



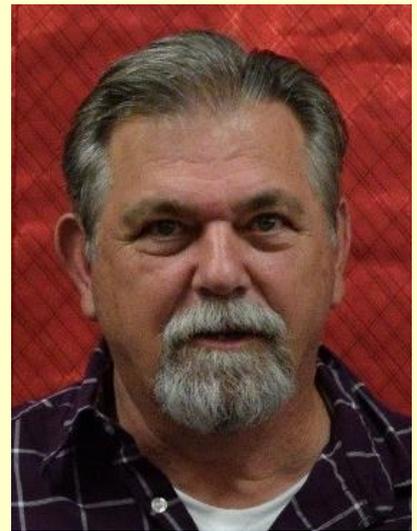
CONTRACTORS INSTITUTE

Promoting Professionalism Through
Quality Construction Education



The Truth about Florida Stucco and Stucco Litigation
The Role of the Designer, Builder, Inspector and Owner

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Robert Koning has been involved with the plastering, stucco, masonry, roofing and waterproofing industry for over 40 years.

Beyond that, the Koning family's involvement in the Florida industry dates back to the 1920's. These combined provide both an indispensable knowledge of ever-advancing products, methods, and standards, and a discernment against persistent myths and outdated requirements.

His numerous licenses and certifications include: Bachelor of Science in Construction Engineering – Certified Arbitrator & Mediator – Director of Construction Education at Contractors Institute – Certified General, Building, Roofing, Plumbing, Underground Utilities, Air Conditioning, Master Electrician, Solar, Mold Assessor, Mold Remediator, Home Inspector, and BPI Building Analyst.

Robert Koning is a Code Certified: Level 1 – Building, Roofing, Plumbing, Mechanical, and Electrical Inspector; Level 2 -Building, Plumbing, Mechanical, and Electrical Plans Examiner; Level 3 – Chief Building, Plumbing, Mechanical and Electrical Code Analyst; Level 4 -Code Enforcement and Administration Professional; State Certified Standard Building Code Administrator

INTRODUCTION

- There is a rising tide of stucco litigation containing pleadings rife with citations violative of the Florida Building Codes, ASTM C-926, Standard Specification for Application of Portland Cement-Based Plaster and ASTM C-1063 Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
- This litigation is partially fueled by expert witnesses proclaiming themselves as “stucco experts” who most often; improperly cite referenced sections, misinterpret meanings, misinterpret the confines of documents, misapply the standards as incorporated into the applicable codes as they relate to a specific design intent, fail to understand and/or factor exceptions, and fail to understand and/or factor permissible modifications to the provisions based upon construction methodologies and regional climatic differences.

- This document and its related testing have been prepared to provide a source for comprehensive, pertinent, and relevant information, without the hysteria currently being associated with the subject.
- This document discusses the application of a Florida Stucco System with an intended Face Barrier System

ELEMENTS INVOLVED

- In simplistic explanation, the various different outer exterior surfacings of buildings can be analogized as a “skin” that either; resists, redirects or prevents water and/or air from entering a building’s interior. Collectively, these components are referred to as the “Building Envelope”.
- The usual intent of a building’s design is to either prevent breaches of this envelope by way of a Water Barrier System (a/k/a Face Barrier) or to manage breaches by way of a Water Management System (a/k/a Drain Plane).

- These systems are usually mutually exclusive, however they both can be employed as a precautionary function, commonly referred to as a “belt-and-suspenders” design.
- In Florida, what cannot happen however is an incomplete or partial application or installation of either one, or both, of these systems.
- My mother used to quote the old adage, “you can’t be a little bit pregnant – you either are, or you aren’t”. This maxim exactly applies to these methodologies; either you have a face barrier system or you don’t – either you have a water management system – or you don’t.

■ EFFECTS OF A BREACH

- Water intrusion beyond the point of the building’s design intent is referred to as a “breach” of the envelope.
- When there is a breach of this envelope (for this writing assume a suspected stuccoed wall leak), testing protocols and accompanying testing methodologies are used to locate and determine the source

Of the leak and determine the extent of stucco substrate damage (if any) and develop a proper repair protocol.

- These protocols and methodologies are not being performed on the aforementioned litigation cases - but this malpractice is for another discussion.
- HISTORY
- For over 40 years, as a contractor, the author has installed countless stucco systems in Florida and has been involved with many, many more as a consultant and instructor.
- These installations contain many of what some proclaimed “stucco experts” are now calling “violations” in need of immediate and costly repairs; yet these stucco installations have historically performed (and in most cases are currently performing) perfectly with many of these “violations”; without any breaches or leaks.

- Misdiagnosis, misdirection for legal posturing and/or misinformation for invocation of insurance coverage are some of the reasons for these claims of code “violations”.
- The citations of violations are specifically intended to be included into legal pleadings which will also be bulked up with exorbitant cost to repair estimates or numbers.

ENVELOPE PROBLEMS

- Are there problems? YES. Are people partially or totally responsible? YES. However most of the problems involve multiple components and usually involve failure of owners to mitigate damages.
- Failure to mitigate is intrinsically tied to the failure to maintain or replenish required coatings and sealants.
- Misdiagnosis, misdirection for legal posturing, and misinformation with large repair numbers intended to invoke insurance coverage control the situation. No one is really concerned with the owner’s actual problem and

development of a workable repair protocol. More on these problems later.

Meanwhile; ignorance of the stucco profession and trade knowledge is oftentimes a contributing or predominate cause of some of these calamities of misinformation.

LEGAL WRANGLING

- Lincoln said of the profession of lawyering:

"Discourage litigation. Persuade your neighbors to compromise whenever you can. Point out to them how the nominal winner is often a real loser---in fees, expenses, and waste of time. As a peacemaker the lawyer has a superior opportunity of being a good man. There will still be business enough."

- Too bad that philosophy has been largely lost in today's economic juggernaut.
- Percentage base rewards lead to broad based pleadings with broad based accusations and accompanying escalated damage estimates in order to drive the highest demand and highest reward for the legal team.

- The percentage Lawyer needs someone to initially substantiate elements for preparation of the Complaint, so, enter the role of the Consultant or is it the “Con” “sultant”?
- This is the beginning of what surely will become a legal quagmire.
- Driven by the economic outcome rather than the factual situation, the consultant substantiates the legal pleadings by his/her opinions.
- Motivated by the fruitful fees that can be derived from initial inspections and subsequent reports, the consultant knows the money tree doesn’t stop producing here.
- Realizing that after the initial income sequences, he will need to be deposed by those defending the suit, next will come the opportunity for large hourly “expert witness” fees.
- Remember these fees are from a newly sourced pocketbook since the defendant’s insurance carrier now usually paying the consultants deposition time – and these new pocketbooks are deep.

- As the law firms continues to dredge up new clients, the consultant can use these same findings over and over and over again - generating multiple fees using “cut-and-paste” mentality for generating a report. The gift that keeps on giving.

BUILDING OFFICIAL DUTIES

- When these consultants compile a long list of alleged code “violations” along with over encompassing and inflated repair costs, stunned owners inevitably look to blame the building department using every media outlet.
- They inevitably accuse the building department of careless plan review and incompetent inspections.
- When the builders are blamed, they retort with the old adage; “the building department approved it and inspected it – therefore it must be correct.”
- Both the owners and the builders are “off based” in their accusations and reliance on the building department responsibilities.

FIRST; WHAT THE BUILDING CODE IS AND IS NOT

- Contrary to popular belief building code is not a “how to” building publication.
- Its primary intent is to be used by professionals when designing the structural, fire and life safety elements of a building.
- Setting aside the plumbing electrical, mechanical, etc.. elements of a building and, speaking on a conceptual basis, the primary purpose of the code is to ensure the integrity of a building’s structural elements; a/k/a; the main wind force resisting system (MWFRS) or simply put, the “skeleton” of the building and the buildings coverings or claddings along with providing fire protection and a controlled exit path from the building in the event of fire or emergency.
- These codes (meant to be read, understood and applied by professionals) are either prescriptive or performance based. Engineered performance methodologies may differ from stated prescriptive methodologies yet are valid by and of themselves.

- Absent from the code are requirements or provisions involving; interior doors, architectural trim, interior paints, cabinets, vanities, wainscot, coverings, moldings, carpets, floorings or other such decorative, cosmetic or non-structural elements or components.

SECOND; CODE PROVISIONS ARE NOT ALWAYS EQUALLY APPLIED OR APPLIED AT ALL

- Many code provisions are conditional or exact in their application. For instance; specific guard railing provisions and baluster spacing may apply to a porch deck when it is more than 30” above grade. If however, the owner builds the porch deck 18” above grade, he/she may install a railing of any fashion they wish. Granted it may be wise to follow the code provisions even if they are not applicable or exempted – but it is NOT a code violation if they are not.
- In a simplistic understanding, code provisions set forth prescriptive and/or

performance criteria for certain components for certain usage for certain building conditions of a certain type of construction; notwithstanding of all the exemptions contained within sections that may be applicable.

- Just like our 10th Constitution Amendment whereby;
- “Any powers that the Constitution does not give to the United States belong to the states and the people...”
- Our code application is understood to follow suit; Any powers (provisions) not specifically addressed by code, or exempted by way of the code, belong to the people.
- Now before I seem to oversimplify the situation, the Building Official retains the right (and obligation) to interpret, apply, and extend these provisions based upon justifiable reason and need of public safety. It is, and always will be, a reserved right of judgment maintained by the Building Official. Rightfully so.
- To remove this human reasoning element would reduce the code provisions to a

Kiosk dispensing unit, and reduce confidence in our infrastructure.

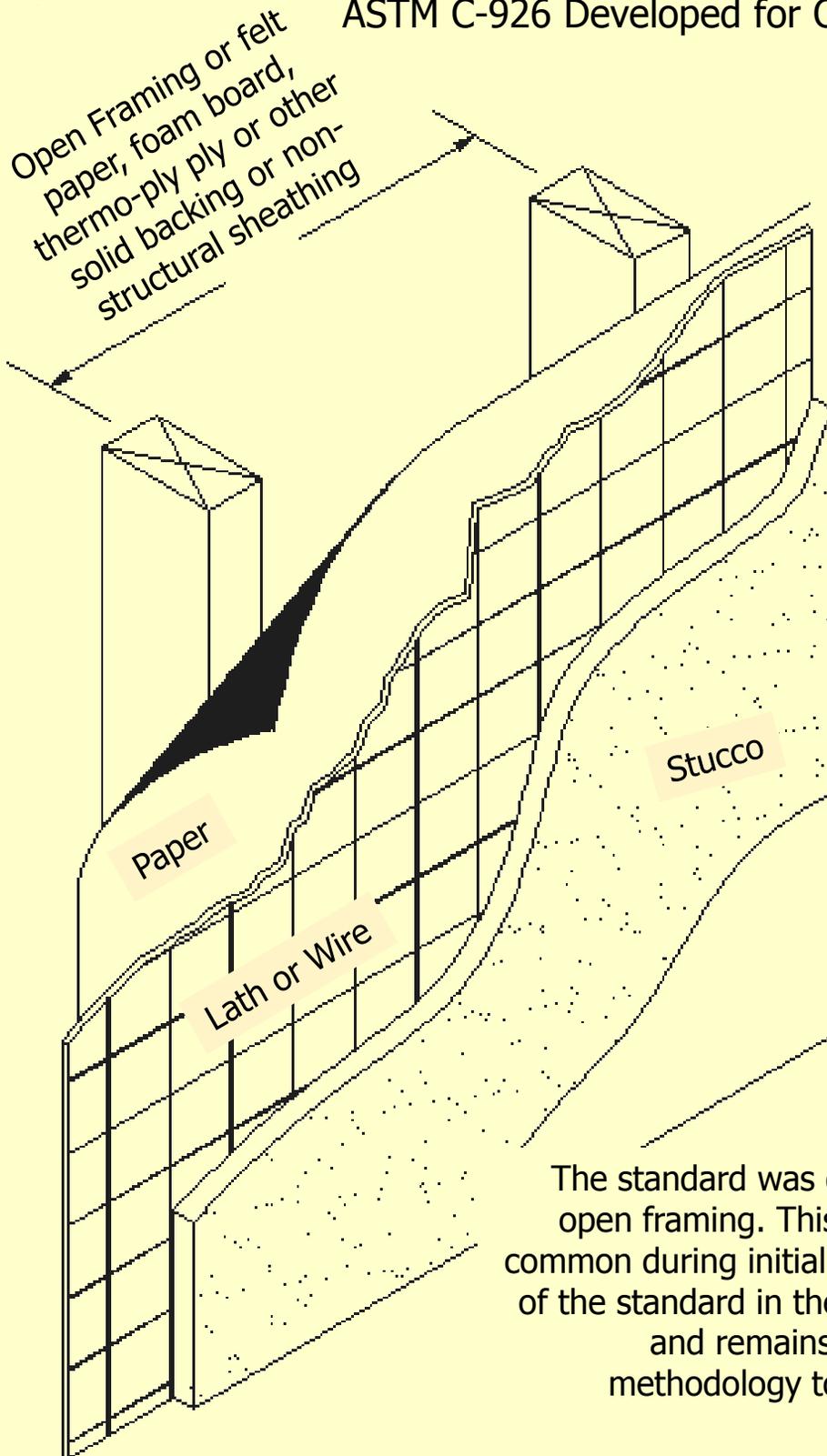
- Although the Building Official may have our back, he/she is not our personal construction or quality control manager.

THIRD; NOT ALL COMPONENTS ARE SUBJECT TO PLAN REVIEW OR INSPECTIONS

- Chapter 1 of the code mandates that the building department review building plans for code approval. This review however does not encompass all code provisions.
- Chapter 1 of the Building Code enumerates the minimum plan items to be reviewed and approved by the building, plumbing, electrical and mechanical plans examiners. These plan review items may be expanded at the local level, but cannot be diminished.
- Although this list is comprehensive regarding structural, fire, and life safety issues - it represents only a fraction of the total code provisions and references.

- Before we continue into the code process, we need to understand that the Florida Building Codes are derivatives of the International Code Council (ICC) a/k/a/ “The International Codes”.
- Likewise, the referenced stucco publication ASTM C-926 and C-1063 are International Standards – they are not specific to any region, including Florida.
- Accordingly, code referenced publications usually recognize regional practices vary, therefore most contain a “unless otherwise specified” provision allowing for modified practices.
- The ASTM C-926 as an International Standard opens its provisions with the following passage:
 - “1. Scope
 - 1.1 This specification covers the requirements for the application of “**full thickness**” portland cement-based plaster for exterior (stucco) and interior work.” *emphasis added by author*
- The importance of this statement is often overlooked. When developing the initial standard, the creators recognized that various stucco processes existed, each valid in their own right and or region and each based upon regional construction differences and applications.
- The standard further defined, and referred to, other systems as “skim coat” systems since the others, to some measured amount, were less than the nominal 7/8” required by the “full thickness” standard and were primarily cosmetic claddings in purpose.
- For a full seminar on the ASTM C-926 and 1063 along with Florida Code Evaluations, review the “Understanding The Florida Code Stucco Provisions” offered by the Contractors Institute and the Stucco Institute.
- Let’s examine the basis and understand some simple building concepts that the ASTM C-926 was developed to accommodate...

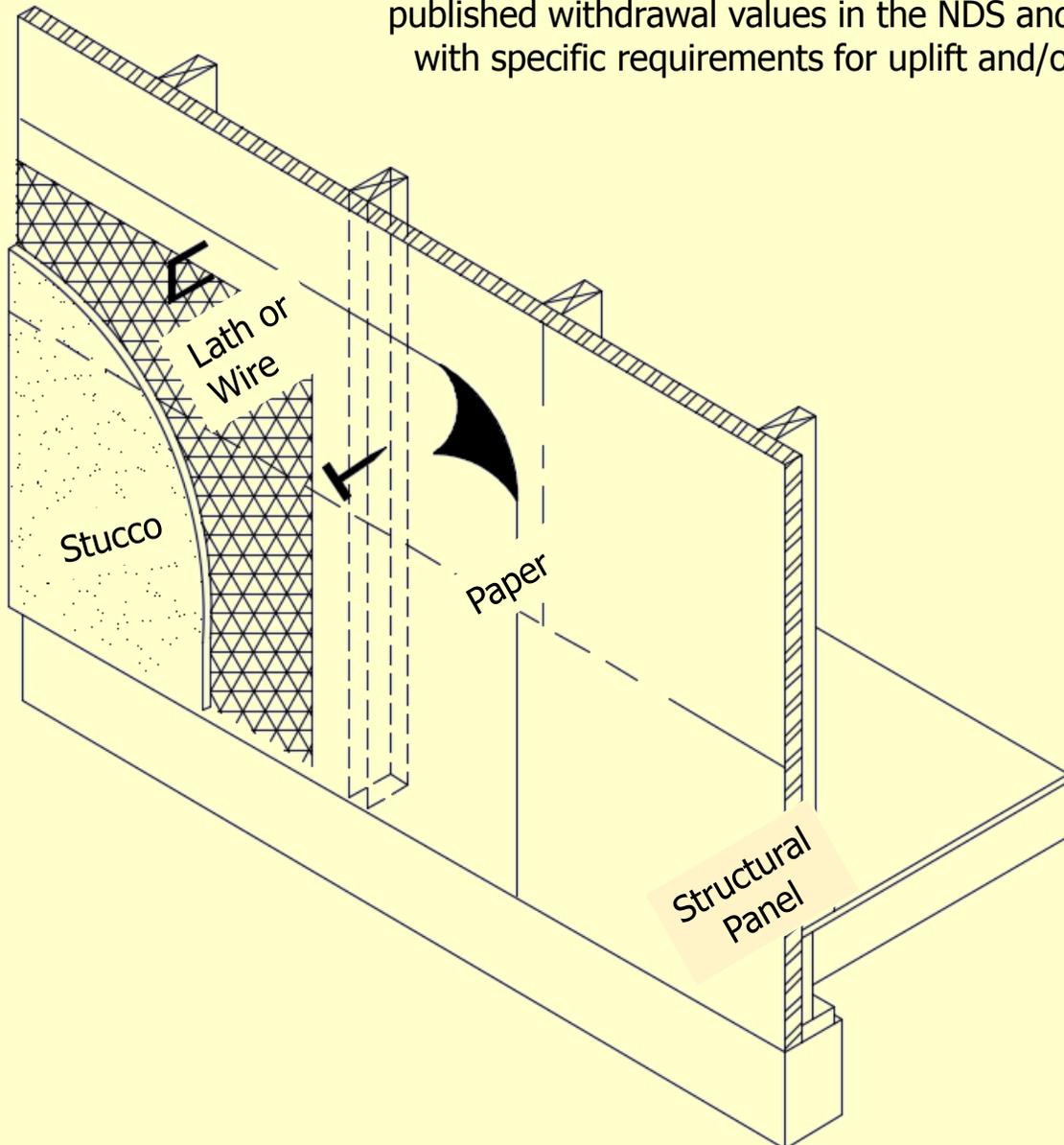
ASTM C-926 Developed for Open Framing



The standard was developed for open framing. This method was common during initial development of the standard in the early 1970's and remains the common methodology today for most regions.

No Provisional Modification for Structural Framing

Structural Framing - Structural Sheathing forming a structural wall covering. Sheathing has published withdrawal values in the NDS and nailed with specific requirements for uplift and/or shear



The ASTM C-926 standard was NOT developed for structural framing - this concept developed as a regional practice long after the development of the ASTM C-926 standard. This regionally mandated protocol was the result from implementation of more modern wind loading provisions in hurricane prone regions such as Florida Coastlines.

Open Framing – Ready for Lath and Stucco



This house represents by far the most common national methodology; open framing. Note that all shear requirements are fulfilled with shear wall segments. The studs may have felt, foam insulation, Thermo-Ply or similar non structural solid backing or sheathing. The ASTM has a provision that requires the lath fasteners to be in the vertical studs; no kidding, as opposed to what? Placement in between the studs where nothing structural is located to nail into? Also, this will explain why the lath needs to be tied in-between the supports and the end laps need to be laced with wire – its because there is nothing structural between the studs!

Also note that the standard provides for a complete stucco finish – no painting or coating necessary. Use gray or white Portland cement and cement dyes to obtain any color you wish, no painting necessary – you can paint if you want, but its purpose can be decorative (color coat) only since it is not required by the standard's methodology.



This house represents by far the most common Florida methodology; Structural Framing. Note that all walls are fully sheathed with structural panels. It is important to note that if the home was waterproofed by an application of coating, the house would be ready for its certificate of occupancy (regarding exterior wall coverings). All code elements of shear, fire and wall covering would have been met – the walls would just need the waterproofing by way of a waterproof **coating** or waterproof **cladding**.

But alas, the owner just wants something more decorative. We could put a "decorative cementitious coating" a/k/a "non full thickness" system directly over the blocks. The wood becomes a little trickier. We need a cladding. We could use aluminum siding, cement board siding or stucco. Let's assume the owner is considering their options ... *continued on next page*

- Regardless of the cladding decided upon, the code will require that the wall sheathing be protected from exposure to bulk water (water leaks) or liquid water intrusion - although transmittable water vapor is factored.
- There are two methodologies available to protect the wall from water intrusion;
 - 1. Manage intruding water by covering the wood sheathing with some type of water barrier such as felt paper or plastic type house wrap and allowing it to migrate down the wall and provide a means for it to escape, (drain plane) or
 - 2. Prevent water intrusion altogether by creating a barrier system on the face of the cladding itself thereby preventing any moisture from gaining entry (face barrier).
- One or the other is generally selected although it is possible to use both if special design considerations are employed.
- PURPOSE OF THE WIRE MESH OR METAL LATH
- Since stucco cannot be directly applied to wood (it does not adhere), we need to first attach a wire mesh or metal lath to the wall to serve as a “mechanical key” for the stucco base coat to attach to.
- The metal lath (or wire mesh) is mechanically fastened to the structural panels.
- The stucco, in its plastic state, is forced through the openings in the wire or lath during the application of its first coat called a “scratch” coat; thereby affixing itself to the wire or metal when it hardens.
- After this scratch coat has begun to harden, it can be scarified and additional coats added later (necessary with open framing), or if structural sheathing is used, it can be “doubled” back upon with additional layers forming one monolithic coat as soon as the scratch coat has set to a point of sufficient rigidity. The latter is the "norm" in Florida applications.

CODE REFERENCES TO STUCCO
A/K/A; CEMENT PLASTER

- Many design professionals prepare plans to a point that will ensure code compliance with the items subject to review and inspection, called a; "Permittable Plan Set". Remember however that these remain a small fraction of the total code provisions. Note however that there are architects that will design and administer complete construction projects but this is not a requirement.
- Therefore, the design professional or others thereafter have to apply, factor, modify and decide on other code provisions or standards applicable to the project beyond the scope of the building department's review and inspection processes.
- Unless the plans and specifications are extremely detailed and specifics, this burden will be spread throughout the construction process by way of the contractor of record and all specialty subcontractors thereafter.
- So lets follow a design thought process for stucco code application.

- We are using the 2010 Florida Building code for a basic conceptual process. For a full seminar on code and stucco see "the "Understanding The Florida Code Stucco Provisions" offered by the Contractors Institute and the Stucco Institute.
- FIRST, We need to determine the occupancy classification of the structure, and type of construction for fire resistance determination.

Let's assume a residential "R-3" classification built as a Type V structure.

- NEXT, we need to determine if we are in need of any specific burn time from the finish on the fire-exposed side of the wall. If yes, we would review the appropriate table in chapter 7 and use or Portland cement-sand plaster (stucco) value.
- For that value to be accurate, the cement plaster would need to be installed according to a protocol. That would be the protocol listed for cement plaster in Chapter 25, Section 2510, which references the ASTM C-926.

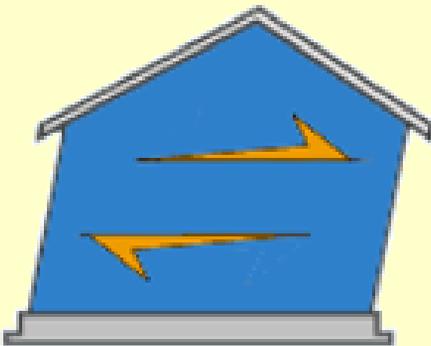
- Some people overlook the fact that this code section does not reference Section 2510 directly, which would invoke all of the provisions of C-926. It simply refers to the application of cement plaster.
- Two of the three thicknesses found in this table; "TIME ASSIGNED TO FINISH MATERIALS ON FIRE-EXPOSED SIDE OF WALL" seem to be violative of the ASTM C-926 provisions. One is less than 7/8" and the other is greater.
- The reason is simple; the provisions for proportioning and placing cement plaster contained in the C-926 is all that would be applicable.
- The code does not specifically "spell all of this out" – it assumes that the professional using the table understands it since it did not specifically reference Section 2510.

Let's assume that we are not in need of any special fire requirements so the need for a cement plaster as a fire resistant covering is not mandatory.

- NOW, we will examine our wall for shear resistance.
- Chapter 23, Section 2304.6 contains provisions regarding the need for exterior wall sheathing:

"Except as provided for in Section 1405 for weatherboarding or where stucco construction that complies with Section 2510 is installed, enclosed buildings (buildings can be open, partially enclosed or enclosed by design) shall be sheathed with one of the materials of the nominal thickness specified in Table 2304.6 or any other approved material of equivalent strength or durability"

- Note that this provision specifically invokes Section 2510 by reference, thereby invoking the requirements of ASTM C-926 (for enclosed buildings)
- So, if we then apply stucco pursuant to Section 2510, which invokes the ASTM C-926, we do not need to use any additional structural or other wall sheathing materials.



- This is a prescriptive code compliance allowable for enclosed buildings
- NEXT, (assuming we want to use the prescriptive wall covering) we must verify that the stucco itself (without sheathing) applied according to the ASTM C-926 will resist the shear that will be imposed by wind load in our region.
- Table 2306.7 allows a shear value of 180 pounds per linear foot. This value is insufficient for the wind region in which our construction is located.
- As a matter of fact, all of the prescriptive wall framing provisions in the code itself are for CONVENTIONAL LIGHT-FRAME CONSTRUCTION, which has limitations. One such limitation is that the Ultimate Design Wind Speed, V_{ult} shall not exceed 115 miles per hour (mph) (44 m/s) (3-second gust). This excludes almost all of Florida, including where our design will be sited.
- From this point on, all prescriptive wall design provisions are outside of the Florida Building Code and must be uniquely engineered or use an approved alternate design methodology such as the ICC 600, AF&PA WFCM, or other approved design manuals.
- These alternate methodology manuals can be used by design professionals or licensed Division 1 contractors that have successfully completed a certification course. Go to the Contractors Institute website for a course list of these classes if you are in need of training and certification.
- At this point we have left the code for our wall design. We now will need to use structural panels installed as a fully sheathed shearwall. This will provide us with our required shear value, but will also provide the required uplift restraint. Using stucco installed pursuant to Section 2510 as a wall covering system by itself is no longer a code approved option.
- So, again, the ASTM C-926 stucco requirements are not required by Chapter 23 and therefore are not mandatory for this design. They may, or may not be specified in part or in whole. It will be a design decision.

- NEXT, We venture to Chapter 14, Exterior Walls. This is where we initially look to decide a wall covering or envelope.
 - We would examine the requirements of the Energy Code at this time and determine that we need an “air barrier” over the outside sheathing in order reduce air infiltration (more on this later) but for now assume we are intending to use the air barrier to serve the additional function of a water infiltration barrier also (a common practice).
 - Section 1403.3 will require all wall coverings to be engineered to meet the wind loading requirements of cladding contained in Chapter 16 since any prescriptive provision was based upon the wind speed for Conventional Light Framed Construction. Some cannot be adjusted to comply.
 - What is critical at this point is determining which of these methodologies you intend upon using. Refer to the following code definitions in Chapter 14:
- EXTERIOR WALL COVERING. A material or assembly of materials applied on the exterior side of exterior walls for the purpose of providing a weather-resisting barrier, insulation or for aesthetics, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim and embellishments such as cornices, soffits, fascias, gutters and leaders.
Many contend that this is usually is related to water management systems
 - EXTERIOR WALL ENVELOPE. A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection of the building structural members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment.
Many contend that this is usually is related to a face barrier system. The face barrier will not only serve as a water barrier, but serves as air barrier and vapor retarder on the warm side of the wall.

- As stated earlier, For a full seminar on code and stucco see “the “Understanding The Florida Code Stucco Provisions” offered by the Contractors Institute and the Stucco Institute.
- This seminar will discuss all of the nuances of the codes and stucco including the HVHZ provisions for both the building and residential code.
- It is interesting how these codes have altered their provisions to and fro in order to try and simplify these complex provisions and variables.
- What inevitably happens however is that the alterations cause more confusion than they solve.
- In order to eliminate the confusion and sometimes controversial provisions, the stucco institute has created a new stucco system called “Sealed Stucco System”.
- Its purpose is to provide a simple effective functioning stucco and waterproofing methodology in order to ensure a stucco application that performs perfectly.
- It is important to note that this approved system is not a “newly developed” system –
- rather it is the system as historically installed with years of perfect service history.
- Among other things, the system bridges stress cracks, preventing salt laden moisture from migrating through the stucco cladding and by sealing the envelope, it prevents the continued introduction of our moisture rich, salt laden atmosphere behind the stucco system thereby inhibiting the initiation corrosion on metal sub-components. If such air is allowed to circulate behind the stucco system, it will result in stucco cracking, which lets in more salt laden moisture, etc.... the dog chases it tail.
- Please go to:
www.stuccoinstitute.com or www.sealedstuccosystem.com for details on this system and other published stucco information.
- For the advanced readers, the author acknowledges this is a simplification of an extremely complex procedure with many variables. These are discussed in our other specific seminars.

So let's continue and "step it up" a notch with some more advanced discussions.

Advancing our Understanding of the Principles

DISCLAIMER

The following information is about specific construction assemblages, on specific types of homes, located in a specific region (Florida), and over specific wall conditions. All residential.

When the author makes statements about components, configurations, stucco applications and the elimination of accessories, it MUST be remembered that these are not to be considered applied with a "broad brush" i.e., the statements and opinions are for the design and construction methodologies specifically being addressed.

The building designer or design professional must determine the specific needs for project conditions and geometries that differ from those being discussed herein.

SYSTEM

- The stucco system we will be discussing is installed over a standard frame wall construction configuration with structural panels (as required by code referenced alternate methodologies) attached using common nails, Tyvek house wrap, metal or wire lath, 5/8" stucco, sealants and quality acrylic elastomeric coating applied to an approx. 12 mil DFT. (dry film thickness) Figure 2, *infra.*

ORDER OF DISCUSSION

- The discussion of the stucco cladding (stucco applied over structural sheathing panels) will be presented in each component from the structural panel outward to the face barrier. Figure 2, *infra.*

ENERGY CODE REQUIREMENT

- Our energy code mandates the installation of air barriers or "wraps". The essential purpose of these is to minimize air circulation and air infiltration

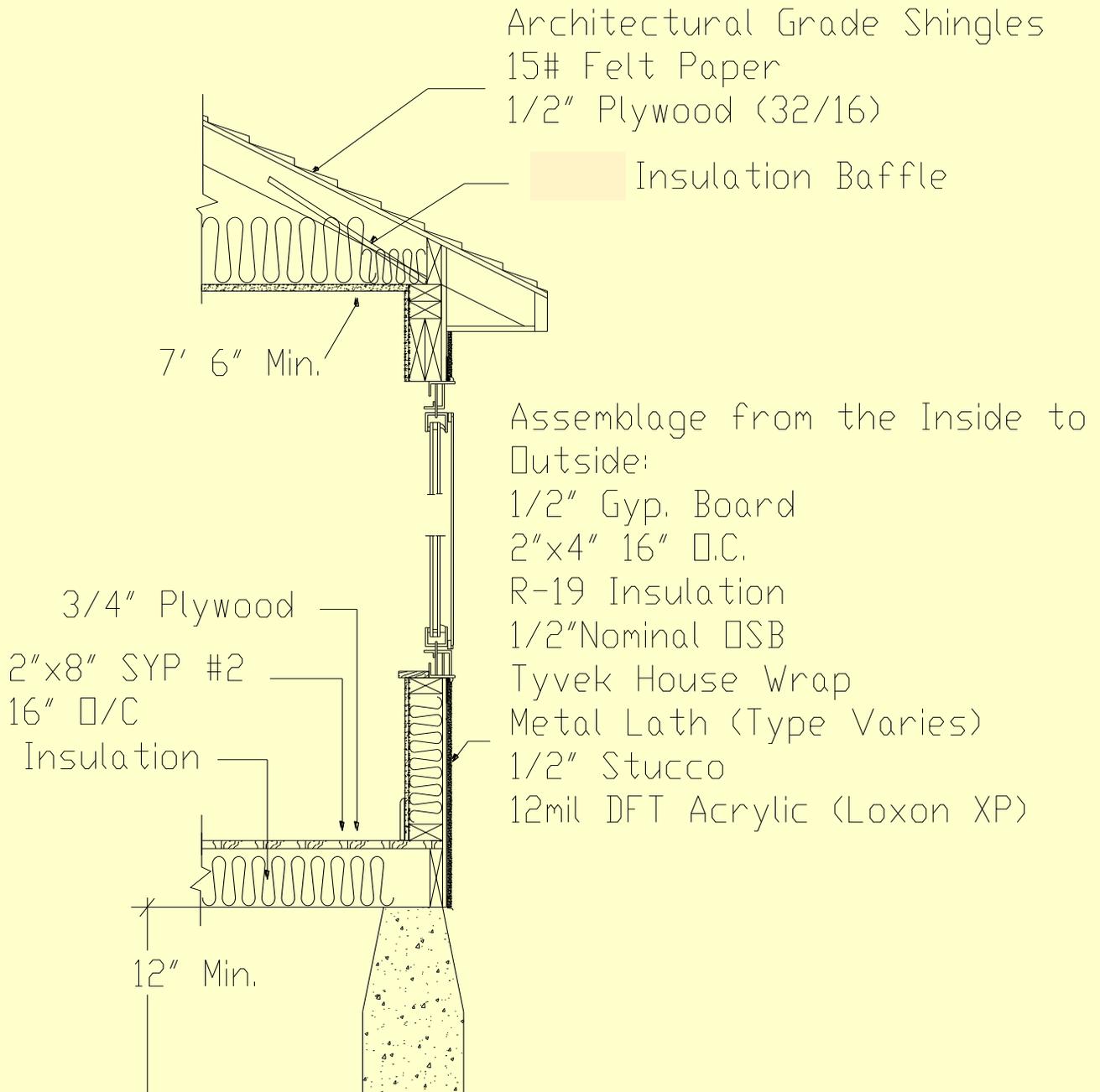
by reducing air currents behind the exterior wall covering or cladding.

- They have the additional benefit of providing not only resistance to air currents, certain types can serve as a water protection barrier for wall sheathing or wood sub-framing.

AIR BARRIER / WATER MANAGEMENT

- Water passes through envelope components either as a vapor or liquid. Simplistically, vapor barriers are exactly that; a complete barrier to the passage of water as a liquid or vapor.
- To be a vapor barrier a product must have a permanence rating (a methodology used to measure the passage of vapor and liquid) less than the value of 1.
- Vapor retarders on the other hand, resist the passage of liquid but will allow water vapor to pass. The rate of passage can be determined by examining their permanence rating, which will be a value greater than 1.

Figure 2 – Wall Section



- In Florida’s environment, air movement around and through the building’s envelope allows outside air (unconditioned air) to enter into interstitial (inside the exterior wall) elements and finally into the inside conditioned space.
- Air infiltration can cause or contribute to a myriad of building and environmental problems, the most prevalent however is the introduction of unintended water vapor and heat (latent loads) as well as pollutants into interstitial and living (conditioned) spaces by this air movement raising the cooling and dehumidification load on the air-conditioning system.
- Air infiltration can be exacerbated by internal and external wall pressures, air temperatures, building geometry, location and humidity differentials between inside and outside conditions.
- This basic understanding reveals the need for some type of “air” barrier on the exterior side of the wall to inhibit the circulation and passage of air and its contained vapor through the wall assemblage.
- Florida’s energy code mandates the installation of an approved air barrier. Common felt paper, is generally considered unsuitable for use as an air barrier due to its vertical lapping every 3 feet unless all the laps are sealed.
- Stucco, (1/2” thick) by and of itself is considered an air barrier
- Polyethylene, polypropylene or similar non-organic based house wraps have been developed with Dupont’s “Tyvek” being very common. They are water resistant and permeable (able to pass vapor in regulated quantities) to various degrees depending on product type dictated by design application intent.
- They are lightweight thereby allowing production and installation in wide, long sheets thereby allowing for ease of installation; minimizing seams and seam taping.

- Dual Usage
- These newer products have long been used serving a “dual-purpose” – air barrier and water barrier (drainage plane) for the back side of cladding systems.
- In the 1980’s, the National Home Builders Association in conjunction with Dupont’s Tyvek division, installed Tyvek behind sidings and stucco on several control houses in southeast Florida. The stucco was directly applied over the Tyvek. See study results at stuccoinstitute.com
- Subsequent testing proved that the air leakage, (measured in air changes per hour (ACH) with the house pressure reduced to negative fifty (-50) pascals) was reduced to quantities below the code allowable maximum. It proved a worthy and valuable component and has been a staple ever since.
- These installations served as an air barrier and a water barrier without fault – in fact, the housing is still in place today (circa 2016) with the same stucco cladding.
- The Tyvek also helped control the drying (hydration) or “curing” of the wet (plastic) stucco, providing a better, stronger product.
- COMPONENTS NEED TO WORK TOGETHER
- Stucco (a cementitious product) bonds or adheres to other masonry or cementitious bases primarily by suction bonding. Simply put, it sticks to itself.
- We learned earlier that over other materials (such as plywood sheathing), or to serve as a base when no other materials are used (open framing), metal lath or wire mesh must be attached to the substrate since there is nothing to provide a “suction bond” .
- The metal lath sheet has mechanically extruded expanded “slits” to allow the stucco to flow through when installed in its initial plastic state. This attachment is called a mechanical “key” and the process “keys” the plastic stucco to the sheet whether the sheet is expanded metal lath or wire mesh.
- This first coat is referred to as the “Scratch” coat and

- needs to be of sufficient thickness to serve as the base for following coats.
- Once the initial scratch coat is keyed in and has set, the following coats are applied and adhere by suction bonding.
- This terminology is important since the moniker of “reinforcement” is incorrect for these metal bases since it is not their design intent.

- PAPERBACKED LATH
- The initial scratch coat was difficult on applications where it was installed over open framing. Even though there was felt paper over the studs, there was not a lot to keep the plastic stucco from just falling through openings in lath or wire and puddling at bottom of the wall on the inside cavity. This was especially true when all ceramic tile was set over a stucco or “mud set” wall.
- If a way could be developed that attached a backing paper to lath it would prevent the
 - stucco from falling out of the backside making the initial scratch coat application easier.
 - Since wire mesh is sold in rolls, attaching a paper backing was problematic. Expanded metal lath however is manufactured in flat sheets $\approx 2'$ wide x $8'$ long which allowed the attachment of an asphalt impregnated “Kraft” paper to its backside, offset to allow lapping of the paper on successive sheets. Titled; “Tilelath”, it was represented by suppliers at the time as the solution for tile setters.
 - In Florida, when used over solid structural wall sheathing, the traditional 1st felt application was eliminated by using the paperbacked lath for exterior stucco assemblies.
 - Furthermore, since a 1/2” coat of stucco provided the required air barrier for energy code compliance, the paperbacked lath and stuccoed assemblage also provided for the air and vapor retarder.

- This single layer method seemed practical since it "killed two birds with one stone" and was code compliant.
- The ability to serve as a drain plane however was dependent upon the proper sequencing and lapping of the paper and the integration of fenestration and other flashings into the paper-backed lath system.
- This latter element was never addressed correctly since it required separate felt "aprons" under the fenestration. Integration with window fin flashing tape (and other flashings) is not possible without this separate apron.
- The omission of the necessary apron flashings would be a recipe for disaster on a drain plane system.
- Therefore, the only way for this methodology to succeed was to install a face barrier system, thereby negating the need for a drainage plane at all (and for other reasons listed later on).
- All was right provided we coated the exterior of the stucco and created that face barrier. And so we did.
- And so countless systems were installed in this manner for over 40 years with flawless success – provided the stucco installations were properly detailed by the trade, the coatings and sealants were properly installed, and the stucco was correctly interfaced with penetrations.
- But, should the coatings and sealants fail – the face barrier system fails, the sheathing gains moisture, stresses collect, the stucco cracks, more water is admitted... and "the dog chases its tail".

THE NEW "BOND BREAKER"

- So, now you have a history and some basics of the drain plane, in more recent years, the code has required a "bond breaker" to be installed between the stucco and the air barrier. The purported reasoning is that the stucco would "bond" to the air barrier and promulgate leakage. The analogy is to a canvas tent in the rain, it doesn't leak until you touch it on the inside and then it wicks.
- The analogy is incorrect. We know this since in Florida, we have directly applied stucco

over “Tyvek” since its inception without any failures.

I TOLD YOU THAT TO TELL YOU THIS

- When using the paperbacked lath, is it being used as a “bond breaker” or a “drain plane”? Which is it? Consultants allege installation deficiencies in one, the other, or both components as violative of ASTM provisions. But which is its purpose? When both Tyvek and paperbacked lath are used, one must be the drain plane and one must be the bond breaker. Both cannot serve both.
- Remember the “little bit pregnant”? Well either one or the other must be used, they cannot be integrally lapped together for a common purpose.
- More importantly, is the system dependent on a face barrier? If so, the need for either to serve as water management is negated. So we will see, both can serve neither.

FACE BARRIER VS. WATER MANAGED WALLS

- The ASTM 2128 “Standard

Guide for Evaluating Water Leakage of Building Walls”

describes a **Barrier Wall** as;

“The mechanism intended to prevent leakage in this type of wall is blocking or interrupting the movement of water to the interior”

- It discusses mass barriers and face sealed barriers – with a **Face Sealed** Barrier system described as;

“The exterior surfaces are relied upon as the only barrier. All joints and interfaces must be sealed to provide a continuous exterior barrier, and the absorption properties of the materials must also be controlled. The materials within the wall assembly must be able to sustain occasional short-term wetting as might occur between maintenance cycles of the exterior seals or from unintended incidental water infiltration...”

- The same standard defines **Water Managed** Walls as;

“The mechanism intended to prevent leakage in this type of wall is the control and discharge of anticipated and accepted amounts of water that penetrates the exterior surfaces.”

ASTM C926 and C-1063

- These documents were originally developed for the application of suspended stuccoed ceiling/soffits systems and a stucco wall covering system by and of themselves. They set the criteria for the installation of a stuccoed wall over “open” stud framing, solid backing or other non-structural sheathing.
 - The development began by recognizing there were multiple stucco systems and distinctly naming the newly developed system as “Full Thickness” in the opening paragraph to differentiate it from other stucco systems.
 - The documents were developed as a standard – not a code document. However, as time progressed, they became referenced by the code as part of its prescriptive provisions.
 - The code provided designers with a published shear value for a stucco system (usually needed for construction outside of Florida), and established fire resistant values published in specific code tables
- These provisions, values, and data were eventually substantiated by laboratory protocols using the ASTM C 926 mixing and proportioning as their basis. Accordingly when being used or applied pursuant to a code prescriptive requirement or application the stucco would need to be installed per the ASTM C926 in order for the construction to match the design considerations used for its structural or fire computations.
- Of course, if it was not the intent to use the stucco as a wall covering system, or for its shear value, or for its fire resistive value, then the application of the cementitious finish (stucco) could be installed as a simple cladding.
 - The code defines cladding as: **CLADDING**. The exterior materials that cover the surface of the building envelope that is directly loaded by the wind.
 - Claddings serve two distinct purposes; 1. They must serve to protect the wall assemblage from water either by themselves or by some method behind them.

- 2. They must resist imposed wind loads for their geographic location.
- Accordingly, stucco applied as a cladding need only meet the “cladding” requirements of the applicable code and serve the required function of an envelope component

CONTROL JOINTS

- For a complete discussion on Control Joints, refer to author’s White Paper on Control Joints. Sufficient to say here, the author (and others) have specified them out for over 40 years with perfect success.
- Industry professionals are very divided about the use and installation methodology of control joints. They serve a valuable purpose for some reasoning, but if not necessary, they should be specified out. If not installed and detailed correctly, they pose the potential for far more harm than gain.
- The basic requirement for control joint placement is 144 square feet. Why and how was this determined. Was this from any scientific or laboratory research or data? No.
- The reason was simple. The ASTM C 926 standard was (and is) written for full thickness stucco by and of itself; no coatings or painting required. You can leave the stucco gray, or tint the gray base with powdered dyes for darker hues or use white cement with dyes for lighter hues. No paint needed – a true lifetime finish.
- Now consider that when applying finished cement plaster (stucco) one must avoid blending the plaster from each successive batch. This is true for base and finish coats. This is CRITICAL! So the best way is to divide the wall up in panel sizes for each batch.
- The most common size stucco mixer is 6 CF. The base application for the brown coat is usually 1/2” and the finish coat 1/8”. Accordingly:
 - $144 \text{ sf} \times .0416' = 6 \text{ CF}$
 - This allows 1 panel per batch for brown coat and 4 panels per batch for finish.
 - Perfect blending to the eye – no wasted material. Easy Peasy – No contraction science involved. That’s the reasoning proffered to us way back then...

Section 12 – Why Florida is Different

- For a full seminar on the ASTM C-926 and 1063 along with Florida Code Evaluations, review the “Understanding The Florida Code Stucco Provisions” offered by the Contractors Institute and the Stucco Institute.

WHY THE ASTM C 926 STANDARD DOESN'T WORK WELL IN FLORIDA

- Now that you are aware that the ASTM C926 standard is for full thickness stucco, and that stucco is not intended to be painted or coated, the next thing you need to be aware of is the standard itself says "stucco however shall not be considered waterproof". Because the standard recognizes that the stucco will not be waterproof, it requires a drain plane to catch that water (we're talking small amounts) and direct it to an exit point at the bottom of the wall.
- Unlike other regions, If we install stucco that will leak on a wall in most regions of Florida, the migrating water will carry salts through and down the wall.
- Once through the stucco, it deposits on the metal lath and other metal components.
- The salts will set up an immediate corrosive atmosphere, the metal lath will begin to locally rust and expand thereby cracking the stucco.
- Additionally these migrating waters will raise the humidity level behind the stucco plane and can cause wood products to expand excessively and can create conditions that promulgate fungal growth.
- Even when no rain is involved the salt laden humidity pumps in and behind the stucco cavity by way of the weep screed. Ever looked around at the metal on a parking lot near the water? We don't need water or humidity behind the stucco cladding in Florida – we need to prevent them both from getting there.
- Therefore it is necessary in Florida to provide a face barrier system whereby this moisture never gains access through cracks or the face of the stucco. Having accomplished this task - the drain plane no longer is functional. It may remain in place as a "belt and suspender" feature - but its original function has now been disengaged. But if left functional, what about the humidity pumping and circulating? We knew this years ago and prevented it.

WHAT HAS HAPPENED

- Someone recently told me that the problems with stucco started during the past boom when untrained stucco contractors applied the product.
- I informed them that the problems started when unlicensed workers could go down to the local supply and buy a airless sprayer with wands for \$200.00 and hold themselves out as a "Painter".
- The older houses were all hand rolled, by tradesmen, waterproofers, applying a primer, and two successive coats ending up with the application applied to the proper mil thickness (about 12 mil) Dry Film Thickness.
- The experienced trained painters used proper sealants, and if proper separation of dissimilar materials were not gapped, they did so.
- The older stucco contractors left sufficient "V" grooves and made sure all horizontal to vertical arris' s provided for drainage away from the wall.
- As plasterers we were taught to be mindful of the painter and his needs.
- Old stucco contractors "rodded" external corners and omitted control joints and other unnecessary accessories.
- Now, we have subdivided the trade to "painters, using paints and caulks" and coating contractors using "coatings and sealants". They used to be the same....
- Commodity fenestration assemblies can play a contributory part in any wall assembly – stucco or otherwise. Just look at the same localized deterioration areas found under stucco and cement lap board siding – same problems. So how is it the stucco is blamed....
- But, without the proper mil thickness, proper sealants and proper maintenance, problems can arise with any exterior cladding.
- Initial stucco applications should be recoated and resealed after 5 years in service. Subsequent coating and reseals may be bumped out considerably.
- There are more aspects of course, but these structure the underlying problem of most stucco issues in current residential construction.
- Other problems will be discussed later on.

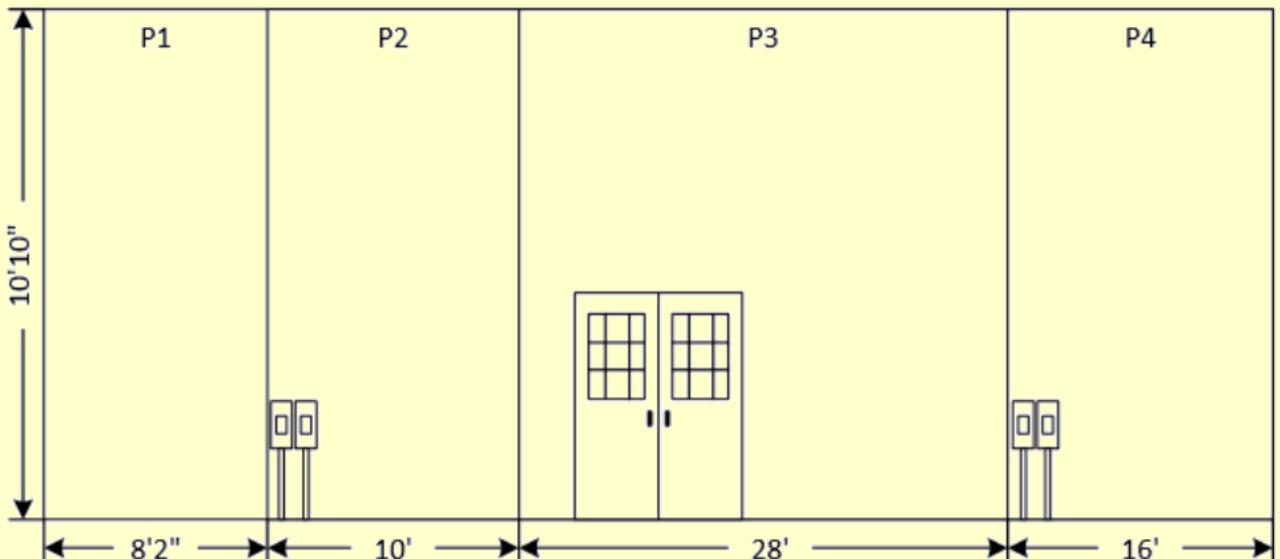
FULL SCALE WALL EXAMPLES

- IN 2001 we installed a stucco cladding on the front of a test building. The substrate was 4' x 8' structural wall sheathing, nominal 1/2" in thickness.
 - Paperbacked metal lath was installed directly over the sheathing. No weep screed was employed since we were using a face barrier system.
 - The entire wall was lathed and stuccoed at the same time, using the same materials and using the same men.
 - The wall was divided into 4 panel sections for application of the face barrier coating only.
 - Two panels were applied with an airless sprayer and two panels were rolled with two coats to the manufacturer's mil thickness recommendation.
 - The coatings were all from the same batch and applied at the same time.
- Visually, the wall appeared the same. No differences were discernable to an untrained or unknowing eye. (the rolled section appeared to have a slightly better sheen.
 - Note this was paperbacked lath attached directly to structural panels. No house wrap, no weep screed and stucco applied to 5/8" thickness
 - The results are summarized on the following slides.

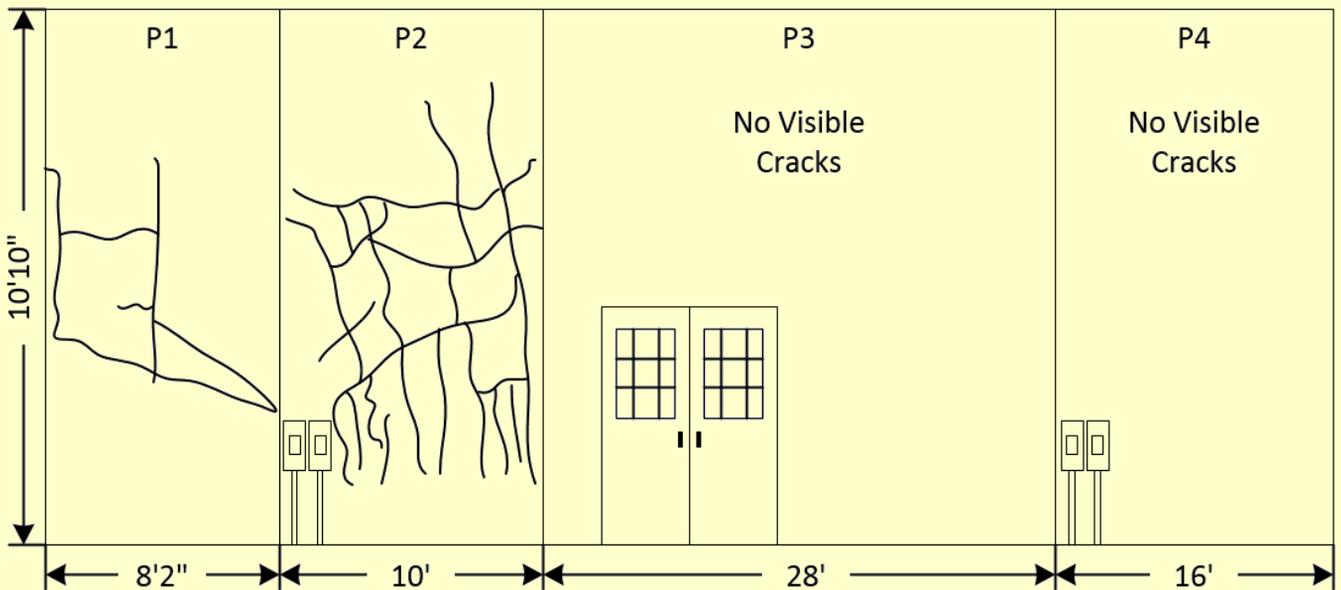
FULL SCALE MODELING

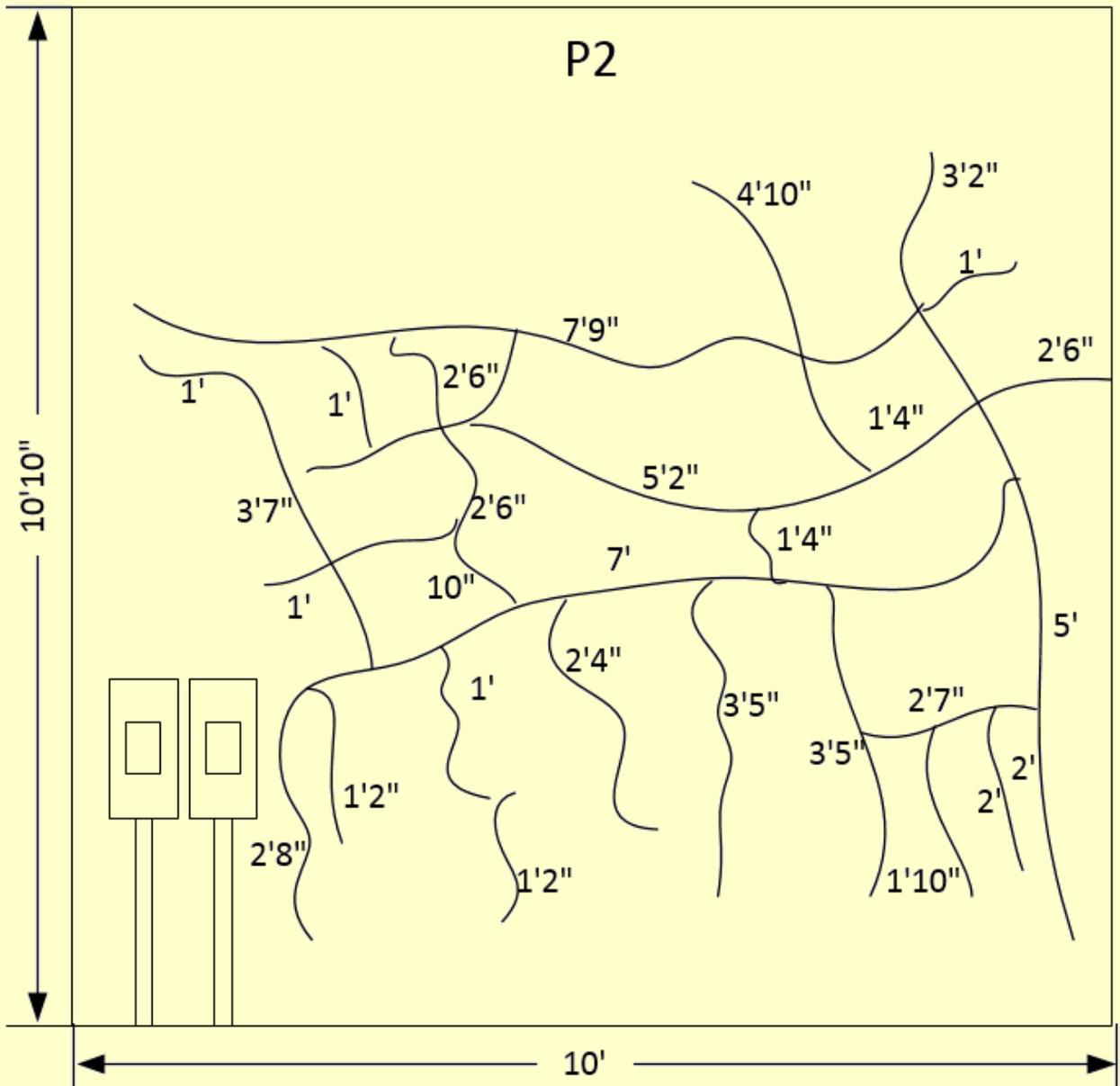
- Later on, we will discuss a full scale model built and stuccoed for exact documentation of other stucco issues and alleged violations, but for now look at our full scale wall examples:

- 2001 – Original Installation - No cracks though the coating in any panel
- Uniform wall assemblage on outside – same occupancy use along inside of the entire wall
- 5/8" Stucco over paperbacked lath on 1/2" plywood. No weep screed.
- Panels 1 and 2 were coated using a standard airless sprayer (\approx 3 mil DFT), while panels 3 and 4 were rolled using tradition masonry nap roller (12 mil DFT minimum) as per the paint manufacturers recommendations.

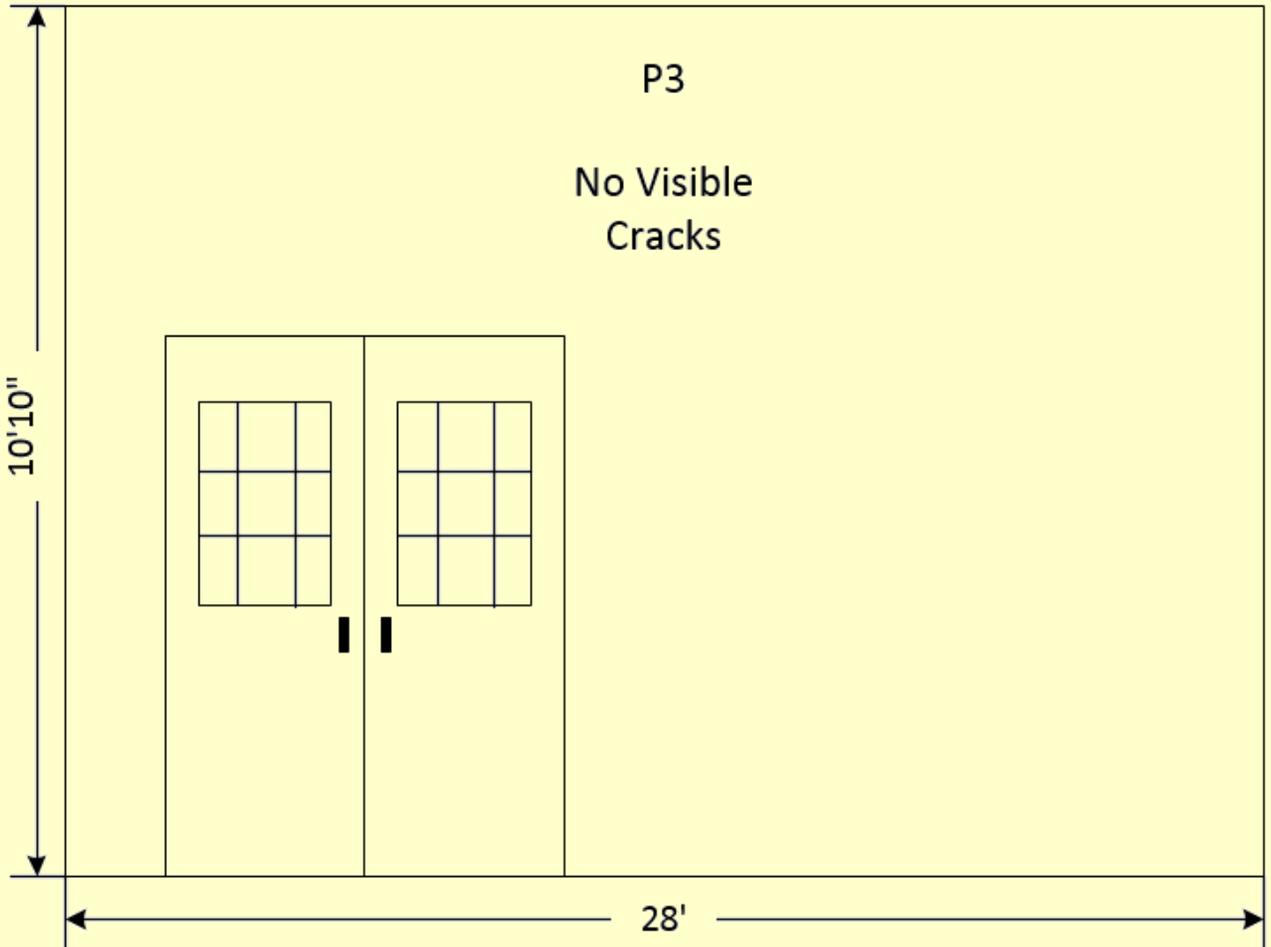


- By 2005 Panels P1 and P2 developed documentable cracking. By 2007, these cracks had expanded to a degree where it was necessary to patch the cracks and re-coat the panels in order to prevent substrate damage. They were coated this time to the required mil thickness using a roller.
- Panels P3 and P4 presented no cracking whatsoever in 2005. They remained crack free. They were recoated for in 2007 with Panels P1 and P2 to maintain appearance.
- Soffit and Fascia Sections (originally rolled to 12 mil DFT minimum) remained crack free performing as Panels P3 and P4



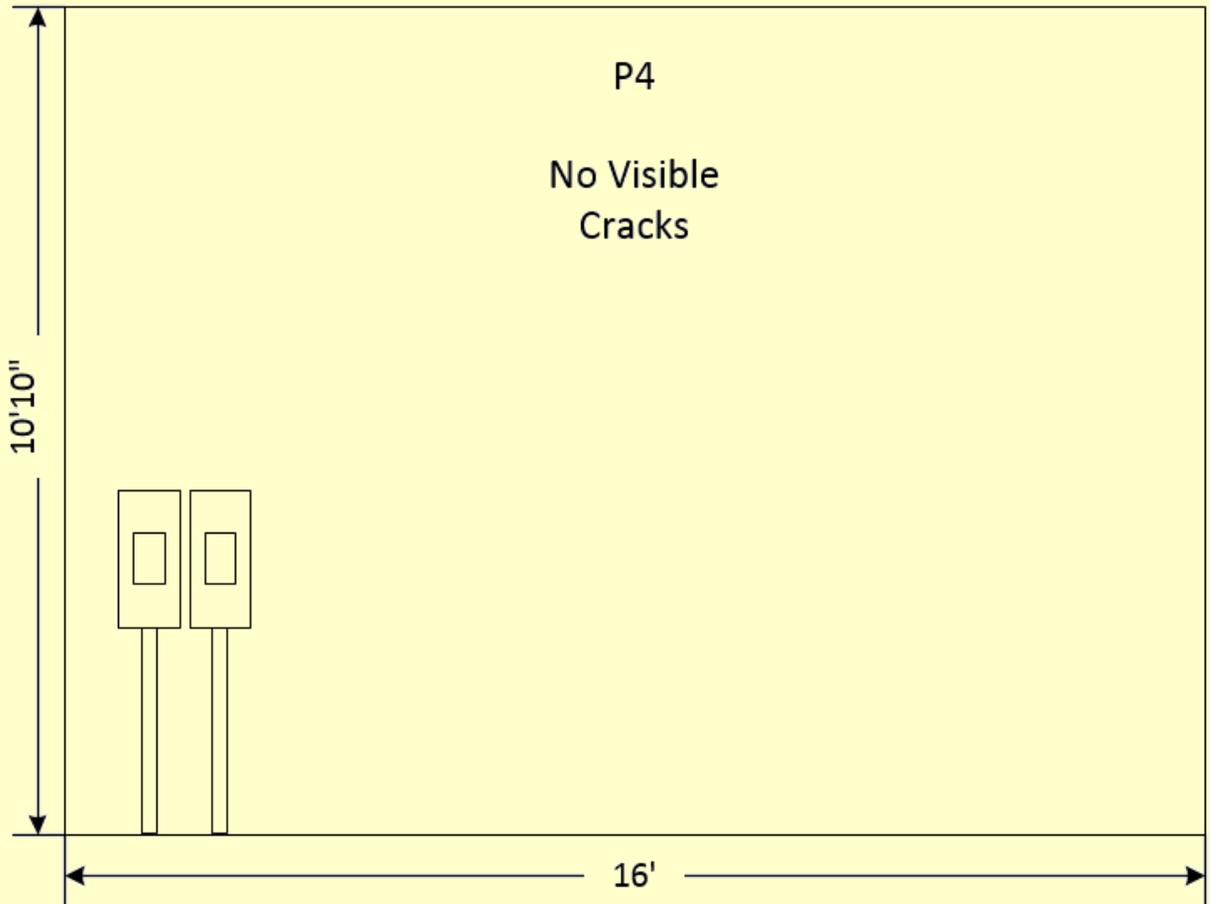


Area in SF	LF Cracks	LF Cracks PSF
108.3	75.08	.70



Area in SF	LF Cracks	Cracks PSF
303.14	0	0

2001 - 2015 – No Cracks
Panel – P3 Two Coats with Roller
(Required 12 mil coverage)



Area in SF	LF Cracks	Cracks PSF
173.28	0	0

- A back section originally painted with an airless sprayer cracked circa 2005 - 2007 just like panel P1 and P2.
- This section however was not repaired, but left alone until 2010. The result was rusting of the lath so severe that the section had to be cut out and re-lathed and stuccoed. It was then properly re-coated and remains in tact today (2016)
- The removal area was extended until non-rusting lath was observed.
- The affected area did not extend down to the slab, but rather down about 2 feet from the entry crack line.
- There was no damage at the bottom of the wall – negating the weep screed drainage argument. The water only migrated down to a point where it stopped absorbing into the stucco. Obviously, over time, the damage would extend all the way down to the bottom.
- This damage manifested itself between 2007 and 2010, or in 3 years the wall **section** (not the entire wall) moved from repairable to non-repairable.





Fenestration

WINDOWS

- Windows and window surrounds are a common source of wall water intrusion.
- Frequently however the apparent source is not what it seems.
- The ASTM C-926 standard states: 7.3.4 Separation shall be provided where plaster abuts dissimilar construction materials or openings. (See A2.1.4.) So lets look at that provision...
- A2.1.4 To reduce spalling where **interior** plaster abuts openings...
- So, do you need to separate a window from its exterior surrounds? Depends Look at Figure W-1 below:
- This photo shows a casement type window set in a wall using open framing. This window must be separated due to the type of fenestration frame – other types may not require it.
- The separation will have a round foam backer rod inserted (to prevent 3 point adhesion) and then a quality sealant applied and tooled with spatula to seal the gap.

Figure W-1



- There are basically three types of window jamb/ sill configurations shown below in Figure W-2.

CENTER FIN

- The center fin type may be extruded with a sealing fin and a stucco stop receiver. If so, no separation is needed, only the ability to provide a bead sealant around the perimeter of the extrusion at the face of the stucco.

FLUSH FIN

- This configuration is for flush mounting usually on a wood or other smooth surface

NO FIN

- These windows have a jamb that protrudes through the rough opening and must be separated from the body of the stucco with some type of casing stop.
- This was the prevalent type of casing when the standard was developed and is still produced today.
- Figure W-1, *supra* is an example of a casement window. It needs the "J" channel (casing stop) to separate the dissimilar "through wall" jamb from the stucco body.

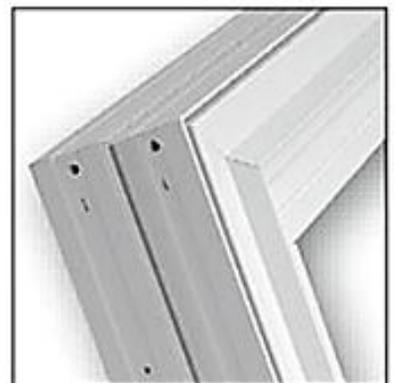
Center Fin



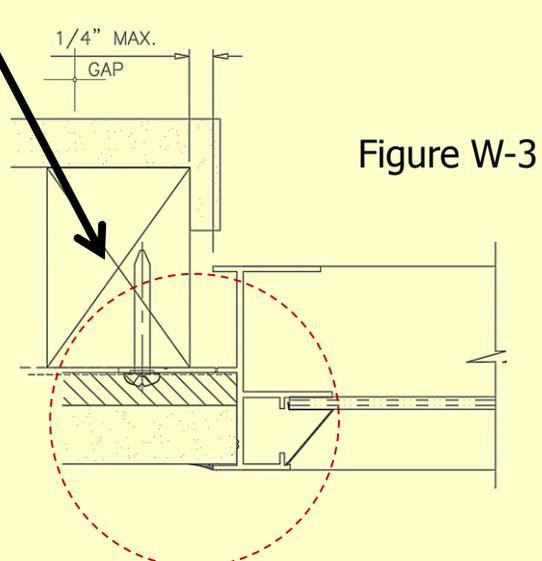
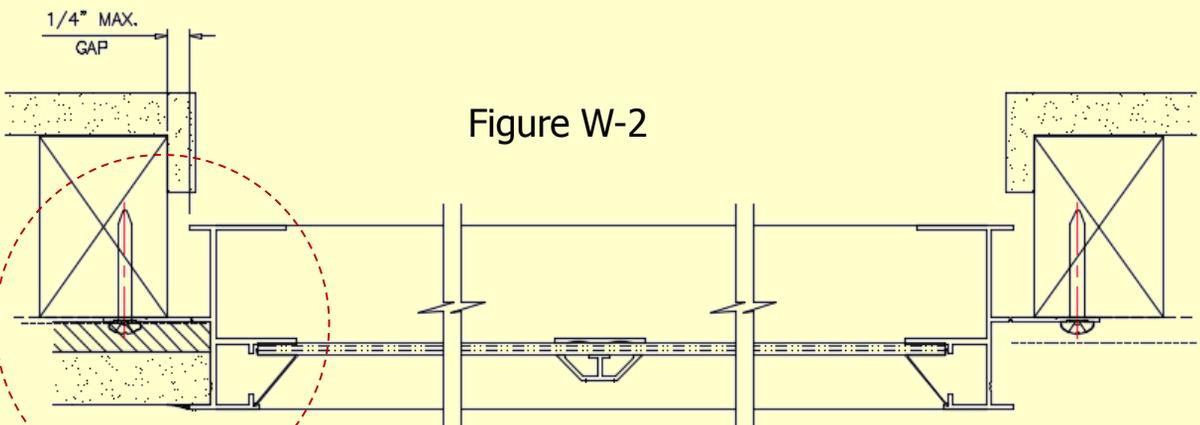
Flush Fin



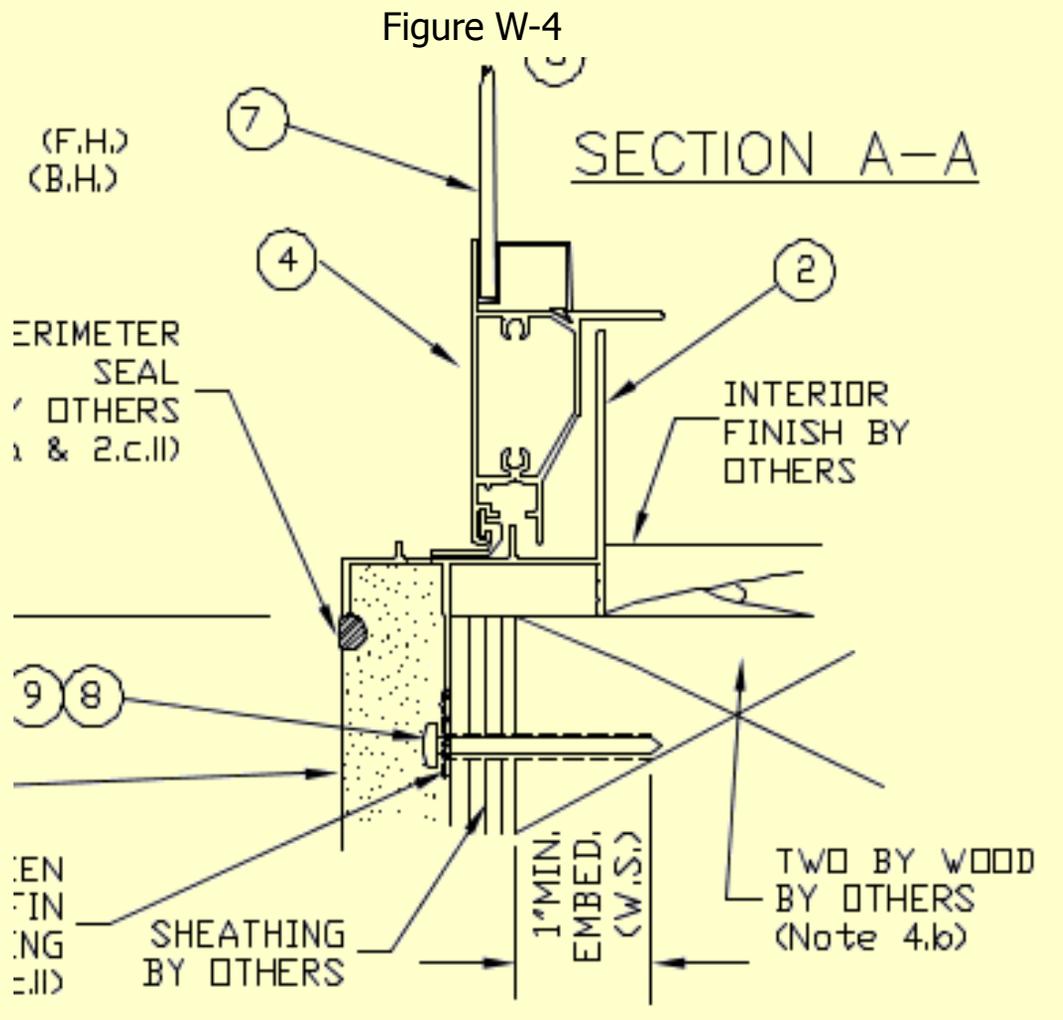
No Fin



- Refer to Figure W-2 and W-3 below. This is a section view of a window with a casing stop as part of its extrusion. Its mounting fins are flashed to the Weather Resistant Barrier. It has an integral receiver that can be used as a stucco casing stop.

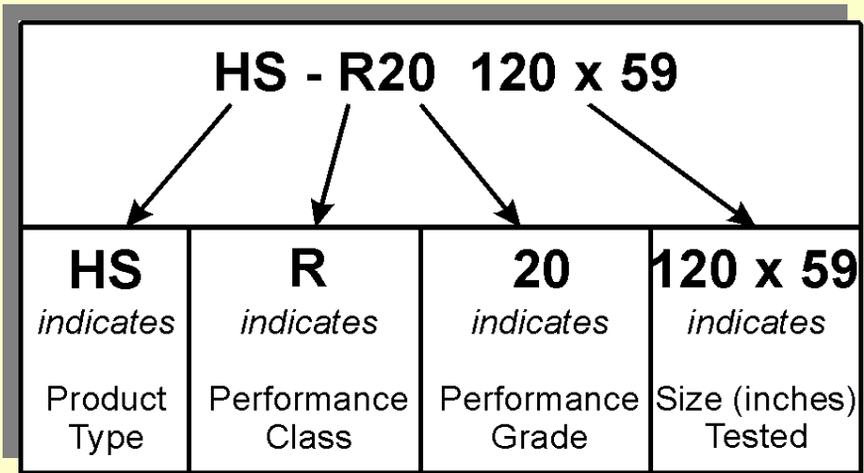


- Refer to Figure W-4 below. This is a section view of a window with a casing stop as part of its extrusion that has Florida Product Approval. It's mounting fins are flashed to the Weather Resistant Barrier. It has an integral receiver that can be used as a stucco casing stop. Interpreted literally, if you follow ASTM C-926 and separate with a casing, you violate the manufacturer's instructions – which violates code requirements. Catch 22. But, the code is not meant to be applied literally for each provision, it is supposed to be applied logically by those who know – not those that assume...



- Windows, like most other products are available in differing grades. The basic window, commonly referred to as a “commodity window” must meet two criteria for code product approval.
- First the glazing (glass window pane) must be rated for its ability to safely resist positive and negative wind loads. The rating is issued in pounds per square foot (psf) and referred to as the “design pressure”.
- Secondly, the window’s pane assemblies, its jamb (vertical frame section), sill (horizontal frame section), mullion bar (joining section for two or more assemblies) and other components must resist water intrusion. Its rating is also in psf, but is a fraction of the wind load rating.
- In other words, the window assembly may have a design pressure of 15 psf yet only need to be water resistant to 2.86 psf. The window type, class, grade (design pressure) and maximum size tested is printed upon a gold label affixed to the upper head rail of the frame assembly. Commonly referred to as the AAMA label.

 MEMBER	QUALITY CONTROL & TESTING AAMA CERTIFICATION PROGRAM ACCREDITED BY: AMERICAN NATIONAL STANDARDS INSTITUTE	This product has been rated in accordance with: ANSI/AAMA/NWDA 101/1.S 2-97 HS-R20 120 X 59 Series: 2600 P.L. # 056-003
	VALIDATOR: ALI [®] Mfr: XXXXXXXXXXXXXXXXXXXX Code: XXX-1	



- Now that we know that the corners of the window frames are only tested to a fraction of their design load, and considering that marginal errors in sub-framing, over torquing of fasteners and the fact that inherent building stresses collect at these interfaces, one might expect these junctions to be considered maintenance critical especially owing that the factory sealants installed were just enough to pass certification.
 - You'd expect, wouldn't you, that when diagnosing envelope intrusion issues, testing of these areas would be included in any protocol by a professional posing as an envelope expert.
 - Yet, many consultants aren't even aware of their contribution at all.
 - Even worse however, many consultants know (but avoid indicating) mention of their contribution in their report. The reason is simple; because, like coatings and sealants, they are ineligible for legal pleadings as "code violations." Furthermore including them will most likely subject the cost of repair damages to defensible offsets, diminutions, allocations, elimination or other defensive tactics including Motions for Summary Judgement.
- This, of course, does not suit the goal of the percentage based fee award for the legal team and most likely will end the attorney's relationship with the consultant.
 - So many consultant's who knowingly are writing conclusory reports stating absolute findings without required testing and alternate evaluations - justify themselves by the reassurance that, after all, these are just "opinions" aren't they.
 - Rather disgusting isn't it?

- Examine photos W-3 and W-4 below from two different jobs.
 - The home inspector (not to be confused with a governmental building inspector) and consultant simply pointed to the provision of an ASTM document requiring casing separation as shown in Figure W-1, supra.
 - No attempt was made to determine flange configuration, no window frame testing, no source tracing, no extent determinations, no repair protocols, no objective analysis to the application of the cited violation itself, etc....
 - Just the “code violation” and requirement to tear off all of the stucco cladding, tear out interior drywall, remediate unknown and unidentified mold, repair unsubstantiated amounts of structural sheathing and studs, and reinstall everything “correctly”.
 - Under the current litigation fiasco, for the most part, the inspector is assigned the “code violation” aspect, and a separate construction estimator is engaged to apply the maximum scope and repair cost that can be extrapolated from the home inspectors report.
- The cited code “violations” can be analogized to a drywall, concrete or rough framing installation. Look hard enough and you will find drywall violations from the gypsum GA-216 installation manual, violations from the ACI-318 Concrete manual or a nailing violation or deviation from the ICC 600 manual. We accept these and provide safety factors and redundancy provisions to accommodate.
 - Although these deviations may be minor, they are “violations of the code” nonetheless. They are not however a “Material Code Violation or Breach” which is a serious violation. We make that distinction in code – but it is not an understood component in law heretofore. We are working to change that, ‘till then we will continue...

Figure W-3 and W-4 have green arrows that point to the item the inspector and consultant pointed to noting lack of a required separating casing bead as the cause of the leak and noting them violative of the code. The red arrows are added by the author and denote the more likely source. Testing needs to determine source.

Photo W-3 – Close up at built-out window band

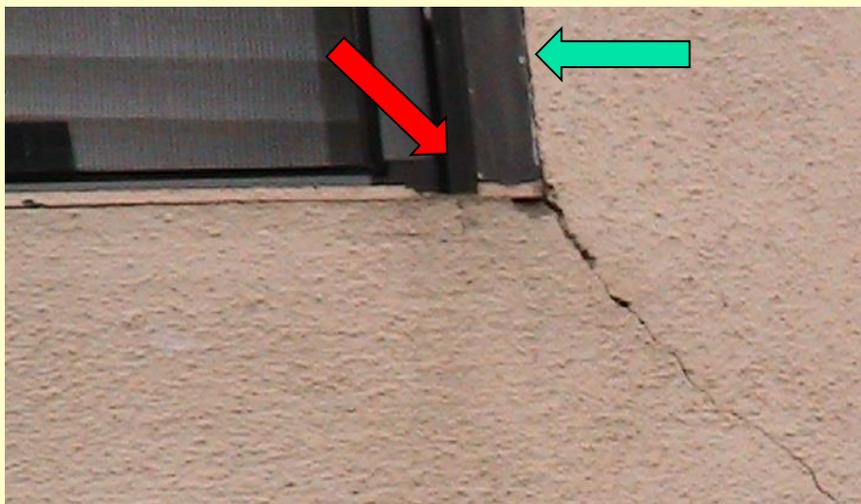


Photo W-4 – Close up of window with flush wall stucco



It should be noted that I would simply require the window be remediated around its perimeter (satisfying the inspector and consultants concerns) and remediate the jamb/sill junction at the same time. This protocol will fix any condition present and can be performed for a minor cost amount. But, it will not serve the “tear-off all” mentality of the percentage based litigation.

Photo W-5 – Flush window installation – No casing separation



Photo W-6 – Flush window installation – No casing separation



Look Familiar – Interstitial Infiltration has created minor mold on interior

Photo W-7 – Close up – Arrows point to water intrusion points by testing



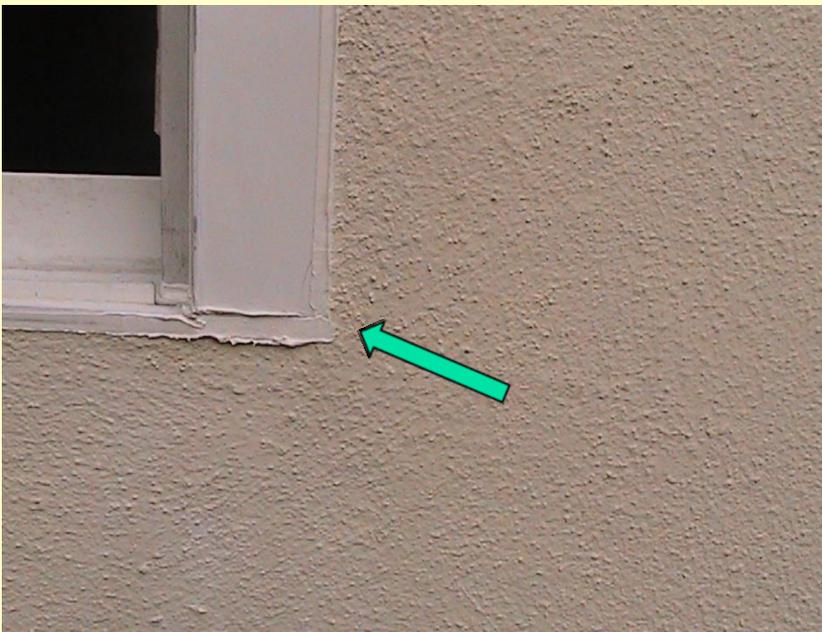
Photo W-8 – Close up – Repair protocol in progress



Photo W-9 – Close up – Corner repair seal complete



Photo W-9 – Close up – Perimeter separation repair complete



Applicator being used. Material tooled in-place with small sealant spatula

Photo W-9 Application in progress (different window from previous photos)



Another example of sealing repair protocol

Photo W-10 – Example window jamb/sill joint leak



Photo W-11 – Example window jamb/sill joint repair



Photo W-12 - What say you?



Photo W-13



Photo W-14 – Close up – Window jamb/sill leak.
Although as previously stated, the remediation
protocol will seal the perimeter frame also.





Banding and Accessories

Photo B-1 – This banding has been correctly installed. It was being removed due to a misdiagnosis indicating it had been installed incorrectly and was the source of water intrusion. The water intrusion was finally determined to be from the fenestration – not the stucco band.



Photo B-2 – This banding has been correctly installed. It was being removed due to a misdiagnosis indicating it had been installed incorrectly and was the source of water intrusion. Water intrusion was from the jamb/sill junction – not the stucco band.



Photo B-3 – This banding has NOT been correctly installed. It needed to be completely removed due to improper installation. The foam was attached to the metal lath and stuccoed contemporaneous with wall. Alternatively, opposing casing stops wider than the wall stucco are attached directly to the lath and filled with stucco at the same time as the wall stucco (see Photo B-6, *infra*). These methodologies are, and always will be, fatal to the envelope integrity without elaborate, integrated head flashing in the wall above and over the band work. Even this is rarely done correctly – almost impossible to integrate with any drain plane or face barrier system.



Photo B-4 – Banding removed from photo B-3. Note the damage over the lower window header from the upper banding placement. Adjacent walls were not as severely damaged due to water and vapor being able to be dispersed within and behind the stucco mass below.

Over the windows however, not only is there water intrusion, but there is a more radical temperature change providing for the activity of water vapor (Aw) to elevate and colonize fungal growth. Additionally the water/vapor had no other place readily to disperse – therefore increasing the time for the elevated moisture exposure. These conditions are disastrous. Period. But they are regionally repairable and do not normally require wholesale de-skinning.



Drawing B-4 – Infra-red on a similar configuration of banding. Waterways pathed out window corners, window bands, horizontal banding and plastic corner beads all source of intrusion. Good news, we know where they all are and can now (and did) develop the repair protocols.

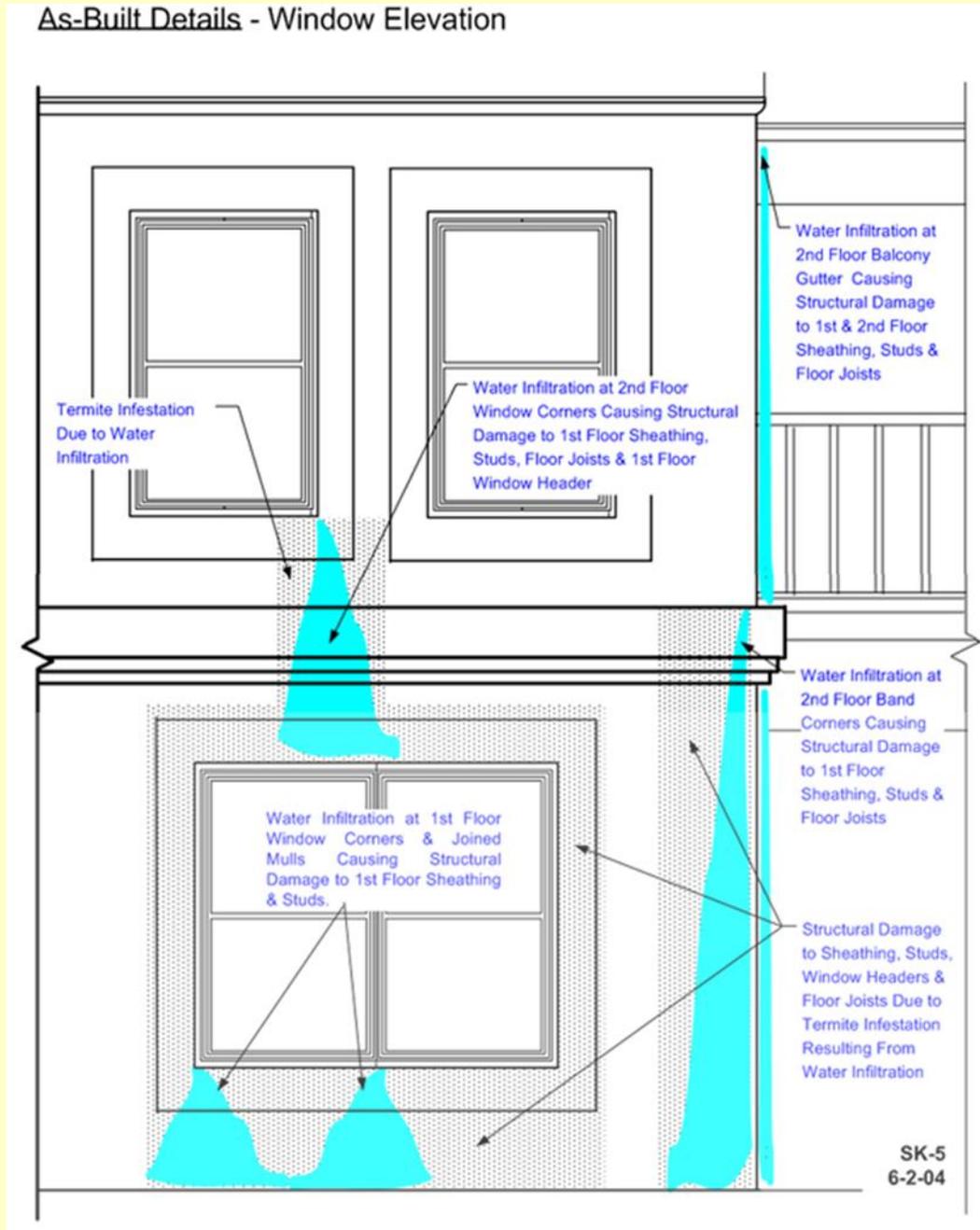


Photo B-5 – This should be self explanatory by now. This condition is so obvious you can see it before you get there!



This is a band over a band. Both are attached directly to the lath and stuccoed at the same time as the wall.

Anyone trained can see this won't work. Where is the common sense...

The bright side however is the wonderful property of stucco – it's reparability!

This is a fairly inexpensive repair protocol.



Photo B-6 – This banding has NOT been correctly installed. The banding is formed by wider casings installed directly on the metal lath. These practices are problematic for several reasons; 1. They place great thickness changes that are directly incorporated into the wall plaster with cold joint breaks on the banding. The ASTM standard is critical of paper over metal lath because the additional 1/8" change of thickness may trigger horizontal wall cracks since the source goes all of the way back to the metal lath directly – well this change is 1 inch!!! Are you crazy or what?



2. The horizontal expansion and contraction rates will be different than the wall. Granted, you have it separated with a casing stop, but what type of backer rod and sealant have you detailed to accommodate for that movement? 3. If you are using a drainage plane system, these interfere with the sub-stucco drainage due to fasteners, mass and configuration or placement of the mid-wall weep mechanism. If you are attempting a face barrier system, good luck – the laws of probability are against you with such inherent wall movement and casing stops that lead directly to the lath surface. Use all the peel-and-stick you want, success is rare with such configurations.



Accessories

Photo C-1 – This is the old way of creating a solid outside corner, you know, the one that worked forever. Its called “rodding”.



Photo C-1 – More “rodding” progress photos

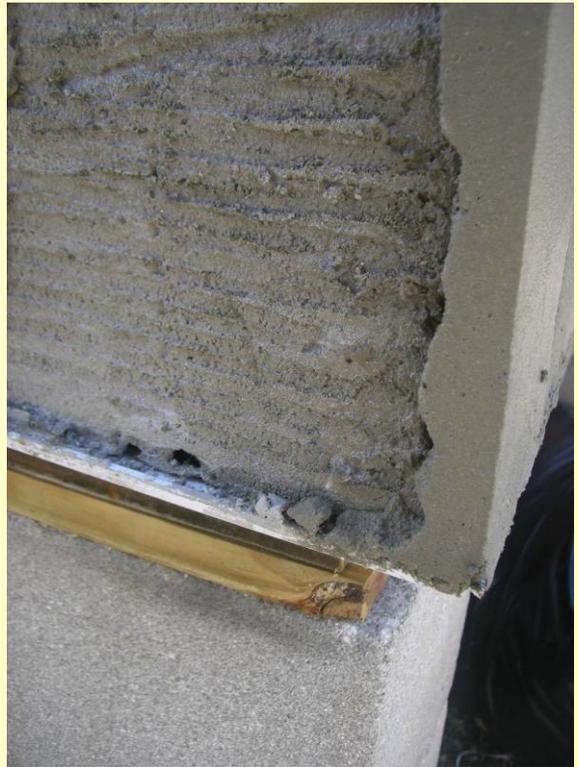


Photo C-2 – Plastic corner bead



The new way and its consequences

Photo C-3 – Where the Plastic corner bead was improperly installed, sealed and prepped for stucco.



Photo C-4 - When you see this, you have trouble. Severe consequences are around the corner if you wait to repair



See, I told you not to wait. Photos C-5 and C-6. 12 – 24 months can mean a lot when staving off damage extents



Section 17 – Control Joints

These have been called “expansion joints”, “control joints” and “contraction joints”. They should however be referred to as “panel joints”.

Many have eliminated them from their applications (such as the author) due to their difficulty of proper installation and more importantly their un-necessity.

The author (and many more) has projects over 40 years old without them that are still performing perfectly. Others, such as Bucholtz in California, have railed against their reasoning, purpose and need for decades. Yet, still, their necessity and interpretation of their origin remains a mystery to many.

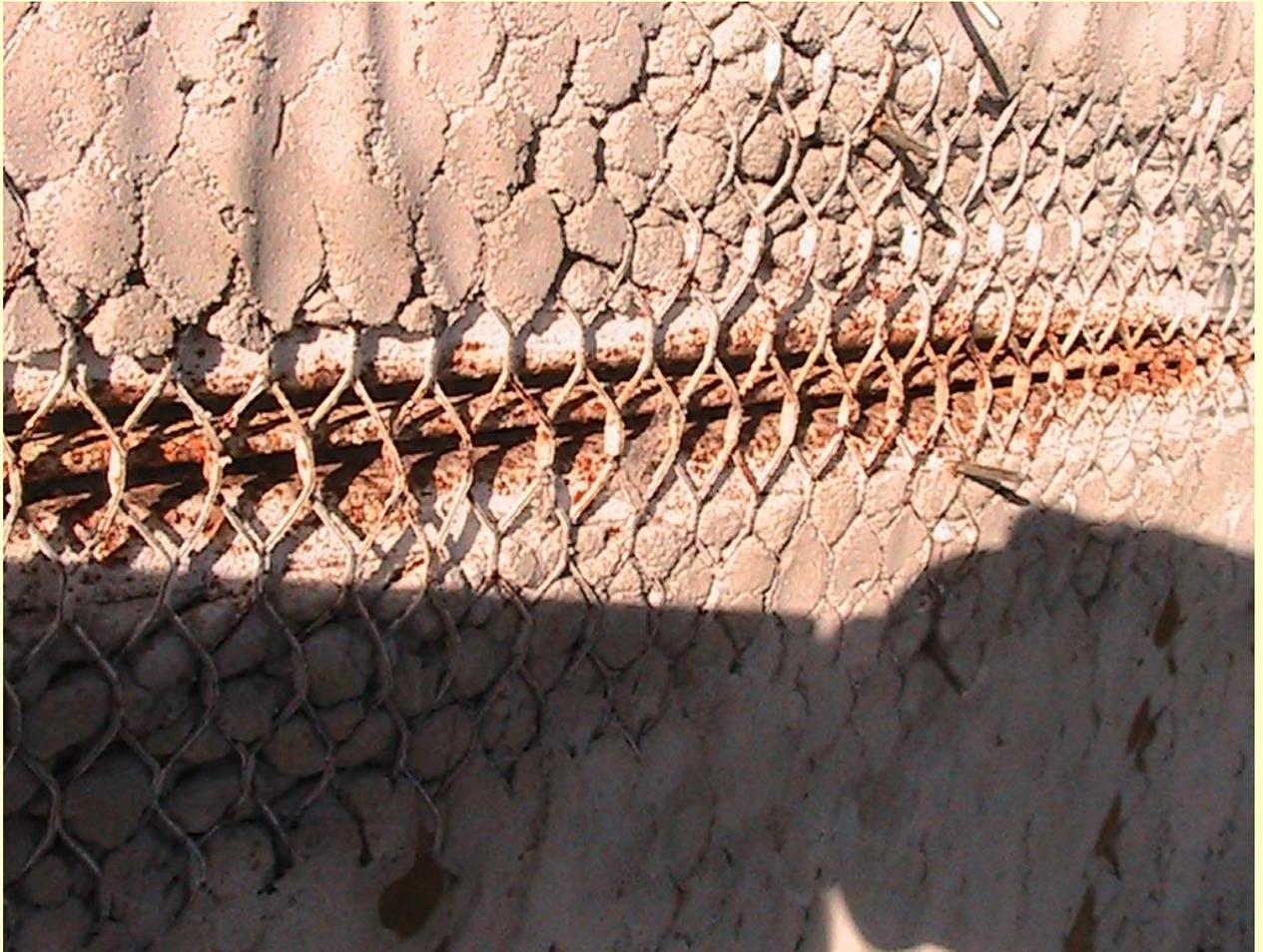


Paper over flange provides a direct water route to substrate





Paper over flange provides a direct water route to substrate



Salt air corrosion from free air circulation behind stucco at drain plane. Photo is the back side of a control joint where air circulates effortlessly at these locations. Also shows continuous lath behind joint. Unless otherwise specified, ASTM C-926 and 1063 recommends the lath be cut. This is a controversial requirement. The lath exhibits no signs of stress from expansion or contraction, just rusting from atmospheric conditions.

Incorrect Application – Accessory Flange not “Fully Embedded” in the cement plaster



Paper over flange provides a direct water route to substrate



Incorrect Application – Accessory Flange not
“Fully Embedded” in the cement plaster



Paper over flange provides a direct water route to substrate



Cracks do not “align” vertically at a control joints – the wall cracks in the same manner with or without control joints.



Even though paper had NOT blocked the accessory's flange – still incorrect application – Accessory Flange not “Fully Embedded” in the cement plaster



These types of accessory flanges are difficult to apply correctly and achieve full embedment

Trouble. Stucco contractor should have provided a key way for sealant – painter should have put one there if one was not. Builder should have caught the error. Instead – all did nothing but leave a leaking wall assembly.



Section 18 - Roofing and Wall Flashings

The following slides are to point out the necessity for correctly fabricated, correctly installed, correctly sealed and correctly sequenced flashings and terminations

- Water path directly to the substrate





Section 18 - Water Intrusion at Roof Flashing behind Stucco Bands. This is a mess. Bad design, bad band installation, bad roofing flashing, bad fascia installation, bad wall accessories, bad painting, bad sealant (non-existent)





Section 19 - De-Skin

The complete stripping of the stucco exterior down to the bare plywood or OSB board is termed "de-skinning" a building. The fallacy that most stucco cannot be repaired is just that – a fallacy. It is an extremely rare project that requires de-skinning. Most repairs (including the identification of deteriorated substrate areas) can be outlined or identified prior to repair work.

Protocols for repair should identify the original cause or causes, outline the scope of work and detail the reconstruction of any removed areas.

The following photos show a house diagnosed by the "con" sultant" as requiring a complete de-skin.

The un-necessity of such a recommendation is self evident.







Section 20 - Other Sidings

Think stucco is the problem? Look at some of these other sidings. You will soon come to the realization that it is not the claddings or sidings – it is the interfaces and waterproofing of the envelope that provides our protection.

Section 20 - Deterioration behind peel-n-stick.
Bad Lap Siding? How did the water get there?









Section 20 - Window Trim Seal or Window corners themselves





HOW WE GOT HERE

- How did we get here in this quagmire of codes, bad work, blame and accusations?
- Until about the 1940's, the construction process was largely performed the same way it had been since its inception.
- From mid 1940 to mid 1970 – the entire process changed, and, to a degree, we are suffering from that change today.
- Prior to the 1940's – a contractor built a client's home almost entirely with its own employees. They performed all the work scopes. It did not benefit a trained worker to cut corners – if the wall wasn't square, he would have to scribe and cut all the woodwork to fit later on. With a handsaw! Therefore, workers had a personal incentive to perform work correctly.
- This presented another reason to ensure that each aspect was well done and correct. Not only you, but all of your co-workers, had to deal with your mistakes – and you had to work with them every day.

- Back then, workers were cross trained in almost all disciplines. Even the carpenters worked and coordinated the work with the lead mason or bricklayer.
- All worked together to attain the goal of constructing with as much ease as possible without redoing any of the work.

THE BIG CHANGE

- By the mid 1970's – all work had become specialized. First the plumbing, electrical, and mechanical trades. Next the masons, concrete, framers, tile setters, drywallers, painters, roofers, cabinetmakers and others – all were now independent contractors.
- People began to refer to contractors as "contactors" since all they did was "contact" each subcontractor and schedule his or her activities.
- So in 30 years – the industry went from a contractor doing everything to doing virtually nothing regarding "hands-on" work processes. The quasi-assembly line process had begun. It started to become a business rather than a profession.

- But we remained somewhat sheltered from that effect, since the builders, even though not directing the work by way of their employees, KNEW how to do it, and saw that it was done properly.
- The initial group of subcontractors came from that same trade-pool and they too, understood aspects and intricacies of other trades.
- But as time has gone along, we have specifically licensed each trade, cross training has gone away, builders are licensed with jobsite or classroom training -- but usually for the estimating, scheduling, supervision and structural aspects only.
- Very few builders have ever installed flashings, shingles, waterproofed, framed, plastered, trimmed, installed fenestrations, or actually laid block.
- The field experience is relegated to each specific trade, which would work, if they all were able to talk and learn from each other. But alas, they often don't.
- Just as many of the seasoned building supervisors have left the trade, so has many of the subcontractor's seasoned supervisors.

THE MODERN HOUSE

- Having said all of this, the modern house is quite a feat in its construction methodologies and deliverables.
- We control our environment, our temperatures, our energy consumption, our sanitary necessities, and our surroundings with the modern design.
- Our families are safer from wind and wind borne debris, flooding and environmental anomalies by way of improved residential design and code provisions.
- Now you see, it's a complicated infrastructure and I know of no specific answer – I can only summarize the facts and conditions of construction for your peruse.

- EVOLUTION OF STUCCO
- Exterior stucco historically had been installed by the plasterer. The plasterer “rock-lathed” the interior and, if the house was framed, wire lathed the exterior. The interior of the house was brown coated, and the outside was “scratched”.
- Remember you had wet gypsum plaster on one side of the wall (interior) curing and wet cement plaster on the other side curing.
- When the plasterer returned to “white coat” the interior (slacked lime and fine sand), the second and sometimes third stucco coat(s) were installed on the exterior with the same slacked lime, now mixed with Portland cement and coarse sand.
- Plaster gave way to drywall and plastering died. Stucco contractors could not afford to make two trips so the application morphed into a single stop process but still employed multiple coats.
- This newer application method proved as performing as its predecessor and sometimes superior – largely due to newer blended cement – lime formulas with added modifiers.
- However, production demand increased for both stucco and painting contractors.
- Stucco contractors began to “lay-up” the scratch coat over metal lath using “slicker-sticks”.
- This yielded faster production but some contend that this method fails to fully encase the metal lath with the plastic cement. In other words, the slicker only partially fills the voids of the lath using an upward sweep – whereas a hand application provides an up-down-up troweling motion with pressure that fills all voids.
- Opponents of the slicker method contend that it leads to excessive cracking. However as of this writing there have been no studies which confirm or deny this contention – just field experience testimony.

- The painting contractor and the stucco contractor have been further disconnected.
- Many stucco contractors are not cognizant of the need to leave “grooves” to receive sealants or provide a smooth enough texture to ensure a good base coat of paint.
- Many painters have degraded their installation by way of inefficient application of coatings, ineffective sealant beads, and improper preparation of exterior surfaces.
- Fenestration quality, roofing configurations, flashings, coatings, substrates, building stresses, material types, orientation, building types, occupancy classifications and geographic locations all play a part.

OUR REGION

- The “old-timers”, whom it was my honor to work with and learn from, all shared concepts and knowledge about specific regional differences and conveyed the “I don’t care how you do it there – this is the way you need to do it here” attitude. Politely – but firmly.
- They all looked out for other trades – each left a suitable substrate for the next and you could depend on the next one to perform his task competently.

STUCCO’S ROLE

- Stucco is but one component in a multi faceted, multi-component building envelope system. The science and principles involved are not simple in many cases.
- Successful building envelope performance is not an accident – it involves several sciences and disciplined installers.

- I still remember in the late 1970's when the "drain plane" concept was brought to Florida - then as a standard not yet adopted by code.
- I still remember the seasoned plasterers (one in particular) who said: "You cannot put a vented drain plane behind a stucco covering in Florida - anybody with knowledge of Florida conditions knows that cannot work here, salt air will get behind the panel and rust the lath and fasteners".
- They said, "you can do that in the Midwest, but not in Florida boy....you need to face seal the system here".
- People didn't listen, some were installed, and they failed. We cut out most all of the "weep-screeds", sealed them up and installed a proper coating.
- Most of us reverted back to the old way and all was fine until the advent of: commodity windows, loss of overhangs, paper thin application of paints and "beauty beads" in lieu of sealants - and homeowners who would not maintenance their home.
- Although construction methodologies have changed – stucco is essentially the same product it was 50 years ago. It is so because it works, and works well.

SUMMARY

- The ASTM C926 and 1063 are EXCELLENT documents, for their application and scope of intent.
- Necessary regional modifications is why the standard includes the "unless otherwise specified" exception.
- They may or may not be installed verbatim depending on regional or job specific requirements, allowing design professionals or experts the ability to modify provisions in order to design a proper regional system.
- Florida has used a "Face Barrier" system for decades without failure – provided all trades perform their tasks professionally.
- With rare exception, your stuccoed house can be repaired easily and cost effectively.

- True construction professionals will diagnose your house starting with items such as; determining where your leaks are located, what your problems are, what are your concerns, do you want an environmental air sample analyzed, etc....
- Next, your involvement, your maintenance, your mitigation efforts will be discussed.
- Next, extraordinary influences will be addressed such as; was there pressure washing, if so, how often, what nozzle type and orifice pressure. (Pressure washing is a common initiation of envelope breaches), do you have any internal temperature extremes, what are your internal wall coverings, etc..
- Next the envelope components will be addressed and analyzed; what type of fenestration, what are their pressure ratings, exterior coating thickness, sealants, flashing etc.... all will be evaluated if indicators warrant.
- Protocols will be developed such as Infra-red surveys, fenestration testing, wall (Rilem tube) testing, moisture mapping, etc..
- Lastly, a report or repair protocol will be developed and you will then know exactly what you need to do to repair and maintain your house.
- These procedures are outlined in concept in the ASTM document E2128. Google it.
- If your professional is sent out by a legal team, bores a few holes, looks around and concludes your house needs to be deskinned, windows replaced, internal drywall replaced, etc.... (usually around 50 – 70 thousand dollars in repairs), then you have yourself a genuine “con-sultant” performing legal pleading services.
- You do not have a knowledgeable waterproofing professional serving your interest.
- You may eventually win, and think him a hero, but, if you do not, its not a pleasant pill to swallow. (The lawyers usually win either way)
- So, decide if you want your house repaired or if you want to join the latest and greatest lawyer relief funding process..

- Well you have been exposed to a lot of information that needs processing.
- The simple fact of this situation is that we need to all work together to ensure the longevity of any building's envelope.
- A building's envelope serviceability begins with the design professional, proceeds to the building contractor, then to the framing, roofing, fenestration, stucco, painting and other contractors.

ROLE OF THE DESIGNER

- Design using regional and industry practices. Provide adequate details and specifications for waterproofing.

ROLE OF THE CONTRACTOR

- Build and construct according to regional and industry waterproofing standards and codes. Keep everyone on the same page; the outcome of a watertight envelope.
- Select competent sub-contractors and ensure that they maintain an "outcome" attitude of a serviceable building envelope.

ROLE OF THE INSPECTOR AND CODES

- The codes were created so the building department to help ensure the life safety aspects of the buildings.
- The building official's role is necessarily limited to the specific items codified in the code to be inspected for compliance. These are plumbing, electrical, mechanical, and structural items.
- The building official is ensures these life safety elements. The building official does not ensure you a well designed or well built home or a serviceable envelope.

ROLE OF THE OWNER

- Maintain all exterior components and surfaces.
- Invest in the longevity of the home exterior.
- If an envelope problem develops – seek competent professionals that convey a solution rather that document opinions of problems.

- This article was written by Robert J. Koning, Director of the Contractors Institute, Founder MyFloridaCode.com and its discussion group, Founder Association of Certified Construction Professionals, President of Grace Industries, Founder of the Stucco Institute, and President Koning Construction Consultants.
- You may contact him at 727-863-5147 or robertk@koning.com
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