THE STUCCO INSTITUTE NEWS LETTER

Stucco Information by and for Stucco Applicators
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Successful Stucco and Lath Application over Structural Panel Sheathed Residential Construction

Drain Plane vs Face Barrier Systems

Historic and Current Code Requirements

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Code Climate Zones 1 and 2 Regions

Introduction and Overview

Successful application of Florida stucco cladding (rigid wall covering) installed over wood framed residential construction has been done successfully since the inception of stucco itself. Historically, the application process was systematically taught to the tradesmen—then methodically applied to countless numbers of homes over many decades, while still performing without any mentionable faults or failures. That success, however, was (and is) interdependent upon other tradesmen performing their work accurately and professionally—it is a systemic process.

I have personally been involved with thousands of such applications for over 40 years and know of thousands more performed by others decades before I was taught how to plaster and stucco. These systems are still in service today, and are still being quietly applied by knowledgeable stucco tradesmen without any of the mentionable problems found on substandard systems, such as; excessive cracking, blow outs, wall leakage, and rotting.

So what the "Sam Hill" is going on with all of these "newer" stucco applications that are reportedly failing?

Well, the current situation is a mix of half truths, legal abuse, incompetent/ incomplete professional evaluations, untrained applicators, untrained building superintendents, unmodified application processes, fenestration problems, deficient coatings and sealants, and lack of maintenance. As I said, it is a systemic process, and failures are oftentimes systemic in sources. All of this can seem very complex—but really it's not. There are two important articles posted at www.stuccoinstitute.com entitled: "The Truth about Florida Stucco" and "Moisture Effects Behind Florida's Walls" along with other articles that provide a more 'in-depth' discussion. We will condense and summarize these issues and try to avoid a lot of technical jargon—simplifying some aspects in order to maintain focus on primary concepts.

First, let's review a little basic building code information. The building code requires that frame wall construction / sheathing be protected from the ele-

ments.

If the final covering is wood siding, wood shakes, cement “lap” siding, textured plywood (T-111), etc., this is accomplished by simply painting the wood or product and sealing (caulking) around penetrations. If your painting or sealants are inadequate, rot begins, and appears, on any wood surface letting the owner know it is in need of immediate repair. Rot is not so evident with cement board (or stucco) that won’t decay. Water damage is frequently hidden behind the assembly showing no signs of decay on the surface.

If stucco is the rigid wall covering or “cladding” to be used, we need to protect the wood wall and its sub-framing components from moisture since stucco is **NOT** a waterproof covering by-and-of itself and usually (globally) **NOT** painted or coated.

Remember the cement used to make the stucco is available in both gray or white color base, allowing powered dyes to be added, creating the ability to mix a colored finish in any hue desired. This yields a maintenance free (no painting required) finish that is very desirable to homeowners. Globally, this is the most common installation methodology. Also, since the finish is not painted, it is universally understood NOT to be considered “waterproof” as a system for several reasons not expanded upon in this article.

So, back to protection of the wood wall and its sub-components when stucco cladding is applied.

Two different methodologies are commonly used to accomplish this goal:

Method 1 - Drain Plane System

Purpose: Protect the framing by applying a “Weather Resistant Barrier” (WRB), such as felt, housewrap, or other product over the face of the studs or sheathing prior to the application of the metal lath and stucco.

In addition to serving as a “drain plane”, this layer protects the frame wall from the elements until the stucco contractor can begin the stucco installation, and it reduces moisture loss during the initial hydration process (curing of the wet stucco) especially when coupled with the required

"densification" process (wet floating the curing cement base).

After the stucco cures, the sole purpose of this protective barrier is to serve as a "drain plane" for any incidental water that enters through the cracks in stucco, around penetrations, or for any vapor that might condense behind the stucco cladding. Any such moisture will migrate down the face of the drain plane and "weep" out at the bottom of the wall, by way of a pre-installed accessory called a "weep screed".

This method is a non-alterable requirement when using colored stucco as a finish since there is no paint or other waterproofing material applied to the face of the stucco to prevent water infiltration. In other words, the drain plane must "manage" any incidental water entering the system. But remember, this is a "weep" screed - not a "drain" screed. The quantity of water is intended to be extremely minor and infrequent.

This colored "finish coat" methodology is the basis for the ASTM C926 and C1063 Standards. Globally, it is the most common application method since most residential framing is "open framing" or framing covered with "solid sheathing". It is CRITICAL that the reader understand that sheathing referenced in the ASTM C926 and C1063 means NON-STRUCTURAL sheathing such as: styrofoam, asphalt impregnated fiberboard, homosote, thermaply, etc... In other words, it simply means "backing" to a stucco applicator.

So, to recap this important point, remember, in the ASTM C926 and C1063 standards, "sheathing" means any kind of rigid or semi-rigid backing over open studs. It does NOT mean structural panels like we use here in Zones 1 and 2.
True, structural panels will serve as solid sheathing backing - but solid sheathing backing will NOT serve as a structural panels. The gate does not swing both ways. Accordingly, the use of structural panels, entirely covering the exterior wall, oftentimes resisting both shear and uplift, is a two edged sword - it provides new opportunities for stucco applications but pos-

es additional challenges to our stucco methodologies. Hence, our historic and necessary modifications.

Method 2 - Face Barrier System

Purpose: Protect the framing by preventing any water or excessive vapor from passing through the stucco cladding.

The system starts with the same Weather Resistant Barrier (WRB) since the wall must still be protected until the stucco contractor arrives, and is still needed to aide in even hydration by reducing water loss during the curing and densification processes.

It is at this point, however, that the methodology changes purpose. Using the face barrier system, first, all penetrations must be properly prepared (usually “V” grooved), then face sealed with a quality sealant (tooled in place with sealant spatulas). Finally, the coating (high grade exterior waterproofing paint, i.e., DRYLOK Extreme) must be installed to its final mil (thickness) requirement (usually 12 mils minimum).

When installed using these appropriate methodologies, this coating and sealant covering system will not only prevent the passage of bulk water, it will bar the passage of water vapor, while its elastomeric properties will bridge anticipated cracking and movement of the stucco assemblage caused by substructure or hydration stresses.

This method is used almost exclusively in climatic regions with high annual rainfall or high annual humidity (such as climate zones 1 and 2). Its purpose is to prevent bulk water infiltration and inhibit the passage (and accumulation) of humidity behind the stucco assembly. When night sky radiant heat loss or other cooling factors create condensing temperatures behind the stucco façade, there will be little or no reservoirs of saturated vapor to condense on the lath laps or window sub-frames.

The ASTM C926 and C1063 standards referenced by our code for stucco and lath respectively, were adopted from the international codes, originally developed for open framing application, designed to

use no backing (or non-structural backing), with a colored finish coat, and applied in arid regions with a low wind velocities. Since this methodology represents the majority of global applications, it works for most regions. Accordingly, the standards do not factor regionally modified systems, or any other types, of acceptable modified stucco installation methodologies.

Where conditions, systems, climatic adjustments or components need alteration (such as fastener spacing, face barriers, exposure protections, etc...), applicators, specifiers, and designers need to evaluate the standards and, if necessary, modify their installation techniques using the "unless otherwise specified" provision built into the standards to accommodate necessary changes due to climatic or component differences.

Historic Changes - Zones 1 and 2

Given zone 1 and 2's climate, and proceeding with the understanding of a face barrier system, historic methodology of installing a stucco system over solid wood structural sheathing developed (and used) the face barrier concept. This was long before any of these systems had a name.

This face barrier system is considerably different in concept, purpose and installation methodology than the recently applied (and failing) process of the drain-plane concept - although both are fully code compliant either through prescriptive text or through allowable changes to the prescriptive text using the "unless otherwise specified" provision.

"Old School" Installation - Methodology for our Southern Climate:

These are the installation methodologies, materials, concepts, circumstances and sequence taught by our regional forefathers for our plastering profession that worked. Historically:

1. We installed metal lath over solid planking or structural plywood panels. *(Note: OSB was in its infancy and although a structural panel, it has significant different moisture management properties, i.e., it resists the passage of vapor and does not substantially pass more moisture vapor as its moisture*

exposure increases. Simply put, it does not promote self-drying by allowing additional quantities of moisture vapor to pass through it as its mass absorbs more water volume. Additionally, its dimensions change as it absorbs water and most importantly, this change is largely in its thickness rather than breadth. This by-and-of-itself, is not a sole cause, but is a significant contributor to failure when using a drain plane system. See other articles regarding Moisture Effects Behind Stucco Walls)

2. We installed metal lath over a weather resistant barrier (just as today). However, the nailing pattern and installation concept was significantly different. The lath was nailed vertically and horizontally using an ≈ 8" on-center nailing pattern - each vertical row staggered 8" from the row in the sheet below it. This yeilds an ≈ 4 fasteners per f^2.

   Note: We were taught that this was necessary for wind withdrawal, and to lock the assembly to the substrate for additional strength, i.e., to affix the lath/ stucco assembly and the structural panel / framing so they become monolithic and acted in concert. The sheathing resisting contraction (shrinkage) during hydration and the stucco / metal lath resisting expansion after hydration cure Never have we seen this information tested, but the walls did not crack to any significant degree using this method.

3. We were taught to keep the system flat to the wall to avoid any creation of pockets or voids which could allow moisture or vapor (either of which could contain salts) from collecting behind the lath / plaster assembly.

4. We pushed the wet cement (as we applied the wet stucco) through the wire lath using an "up-down-up" motion of our trowel. We were taught that this was one of the most important steps.

   We were taught to watch (and ensure) that the force of our hand trowel caused the wet stucco to fully embed the lath and cause a slight "bulge" or "ripple" in the previously applied trowel full. The goal was to eliminate any and all voids or spaces behind the lath.

Those voids or spaces would be places for moisture or vapor to collect - which was to be avoided at all costs . If any voids were left or created, rusting of the lath and delamination of the stucco plane would be imminent within a few years *(remember we were using ungalvanized, un-furred, asphalt coated diamond lath at that time. And those installations are still there performing!).*

Note: Within the last 15 years or so, this application changed (for economy) from the hand "hawk-and-trowel" method to the use of "slickers", which are 36" long x ≈5" wide metal strips made to "level" plaster after hand application.

Using slickers, the stucco can be rapidly applied, but the required hand pressure is lost and the stucco application becomes light and honeycombed. It will attain its requisite strength, but will not resist the passage of water or vapor as a hand-applied application would and laps are frequently inadequately embedded. (See videos at www.stuccoinstitute.com—under the Education tab.)

5. We then were taught to "densify" the second application coat. This is "wet" floating of the stucco when hydration is just beginning. The purpose was not to provide a "sand" or "rubbed" finish whatsoever - it was to replenish the body of cement plaster with water thereby allowing a slower, more uniform hydration "cure" and to densify the body even further.

   Newer (and failing) systems omit this step. Instead they "steel trowel" (after application with slickers) the surface flat, preparing it for the application of the finish texture. Using a hand trowel over plaster applied with a slicker will cause major micro-fracturing within the now fragile (and hydrating) mass. It does nothing to aid densification, and does nothing to recharge or temper the hydrating process.

6. We used a "V" cutter and "brushed" the trough created in order to aide the sealant application at every major penetration (vents, windows, door jambs etc...). Today, they apply "beauty beads" of caulk for painting purposes. This, of course, is oftentimes insuffi-

cient for waterproofing serving as a face barrier system.

7. We eliminated all unnecessary accessories like corner beads and control joints. All corners, beads returns, etc.. were manually rodded for corner strength and water direction slope. Control joints were eliminated since they do NOT control cracking in common residential construction, and they are a frequent source of water and humidity entry; not-to-mention their primary purpose was for panelizing colored (non-painted) stucco applications.
8. We “Coated” and “Sealed” the exterior - we did NOT “Paint and Caulk”. The exterior coating (quality exterior paint) was applied by using a heavy nap roller and the coating was applied to the correct mil (thousandths of an inch) thickness - ≈ 14 mils. Brushes were used to trim and prime the “V” troughs and sealants were applied and “tooled” with a sealant spatula.

Voila! A system that doesn’t crack (minor cracks may occur, but they are bridged by the elastomeric properties of the coating).

The system is water and largely air tight. It resists the passage of bulk water and water vapor. Without behind the wall reservoirs of salt laden humid air, the condensing temperature attained by night sky radiant heat loss is more difficult to achieve, (since the stucco body and wall panel are not separated by an air barrier) and once attained, that temperature will not promulgate condensation since the volume of vapor is miniscule.

What Changed and Why

Newer consultants (circa 2000 forward), operating out of their field of expertise, began to blindly apply the ASTM C926 (stucco) and C1063 (lath) standards “as-written”. Wrongly assuming that these provisions are fully applicable to Florida residential applications.

They failed to factor the great importance of key provisions in those referenced documents: the provisions that say “unless otherwise specified”. Those provisions have been in both the standards since their beginning.

These “unless otherwise specified” provi-

sions allow (and allowed) the regional trained plasterers and knowledgeable specifiers / professionals the ability to modify the standards to fit their regional climate conditions and the unique conditions of each and every job itself. This was (and is) necessary to build systems that work globally.

The “un-educated” professionals further failed to understand that the western developed standards (and their provisions) were prepared for applications over “open” framing, or framing covered in non-structural sheathing such as foam board or fiberboard. Furthermore, they failed to factor the fact that the standard was developed for the use of colored stucco.

Today, these self-professed experts, many of whom have never been a plasterer or a plastering contractor, continue to claim “blind allegiance” to the standard, yet allow: application by “slicker”, fail to require densification of the stucco, deliberately create drainage spaces, add unnecessary accessories and most importantly, allow paint applied by “airless” sprayers to be applied at thicknesses of 3 to 5 mils in lieu of the 12 mil required.

They fail to require “V” troughs to separate dissimilar materials, allow beauty beads in lieu of sealants (since there are no “V” troughs to seal), allow cornerbeads that admit both bulk and vapor moisture behind the systems (unless carefully specifically bedded), specify control joints doing the same, and require “weep-screeds” purposed to “weep” water out of the system - then require them to be covered over with paint making them worthless as a “weep”.

Special detailing and tooling is necessary to accommodate a drain plane and face barrier interface at a weeps or other such termination points. Unless otherwise carefully detailed and performed, their use is relegated to use as a screed and/or a transition from frame to block interfaces.

Commodity window frames are a common source of water behind the stucco and the weather resistant barrier. Failure to remediate the corner frame seals will most likely allow water behind both components.

Recently a contractor tested new window

corner seals from supplier delivered window assemblies. The “out-of-the-box” leakage rate was very significant at the lower corners. We cannot overlook this important step (further details online).

For these reasons and more, the stucco systems are failing. Even recently de-skinned (torn-off) systems replaced with new supposedly “compliant” ones are beginning to fail (other systems such as cement board lap siding is suffering the same fate for similar and other reasons).

Designing a Workable System

Either design it using all information and changes necessary for Florida’s unique environment or follow the protocol for the Sealed Stucco System at the Stucco Institute.

This is not a “new” system. It is the “old” tried and true stucco methodology that was described herein and has been installed for a century or more. But some building professionals are not familiar with it, and some building officials are unclear about the “unless otherwise specified” provisions of the referenced standards, (if specified otherwise, then the change **IS** code compliant by the text of the standard).

So to eliminate any confusion and eliminate any argument, we tested the age old, code accepted systems according to the new code specified testing methodology: the ASTM E330, ASTM E331 and ASTM E72.

With these certified approvals, this system can be installed the “Old-School” way, and if applied according to the required protocols, it will perform without fault or flaw. (www.sealedcladdingsystems.com)

Conclusion

It never fails to amaze people when they see this “old” installation methodology and the final product; They ask; How can a 45 ft. long x 10 ft. high wall not crack without control joints? How can these corners be so perfect and solid without beads? How can this system work without open weep screeds? How can that gable function without horizontal joints? Why is this not cracking after 3 years and two hurricanes? How is this all possible on all of

these houses?

I think my Uncle (a mighty-fine old-school plasterer who taught me) would look at them with a confused stare and say: “How is it not possible? It will always perform this way if you install it correctly!”

So it’s true, the stucco profession is more of an art than a science.

Owners MUST be told of their responsibilities for exterior maintenance and informed of the consequences if they do NOT maintain the exterior. If initial application was a hybrid drain plane / painted (with airless to 4-5 mils) surface and penetrations sealed with beauty beads, this maintenance will require that the coatings / sealants be replenished around the 5 year mark.

If specifically (and properly) designed as a true face barrier system, it should be checked at the 5 year mark but it is not uncommon for the initial replenishment to be extended to, or beyond, the 10 year mark, especially if the window corners are initially sealed.

So, drain plane or face barrier - it’s your choice, both are code compliant - but one has proven to be best methodology for Florida’s environment.

Either way, this problem is ours to cure, building officials cannot inspect performance (nor is it in their wheelhouse to do so) so we must ensure proper performance. Stucco and waterproofing (painting) contractors must stop treating this business as a commodity and return to treating it as a trade. Builders must demand qualified plastering and waterproofing contractors, verifying the products are installed properly, and “CON-sultants” need to stop specifying systems they are not intimately and historically familiar with.

Maybe someday we will get a certification or license in place for these professions with meaningful prequalification and testing competencies.

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Respectfully,

Bob Koning

