of the control joint accessory, violating ASTM C1063 7.10.1.5.*

Figure 5. *Example of damage resulting, at least in part, from improper separation between window and stucco, violating ASTM C1063 7.11.7 and ASTM C926 7.3.4, A2.1.2, A2.1.3.*

Figure 2. *Example of damage resulting, at least in part, from lath not installed backing on backing and metal on metal , violating ASTM C1063 7.9.3.*

Figure 4. *Example of damage resulting, at least in part, from improper separation between window and stucco, violating ASTM C1063 7.11.7 and ASTM C926 7.3.4, A2.1.2, A2.1.3.*

Figure 6. *Example of damage resulting, at least in part, from a missing weep accessory at the horizontal-to-vertical intersection, violating ASTM C926 A2.2.2.*

shall obtain approval from the building official or AHJ for any alternative materials or methods they intend to use in their design.

Stucco contractors should strive toward understanding the codes and referenced standards, while recognizing that they are only **minimum** requirements. They should work closely with design professionals and code enforcement to benefit the project.

If construction documents are not clear, stucco installers should require clarity from the designer.

Ultimately, any alternative material, design, or method of construction shall be equal to or better than specified in the code or standards, and it shall specifically be reviewed and approved by the building official or AHJ.

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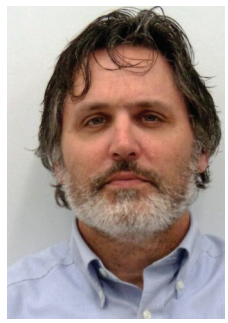

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