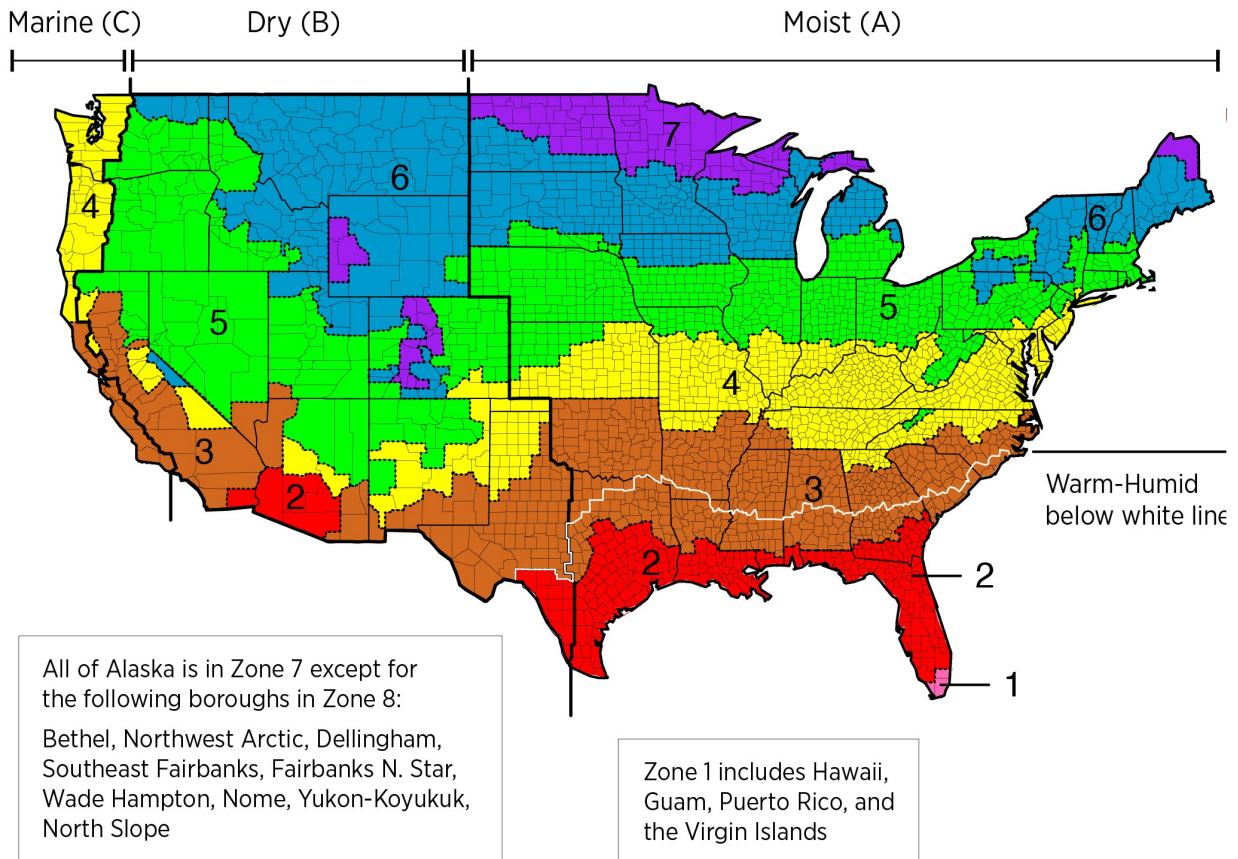


Stucco Facts, Misunderstandings And Common Stucco Myths Climate Zones 1 and 2 TB-108-17a

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COMMON STUCCO MYTHS, MISUNDERSTANDINGS AND FACTS

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Important Note: This bulletin was written in conjunction with Technical Bulletin TB-102A (Concealed Barrier vs Face Barrier Systems). Please refer to that bulletin for more in depth information regarding water management systems.

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INTRODUCTION TO STUCCO

The application of Portland based cement plaster (stucco) seemingly is a simple process; mix some powdered cement, lime, and sand (or mix preblended bags with or without sand) with water to form a paste and apply it to the wall. Seems a benign process, however the complexities are vast and needed modifications from base line application standards and procedures are required for varying regional climatic conditions in order to provide a workable building envelope system.

When stucco is applied directly to cement masonry units (CMU's) *a/k/a "Blocks"*, poured concrete or other such solid cementitious base material that provides a "bonding" ability, it is referred to as a "Direct Bond" application or simply stated as "Direct Applied" stucco. If it is applied onto metal, wire or other lath (lath is usually applied to a framed wall covered with sheathing), its a "Keyed" attachment system - meaning the lath is attached to the wall studs or sheathing, then by way of openings within the lath, the wet plaster "keys" to the lath when it is forced through those openings. This method is simply referred to as an "Indirect Bond or Indirect Application".

The current ICC (and Florida) codes contain some prescriptive international provisions for the application of stucco as well as referencing the ASTM C926 Standard titled: "Standard Specification for the Application of Portland Cement-Based Plaster" as an application standard. It is important to note that this standard was developed in the early 1970s for stucco applications sited mostly in arid regions having low wind velocity with lower applicable wall zone pressures, and installed over open framing (vertical studs

left open or covered with a non structural sheathing). Stucco is indirectly applied using two application coats with a final "skim" coat of colored cement as a finish.

This final colored "skim coat" ($\approx 1/8$) is obtained by mixing white or gray cement with the sand and adding powered dyes to obtain the desired finish color - or pre-colored cement bag mix is purchased and applied. No painting of the stucco was ever contemplated. Virtually any color the owner desires can be mixed or purchased.

This type of colored cement shell finish will provide a virtually maintenance free exterior - however it does have some drawbacks and limitations;

First, on direct applied systems a 3/8" level suction base coat (to which the last 1/8" final shell colored stucco coat is applied) must be applied, densified, rewetted and allowed to cure (usually 5 days). Then this cured 3/8" base coat is used to provide a uniform suction plane so the final shell color coat will hydrate and cure evenly providing a uniform wall finish color . Otherwise the colored stucco will appear blotchy and mottled if it dries/ cures/hydrates unevenly. Applying and curing this 3/8" base coat adds cost and time to the project.

Second; the colored stucco does not work well in regions of high humidity especially where average outdoor humidifies are greater than the indoor humidifies. In these regions, the vapor drive is from the outside through the plaster assembly towards the inside. On indirect bond applications (over metal / wire lath), this can manifest to high moisture gains behind the plastering sub-cladding creating efflorescence, condensing vapor, corrosion, fungal growth, and pollutant staining from migrating impurities. On Direct Bond applications, this can lead to visual telegraphing at mortar

joints, poured cells, poured columns, etc. All as a result of high humidity loading. In these high-humidity regions, both system application methods usually result in shell finish color coat that is blotchy, moldy, uneven, and marked with substrate telegraphing rendering the colored shell finish visually unpleasant and functionally inefficient. These will appear within the finished coat even though there is an adequate cured base coat behind it. Therefore, face barrier systems are preferred in these high humidity regions in lieu of the colored shell finish systems.

It is for these reasons (and others not discussed herein), that most referenced standards need to be modified for regional application to a “Face Barrier” system (two coats of stucco with a coated (painted) and sealed system) rather than a “Concealed Barrier” system. See attached **TA-ST-#5 - “Water Management Systems”** which has been attached to this Advisory for your convenience.

LATHING

The ASTM 1063 is titled: “Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster” and is intended to address this metal lath / wire application process. However, again, this document was written for metal wire or lath attachment (and accessories) that are placed over open framing or non structural sheathing in areas subject to wind speeds ≤ 115 Vult. Modifications may have to be made to the standard when the design wind speeds are over 115 Vult or when attached to Structural Panels for wind resistance.

The South Florida Building Code, (later included

in the Florida Building Code as the High-Velocity Hurricane Zone; a/k/a *HVHZ*) - officially adopted in the 1950s, eventually recognized the ASTM C926 for its mixing and proportioning information, but excluded its thickness table since its basis was to provide a base coat for the even curing of the colored overcoat which was rarely used in high humidity regions. In these high-wind, high-humidity regions a face barrier system (a/k/a *“paint and sealants”*), is placed over the final stucco application (in lieu of the colored finish coat) to provide color and resist both bulk water and vapor migration. Therefore, stucco over the wall (prior to coating) was purely cosmetic and only needed to be applied as a “Skim Coat” as defined in the Florida Building Code as a “Decorative Cementitious Finish”.

The South Florida building code and its HVHZ provisions never adopted the ASTM 1063 for the application of metal/wire lath since its fastening patterns did not meet their 2 fasteners p/s/f for high wind regions and its accessory integration was designed for a colored stucco finish application, over open framing or non structural sheathing - none of which are common in high wind regions.

The creators of the stucco application standards were well aware of these facts and were not attempting to create a “global” application standard where all provisions were to be considered as “mandatory”. Accordingly, the standards are rife with provisions to allow these modifications as needed. Since the standard was written by trained plasterers, to be used by trained plasterers, in real time during the application process, changes or modification of these provisions were ordinarily left up to the plasterer.

The following is a list of modifying and informational statements contained in current and past

standards along with other industry texts and manuals which recognize and bestow the right and need for regional and climatic modifications to referenced stucco installation provisions. .

COMMON STUCCO CONDITIONAL STATEMENTS

Metal bases and accessories used to receive plaster shall be installed in conformance with ___, **except as otherwise specified.**

Metal plaster bases, backing, attachment, and accessories to receive plaster shall be examined to determine if the applicable requirements of ___ have been met **unless otherwise required by the contract specifications.**

At the bottom of exterior walls where the wall is supported by a floor or foundation, a drip screed and through- wall flashing or weep holes **or other effective means** to drain away any water ...

Sealing or caulking of **V-grooves**, exposed ends, and edges of plaster panels exterior work **to prevent entry of water shall be provided.**

To reduce spalling where interior plaster abuts openings, such as wood or metal door or window frames, or fascia boards, the edge of three-coat plaster shall be tooled through the second and finish coats to produce a **continuous small V-joint of uniform depth and width.** On two-coat work, the V-joint shall be tooled through the finish coat only.

Note the difference between V Groove and V Joint - Discussed later in document.

COMMON LATHING CONDITIONAL STATEMENTS

Lath shall be applied with the long dimension at right angles to the supports, **unless otherwise specified.**

Foundation Weep Screed—Accessory used to terminate Portland cement based stucco at the bottom of exterior walls. This accessory shall have a sloped, solid, or perforated, ground **or screed flange** to facilitate the removal of moisture from the wall cavity...

Non-load-bearing members shall be isolated from load-bearing members, and all penetrating elements, with casing beads **or other suitable means**, to avoid transfer of structural loads, and to separate from dissimilar materials.

COMMON COLOR COAT STATEMENTS

Color material for integral mixing with plaster....

Color uniformity is affected to an even greater degree by variations in thickness and differences in the **suction of the base.**

When specified as **alternate for final coat**, trowel- or plaster machine-applied textured acrylic finishes containing aggregate may be substituted for Portland cement finish coats, provided brown coat is properly prepared and finish is applied according to the **manufacturer's directions.**

ACCESSORY DEPTH

Accessories serving as system grounds for an indirect system are set to a dimension of 3/4" to achieve a 7/8" thickness. The 1/8" colored coat is not part of the 3/8" scratch and 3/8" brown coat system grounds. Hence a 7/8" accessory ground would yield a 1" thick system. Typical language from various standards:

Application of Plaster Basecoats: Conventional, three-coat plaster is applied over a metal plaster base in two, nominal 3/8 in. coats. The traditional application brings the plaster brown coat out to the **lathing accessories which are set to approximately 3/4 in. off the substrate**. The lathing accessories that traditionally provide the plaster thickness screed point include the casing beads, used to terminate the plaster ...

Application of Plaster Basecoats: Conventional, three-coat plaster is applied over a metal plaster base in two, nominal 3/8 in. coats. The traditional application brings the plaster brown coat out to the lathing accessories which are set **to approximately 3/4 in. off the substrate**. The lathing accessories that traditionally **provide the plaster thickness screed point** include the casing beads, used to terminate the plaster into a dissimilar material, **control and expansion joints** installed in accordance with corner transition trims, typically used at a vertical to horizontal transition, and outside corner reinforcement.

Note the difference in the terms control and expansion joints in the above text - they are two separate details, serve two different purposes, serving two different functions and use two different installation methodologies. They serve either the structure (structural) or the plaster assembly when providing rustication, breaks, etc.

DETERMINING STUCCO THICKNESS

For Direct Applied Systems (e.g. over block):

1. If applied using a coated (painted) finish over CMU (block) or concrete —no specific dimension is required by code. The stucco is a “Decorative Cementitious Finish” a/k/a “Skim Coat” applied for cosmetic purposes.

2. If applied to a specific thickness requirement by the contract documents or code requirement (fire or structural application), the measurement shall be taken from the face of the solid bonding substrate to the face of the stucco exclusive of any finishing textures. To obtain depth measurement, carefully drill an ≈1/2" diameter core to the solid bonding substrate and measure outward to the face of the stucco excluding texture variations. Hammer drills or any other form of chiseling device should not be used in order to protect surrounding in-situ suction bonding.

For Indirect Applied Systems:

1. When applied over structural panels, plaster nominal thickness shall be measured from the surface of the outermost Weather Resistant Barrier (WRB) to the outer surface of the plaster exclusive of texture variations. To obtain depth measurement, carefully drill an ≈1-1/2" diameter core to the structural sheathing's WRB and measuring outward to the face of the stucco excluding texture variations. Hammer drills or any form of chiseling device should be not be used in order to protect surrounding in-situ mechanical keying.

Number of samples:

1. The quantity of samples should be sufficient to determine the average thickness of the system. Locations shall be randomized throughout the sample areas.

DETERMINING TOLERANCES

The interface of fenestrations, load path connectors, metal flashings, multiple overlaps of weather resistant barriers, bond breaking layers, flexible membrane tapes, normal wall out of plane tolerances ($\pm 1/4"$ in 10'), CMU differences, and mortar bed joint variables, etc., All affect the final plaster assembly thickness. Therefore any and all stucco thickness measurements should be considered "Nominal" and subject to an allowable $\approx 25\%$ variation from actual dimensional measurement requirements.

DETERMINING LATH EMBEDMENT

To determine proper embedment of lath, a sample size should be taken that follows the AC191 (48" x 48") testing specimen capable of achieving 50% embedment through the lath sheet. This establishes calculated target compliance criteria for in situ evaluation. This is the sample size that should be used to determine the proper **average** stucco embedment.

DETERMINING BOND STRENGTH

To determine tensile withdrawal resistance or bonding of in situ stucco assemblies, follow the procedures outlined in the current version of ASTM C1860.

Note: For direct bond applications, smaller area (diameter) pull plates may be used (for ease of testing) with appropriate mathematical area adjustments. These will yield a more conservative outcome.

For indirect applications this test will NOT determine **flexure loading** required by building codes. This can only be determined by approved laboratory assembly testing such as ASTM E330.

HVHZ - SOUTH FLORIDA CODE

This code is still in use today using the "unless otherwise specified" allowance and, after more than a 3/4 of a century of use, it continues with no problems

R4411-3.1.1 Portland cement based plaster shall be applied in accordance with ASTM C 926, **excluding Table 4 of that standard.** (Thickness)

R4411.3.2.2 Moisture barrier. Wood shall be covered with 15-pound (9 kg) roofing felt, **or other approved equally moisture-resisting layer**, and metal reinforcement as set forth herein.

R4411.2.3.4 Fastenings into wood sheathing or wood framing shall be by galvanized nails, with heads not less than 3/8 inch (9.5 mm) in diameter, driven to full penetration. using a minimum of **two nails per square** foot (0.093 m2), or by approved staples having equal resistance to withdrawal.

R4411.3.2.4.1 Stucco applied on metal lath shall be three-coat work applied to a total thickness of **not less than 1/2 inch** (12.7 mm) thickness except as required to meet fire resistance requirements.

Note:

ASTM Fastening; 7" Vertical x 16" Horizontal = 112 sq.in. Tributary

*Miami-Dade High Wind; 2 fasteners psf
144 / 2 = 72 sq. in. Tributary*

ASTM fastening tributary area is 56% (40 sq. in.) oversized compared to the HVHZ and is deficient in meeting wind resistant for convex bending (flexure loading) in high wind areas. This violates Florida Building Code in most all Florida regions.

CONTROL JOINTS

Prefabricated **control joint members** shall be installed prior to the application of plaster; therefore, **the decision to use them**, the type selected, their location, and method of installation shall be determined and specified in project specification sections other than the section on plastering.

From the 2007 MN Building Code R703.6.1.3, and the Minnesota Lath and Plaster Bureau:

“Control joints and expansion joints. Provisions for the control of expansion shall be determined by the exterior plaster application designer. ASTM C 1063-03 Sections 7.11.4–7.11.4.4 do not apply”.

Even when used for a specific reason, Control Joints only serve to mitigate some thermal expansion and contraction while the plaster is in the green or curing (hydration) state. Once final set is reached, the control joint has no further control function whatsoever.

Control joints are not required in direct applied systems. However, they are often used on large wall areas, to serve solely as screeds and/or stopping and transition breaks.

WHY CRACKS HAPPEN - WITH OR WITHOUT CONTROL JOINTS

“Cracking occurs because stress exceeds the strength capacity of the stucco. Some examples of stress that can be imposed on stucco are: racking, twisting, cupping and shrinking of dimensional lumber, structural settling, compression, and truss uplift. Experience has shown that such stresses will impact the integrity of the stucco regardless of **whether or not control joints have been installed. Contrary to reasoning, it is not unusual to see a wall broken up with control**

joints that still exhibits cracking, while conversely, a wall without control joints may remain pristine for several years”.

The main reason for lack of control joint use in residential applications is the simple fact that wall areas tend to **be smaller than those commonly found in commercial** installations, thus eliminating their need.

With the growing trend of larger houses, comes the real concern that perhaps control and expansion joints should be introduced into larger wall areas. **However, with their introduction into a wall area comes the added concern that these components open up another potential avenue for water entry into the wall assembly”.**

The FLAPB and the MN Lath and Plaster Bureau further suggests that the use of control joints be discussed with the homeowner or his representative. As in commercial construction their use should be judged by the size and complexity of the wall area(s) during document preparation.

COMMON CAUSES AND PREVENTION OF STUCCO CRACKING:

- ◆ Substrate stress exceeds the strength capacity of the stucco. Such stresses that can be imposed on stucco are:
- ◆ Racking, twisting, cupping and shrinking of dimensional lumber, structural settling, compression, cyclic wetting and drying of CMU substrates, excessive negative dynamic wall loading (convex bending), and truss uplift.
- ◆ Experience has shown that such stresses will impact the integrity of the stucco regardless of **whether or not control joints have been installed.**

- ◆ Improper curing of the stucco system. Stucco cures through a process of hydration which must be controlled by moisture. Hydration is the chemical reaction between Portland cement and water that forms calcium silicate hydrate, which in turn, provides strength. Permeability Reducing Admixtures added to the stucco during the mixing process can provide more silicates that add additional strength.

The plasterer should monitor and control the curing process. The goal is to maintain a slow, even hydration rate. Additives to the mix may be used to aid and control hydration and add strength.

The plasterer should :

- ◆ Monitor ambient relative humidity (under 70%) will warrant more careful monitoring for rewetting
- ◆ Monitor wind speed and direction. Walls subjected to higher wind velocity will warrant more careful monitoring and re-wetting.
- ◆ CMU or cement walls must be properly wetted prior to application of cement plaster
- ◆ Cement plaster should be “wet densified” when hydration begins (determined in real time by texture changes and curing “heat”)
- ◆ Walls should be re-wetted at the conclusion of the day’s activity (subject to non-freezing night conditions)
- ◆ Minor hydration cracks can oftentimes be repaired easily. If a proper Face Barrier coating is applied (once the stucco has properly cured to a pH of ≈ 9 or less) the coating will bridge minor cracks completely.

Exterior wall coatings should be applied in the exact manner used to pass the ASTM D6904-03, *Resistance to Wind-Driven Rain for Exterior Coatings Applied on Masonry*. This test evaluates whether a coating system resists water passing through a masonry block under continuous water spray and pressure equivalent to a 98 mph wind. Although it does not establish that a particular stucco wall, including its cracks, joints, windows, and penetrations, will be watertight. Exterior coatings that have not been tested to this minimum standard should be evaluated by the appropriate design professional for suitability.

- ◆ Sealants should be high quality, exterior grade and compatible with the exterior wall coating. All exterior sealants should be properly applied and tooled in place.

Now that you have reviewed conditional information and some factual statements, let’s review some *common stucco myths, misconceptions, and facts*.

Common Stucco Myths, Misconceptions and Facts

MYTH

***THE ASTM C926 (STUCCO)
AND C1063 (LATH) ALWAYS REQUIRE STUCCO
OVER LATH TO BE 7/8" THICK***

Common Contention:

Stucco is to be installed to a total system thickness of 7/8" when installed over metal lath or wire lath on a framed wall (indirect bond application) construction.

CONDITIONAL

Yes / No

Fact: Over any metal lath substrate, the ASTM stucco system has ALWAYS required a 3/4" NOMINAL base coat system thickness (3/8" scratch and 3/8" brown coat). The additional 1/8" is required when applying a colored final finish coat. When other finishes are used in lieu of the colored coat- the 1/8" thickness is substituted for the chosen manufacturer's requirement. So the 1/8" is not part of the stucco system - rather a finish coat with an 1/8" dimension added to the 3/4" system thickness, providing for a total thickness of 7/8".

So;

YES, if applying a 3-coat system over concealed barrier system using an 1/8" colored cementitious finish over the 3/4" NOMINAL thickness base coat.

NO, if the final coat is to be an alternate coating which is allowed by its "Unless otherwise Specified" provisions and by its X1.3 Appendix "When an alternate finish coat is used...."

NO, If your are applying a Face Barrier System.

NO, if you are applying a system designed using the Florida HVHZ provisions – they have ALWAYS required a total thickness of 1/2"

NO, If you are using a code approved system which has been tested in accordance with the ASTM E331 which applications provides otherwise.

MYTH

***THE ASTM C926 (STUCCO)
AND C1063 (LATH) ALWAYS REQUIRE 1/2"
STUCCO THICKNESS WHEN APPLIED OVER
BLOCK WALLS (DIRECT BOND)***

Common Contention:
Stucco is to be installed to a thickness of 1/2"
when applied (direct bond) over CMU's *a/k/a* ce-
ment blocks or similar cementitious substrates.

CONDITIONAL

Yes / No

The ASTM stucco system for application over cement block substrates has ALWAYS required a 3/8" thick cured base coat to provide a uniform suction plane prior to the application of the final 1/8" colored coating in order to provide even color curing. As such, the total thickness is 1/2"

So;

YES, if applying a 2-coat system using an 1/8" colored cementitious finish over the cured 3/8" base coat

NO, if you are using the Decorative Cementitious Finish provision of the code or the "Skim Coat" Provision of the ASTM and it is to be painted (coated). By and of itself, the code does not require CMU's to have a stucco covering at all – so why would stucco need to be any specific thickness when applied to them? Its purpose is cosmetic.

NO, if the final coat is to be an alternate coating specified for cosmetic purposes. This is allowed by the provisions "Skim Coat", "Unless Otherwise Specified" and similar statements contained within the ASTM documents.

NO, if a Face Barrier System is being employed.

MYTH

THE ASTM C926 (STUCCO) AND C1063 (LATH) MANDATE THE USE OF CONTROL JOINTS TO PREVENT CRACKING

Common Contentment:

Control Joints are needed to prevent cracking and are required by the ASTM standard

Additional Information:

Results from 2 full application testing panel models from two separate stucco associations (Nevada and Texas) indicate there was no meaningful difference in cracking patterns regardless of how the control joints were attached (wire tied or attached with fasteners – one or both legs). Or any meaningful difference in the test panel with NO control joints at all.

Some claim that Control Joints aid in crack reduction during hydration (curing) of the stucco. All agree however that even if this were true, their benefit and function would cease upon curing. No further benefit to the building is possible.

TRUTH

Conditional No - its not that simple.

Control Joints divide large walls into manageable plastering panel sections. When used, spacing is usually determined by building configuration and wall geometry (width and height). They serve as depth screeds to provide a flat face to the finished wall plane. The spacing is also a factor of the length of the “rod” the plaster’s are using to assure a flat planar panel. In sum, when used, they are for panelization and screeding purposes.

No agreed upon scientific data has ever ascribed crack prevention or crack control properties to wall control joints in an in-situ wall application.

Bucholtz said; “attributing crack control to these joints was the most asinine thing he ever heard intelligent men profess”.

Arguendo, over suspended ceilings using runners and cross furring, etc., (where the lath is not directly attached to the sub-framing, they ***theoretically*** could aid in collection of stresses during hydration (curing) but would never serve any benefit post hydration.

Continued on next page....

MYTH

THE ASTM C926 (STUCCO) AND C1063 (LATH) MANDATE THE USE OF CONTROL JOINTS

Continuation of previous subject...

Reality:

Control Joints are oftentimes needed where multiple story wall height requires a continuous coat, or where large wall areas will require a mid-wall stopping point or where a large area needs to have a flat planar finish (such as sand finish), etc..

FACTS

Standards provide some prescriptive installation details (discussed on the next page). The “Unless Otherwise Specified” provisions allows modification of installation procedures or elimination of their use if unnecessary. However, **If you are using control joints**, follow these important application requirements:

1. Control Joints at the corner of windows should be avoided.
2. If Control Joints are used, end joints must be set in sealants as they are being installed. (all ends and intersections except where the Control Joint terminates at a designated weep).
3. Control Joint flanges must be embedded by trowel (not slicker, darby, or rod, etc.) at the time of scratch.
4. Control Joints can help keep a more constant brown coat thickness when working on large wall areas. This improves the quality of work. However there are other less obtrusive accessories and methods that can provide a depth screed.
5. Control Joints can save on repair cost. If the wall is hurricane damaged The control joint allows a start and stop point when repairing stucco.
6. Control Joints give a point to stop and start during plaster application. This is very advantageous on walls that are high or long. Without them you will have cold joints which can cause a dry out crack and are frequently unsightly.

Note: This list (2-6) can also be used when installing corner beads. where outside corners are not manually rodded.

MYTH

THE ASTM C926 (STUCCO) AND C1063 (LATH) REQUIRE SPECIFIC PLACE- MENT AND SPACING OF CONTROL JOINTS AND WEEP SCREEDS

Common Contention:

The standards require Control Joints at 144 sq ft. Intervals, not to exceed 18' and not to exceed a ratio of 2.5 to1 – Therefore they must be installed along with other accessories such as outside corner beads

CONDITIONAL

Yes / No

The standard provides geometric dimensions as a PRESCRIPTIVE methodology if Control Joints are to be used. (see modification statements earlier). The standard is written for using a 3 coat, colored stucco application system. These joints serve as “screeds” to aid in uniform thickness and to break large wall areas into “panels” to control suction, and to break up the wall areas so that batches of “mud” (including the 1/8” shell color coat) are applied from a single batch within their boundaries without unnecessary waste or integrating a subsequent “mud” batch into an area. This also helps ensure that the final finish coat “cures” (dries) as evenly as possible thereby providing color uniformity.

However, if the system is designed otherwise, such as a face barrier system, the color coat is eliminated. Therefore, the control joints (and other provisions) may not be necessary. Building geometry in most all residential construction eliminates their need. These conditions are allowed modifications because they are not needed and by use of the “unless otherwise specified” or the “installed according to the contract documents” (or similar) provisions provided within the ASTM standards as allowable application modifications.

There is no requirement mandating the use of outside corner beads within the standards.

The following pages exemplify fully code compliant designs that have performed perfectly for many, many decades and are still current designs in use today:

Examples of Face Barrier Systems without weep screeds or control joints.
Since the inception of modern stucco, many residential and similar low rise designs never used these optional weeps, screeds or accessories. These examples apply to modern and old residences

Vertical Control Joint Omitted
Horizontal Weep Screed Omitted

These accessory locations are prescriptively noted within the ASTM , but are allowed omissions per the “unless otherwise specified” when using a face barrier system.)



Continuation of previous subject...

These examples have no control joints, no weep screeds, no corner beads or other accessories and all are FULLY CODE COMPLIANT.

CONTINUED ON NEXT PAGE...



Continuation of previous subject...

These examples have no control joints, no weep screeds, no corner beads or other accessories and all are FULLY CODE COMPLIANT.

CONTINUED ON NEXT PAGE...



Do you need Control Joints to serve as panelization screeds and Accessories on an application such as this? Yes, in such installations, they are a critical panelization element for maintaining a flat surface. But they do not provide any “crack reduction” benefit.

Control Joints Needed for Panelization and Screeding.



Continuation of previous subject...



MYTH

***THE ASTM C926 (STUCCO)
AND C1063 (LATH) WERE DEVELOPED AS DE-
SIGN STANDARDS***

Common Contention:

The Standards are Design Documents

TRUTH

No

The Standards are “Application Standards” written by experienced plasters to be used (and understood) in real time by experienced plasters in the field (wet curing for example). The standards were never written for code or design intent although they certainly can aid in design.

The standards were developed for Open Framing (or covered with non-structural sheathing such as asphalt impregnated sheathing or Styrofoam) in an arid region with sustained winds of 90 mph or less. When the standards were developed, the code ascribed horizontal wall pressures for building less than 30’ in height was 10psf for inland areas and 25 psf for coastal regions. These loading conditions were used during the standards development and haven’t changed over time.

According to our code, prescriptive standards are not to be used when the Vult is in excess 115 mph or the wall loads are in excess of 30 psf. Attach your lath according to the standard’s provisions. (7” vertically to 16” horizontally placed studs) and you will most likely VIOLATE our code provisions. (see tested attachment tables at the stuccoinstitute.com)

Failure mode is not the fastener’s resistance to direct withdrawal, it is rather the convex bending rupture due to the horizontal fastener spacing leaving a 16” wide (by 8-10’ vertical) unrestrained void that fails in negative loading.

In all cases the wind loading provision of both the Building and Residential codes require compliance with their wind loading provisions and requirements.

MYTH

THE ASTM C926 (STUCCO) AND C1063 (LATH) LENGTHENED FASTENERS OVER SHEATHING

Common Contention:

The Standard require all fasteners to be in the vertical framing members and the thickness of the sheathing is to be added to their required base length.

CONDITIONAL

Yes / No

Yes, if you are attaching to studs when using the “open framing” method or attaching to the vertical framing members when applying the lath over non-structural sheathing or continuous exterior insulation boards where wind speeds are ≤ 115 Vult

No, if you are applying over a structural panel with withdrawal values published in the NDS (National Design Standard) which are $\geq$ those of the stud withdrawal values (such as common exterior structural rated shear panels). Attach anywhere on the panel – its all structural for withdrawal values.

In high wind areas, ≥ 115 Vult, it is the convex bending forces between the vertical studs that must be restrained by the panel nail spacing rather than direct withdrawal. Sufficient fasteners must be placed without over fastening the lath. Common objection to closer spacing is often; “*You will penetrate the drain plane*” – *all fasteners penetrate the drain plane.*

“You will allow water to pass around the fastener leg since it not sealed” – besides the absurdity of the concept – would you would rather the water absorb into (and decay) the field sheathing or pass into and decay the vertical stud being used as part of the shear wall line?

These are fallacies of course. When using a face barrier system, the bulk water and vapor is blocked at the walls outer plane (just like a roof covering) making these hypothetical contentions moot.

With a concealed barrier water management system (drain plane) over open framing or non-structural sheathing the vertical framing members are ONLY fastening points available.

MYTH

THE ASTM C926 (STUCCO) AND C1063 (LATH) REQUIRE STUCCO TO BE APPLIED IN 3 SEPARATE COATS

Common Contention:

The Plaster must be installed in 3 separate and distinct coats, each allowing to cure before the successive coat can be applied.

CONDITIONAL

Yes / No

Yes, if you are installing stucco over metal lath/wire installed over open framing or over most non structural sheathing, the scratch coat must be gently applied (the lath bends between studs), then allowed to cure providing enough lateral support for the horizontal pressures exerted during the next successive (brown) coat. That coat must cure before the final 1/8" shell colored coat is applied in order for it to dry (cure) uniformly in order to maintain an acceptable finish.

No, When structural panels serve as the sheathing under the metal lath (or non-structural sheathing of sufficient resistance is used) standards prescribe typical statements as the preferred method:

Double-up coat—the brown-coat plaster applied to the scratch coat plaster before the scratch-coat plaster has set.

In order to provide more intimate contact and bond between coats and to reduce rapid water loss, the second coat should be applied as soon as the first coat is sufficiently rigid to resist cracking, the pressures of the second coat application, and the leveling process.

If using a 1/8" shell finish colored coat, this brown coat must cure before the application of the colored coat. The desired finish texture is applied as part of the color (3rd) coat.

If using a face barrier system, the final texture is applied at this time, then the stucco is usually required to remain open until the PH is reduced to less than 10. The wall can be coated (3rd) and sealed at that time.

MYTH

GENERAL PROPERTY MYTH

Stucco is the same as Concrete, i.e., Stucco strength properties are similar to concrete

TRUTH

No

- ◆ There are no standards which stucco mix must meet aside from durability and appearance
- ◆ It has no standard of hydration testing
- ◆ It has no specific strength requirements
- ◆ It has no carbonation testing requirements related to moist curing time
- ◆ There is no justification for the testing of stucco

Excerpted from Bucholtz - Tips and Techniques #136

Note: these statements apply to field-mixed stucco due to the many variables such as, aggregate diversity, aggregate quantity, water quantity, mixing time and curing conditions.

MYTH

GENERAL PROPERTY MYTH

Over sanding causes Cracking, i.e., Over sanding causes a weak mix and causes subsequent cracking

TRUTH

CONDITIONAL

- ♦ Stucco mix so over sanded as to significantly reduce the strength of the product cannot be worked off of the tradesman's hawk & trowel
- ♦ Usually under sanding or over liming causes a mix that is too rich
- ♦ When using portland cement, lime should be avoided. There are admixtures that can be added (2-3 oz) that will provide the plasticity of lime without the over-richening affects
- ♦ Our newer Type "S" Stucco Mixes need no additives or alteration for all normal applications

MYTH

THE ASTM C926 (STUCCO) AND C1063 (LATH) REQUIRE CONTROL JOINTS TO BE TIED USING WIRE TO A METAL LATH SUBSTRATE

Common Contentions:

By wire tying Control Joints to the lath, cracking is controlled. Therefore, flanges must be wire tied to the lath cut independently behind the joint and independent of the sub-framing

CONDITIONAL

Yes / No

YES,

- ♦ Tying of the flanges is necessary in open framing or non-structural sheathing like foam sheathing because it is the ONLY way they can be attached

NO,

- ♦ There is no evidence that control joints will assure cracking will not occur or will direct cracks to the joint
- ♦ Many buildings built without control joints experience cracking no different than ones employing them
- ♦ Another fallacy is that by breaking the metal lath behind the joint, the stucco will float as panels
- ♦ *"Note: Neither ASTM C926 nor C1063 prohibits fastening of Control Joint flanges. These documents only require that you tie the flanges to the lath. This requirement was intended for stucco over open-framing, not for stucco over wood framing and sheathing."*
- ♦ The lath is attached to the studs and the plaster (and accessories embedded into it) is attached to the lath – the plaster will not move independently of the lath. If one moves, so does the other
- ♦ In high wind regions the flanges must be anchored to the framing substrate (structural panels) so it will not initiate a vertical break plane in extreme negative (convex) flexure.

MYTH

THE ASTM C926 (STUCCO) AND C1063 (LATH) REQUIRE SEPARATION OF DISSIMILAR MATERIAL USING A BACKING ROD

Common Contention:

Window Frames MUST be separated from stucco with Casing Bead and using a backer rod and sealant. This is incorrect—there are other “suitable means”.

The ASTM mentions these two “suitable” separation methods

“V” Grooves use a “cutter” to plow a sealant groove. The wall is then primed, sealant tooled into the groove and then the final wall coating is applied - sealing the system at its face.

“V” Joints are used in more arid regions. The penetration is sealed at the water management layer. A joint is tooled at the interface of the brown coat with the colored coat tooled into the joint. Minor water is blocked at the subsurface..

“V” Groove

“V” Joint



TRUTH

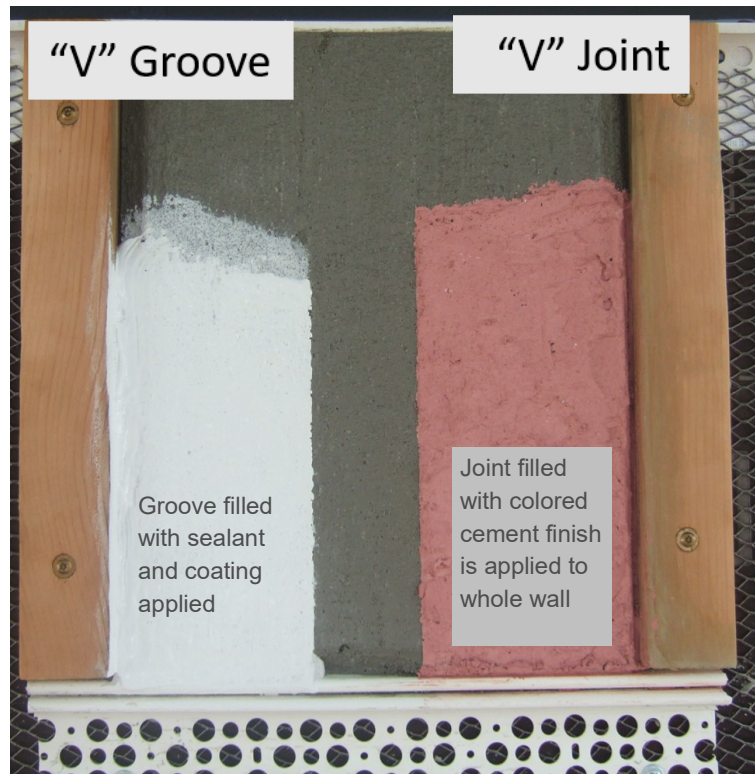
No

ASTM C1063 says:

7.11.3 Casing Beads—Non-load-bearing members shall be isolated from load-bearing members, and all penetrating elements, with casing beads or **other suitable means**, to avoid transfer of structural loads, and to separate from dissimilar materials. The NOA may control method.

“V” Grooves are a code approved method to provide such separations and have been used since the inception of modern stucco many decades ago. They have performed (when used) without any failures and are fully code approved.

In some regions, the window and penetrations are sealed behind the stucco at the water resistive barrier (WRB).



MYTH

***THE ASTM C926 (STUCCO)
AND C1063 (LATH) REQUIRE A VERTICAL CAS-
ING EXTENDED BELOW A HORIZONTAL CAS-
ING ON VERTICAL/HORIZONTAL INTERFACES***

Common Contention:

ASTM C-926

Vertical surfaces must extend below horizontal surfaces according to:

A2.2.3 Where vertical and horizontal exterior plaster surfaces meet, both surfaces shall be terminated with casing beads with the vertical surface extending at least 1/4 in. (6 mm) below the intersecting horizontal plastered surface, thus providing a drip edge. The casing bead for the horizontal surface shall be terminated not less than 1/4 in. from the back of the vertical surface to provide drainage.

SEE EXAMPLE OPPOSITE THIS TEXT

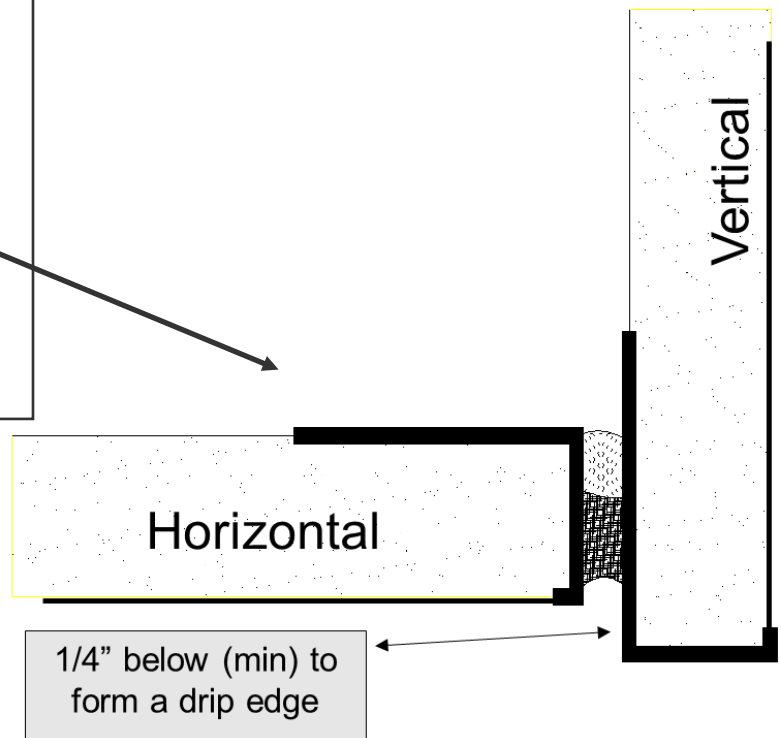
CONDITIONAL

Yes / No

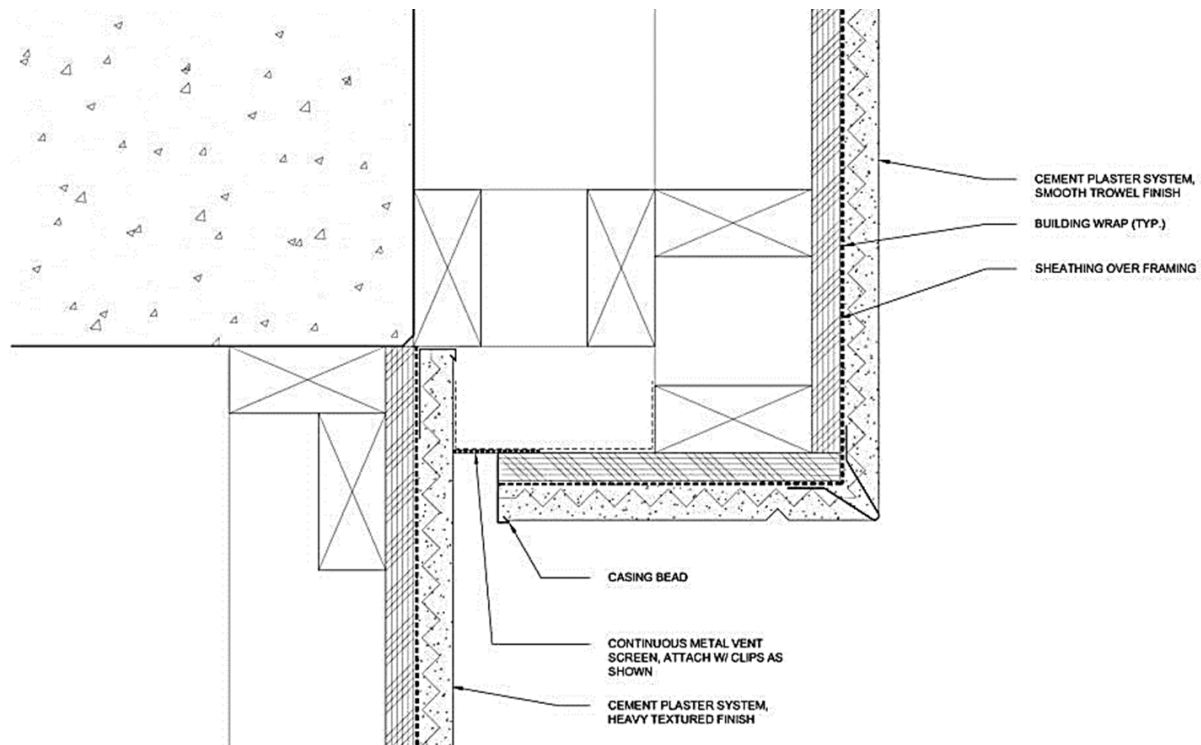
Yes, if the wall design uses a concealed water management system (drain plane) and the intersection is a vertical wall to horizontal ceiling.

No, if it is face barrier system or a simple covered beam. Not supporting a floor or foundation.

SEE EXAMPLES ON NEXT PAGE...



NO, These are examples of industry publication and drawings for face barrier systems and simple vented beam / soffit transitions to be used with either system. Both are fully compliant. Bottom photo depicts a fully compliant face barrier system installation at a front entry.



MYTH

***THE ASTM C926 (STUCCO)
AND C1063 (LATH) REQUIRE WEEP SCREEDS
AT GABLE TRUSS / CMU LINTEL INTERACES***

Common Contention:

Gable ends need a horizontal weep or screed at the base of the wooden truss at the CMU lintel intersection.

CONDITIONAL

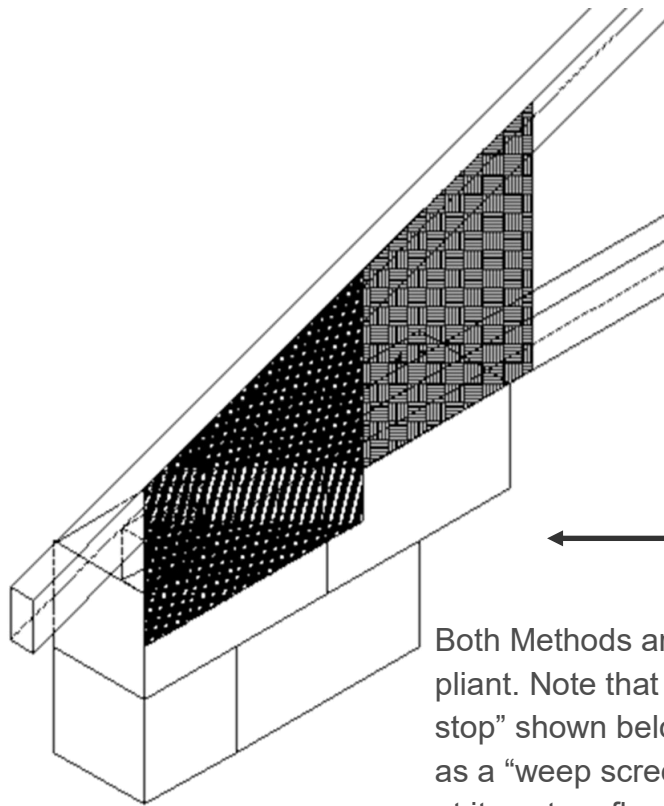
Yes / No

It is up to the designer, with indirect bond application using a water management (drain plane) system, the weep can either be at the bottom of the wall or at the horizontal truss line and the bottom of the wall both.

When the lower wall is CMU with a poured lintel, it is again up to the designer. Either place a horizontal screed or lap the metal lath down onto the CMU and stub nail in place. Then place a continuous coat of plaster over the entire wall.

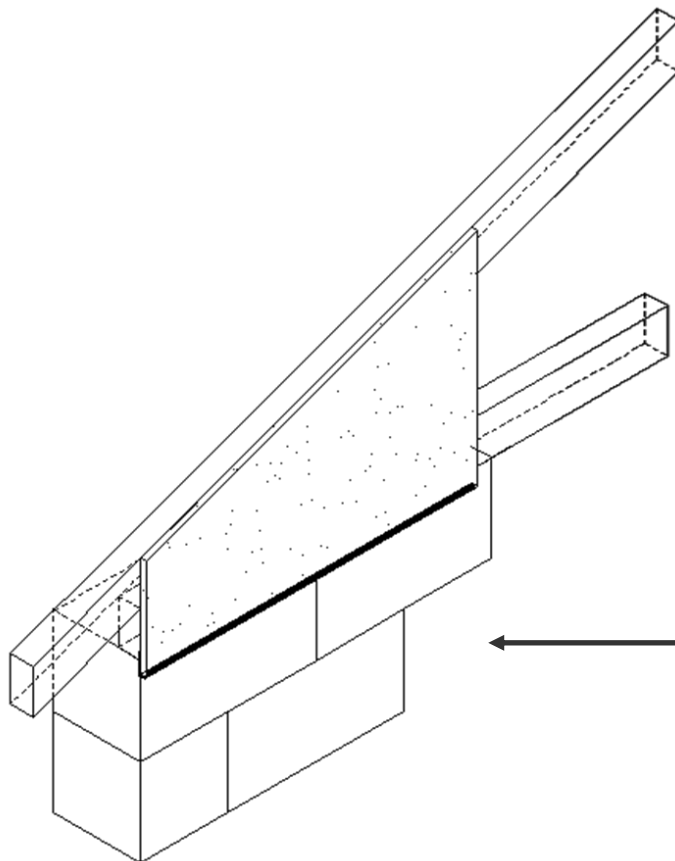
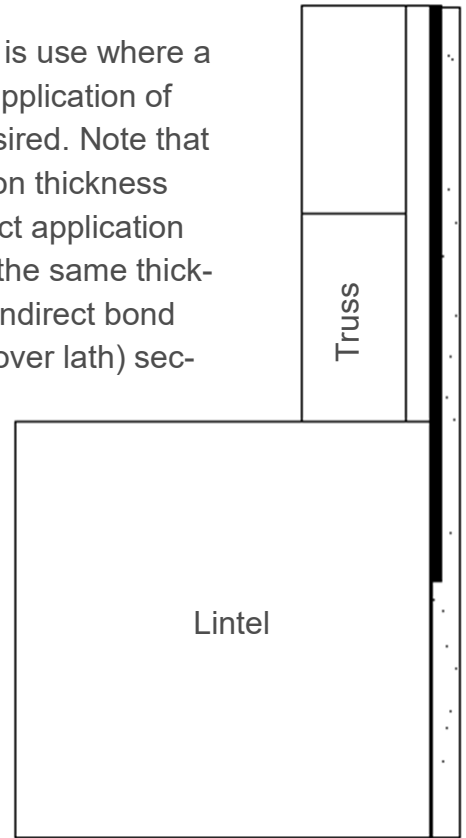
Where dissimilar materials abut and are to receive a continuous coat of plaster: (1) a two-piece expansion joint, casing beads back-to-back, or premanufactured control- expansion joint member shall be installed; or (2) the juncture shall be covered with a 6-in. (152-mm) wide strip of galvanized, self-furring metal plaster base extending 3 in. (76 mm) on either side of the juncture; or (3) where one of the bases is metal plaster base, self-furring metal plaster base shall be extended 4 in. (102 mm) onto the abutting base.

***SEE BOTH CODE COMPLIANT DETAILS ON
NEXT PAGE...***

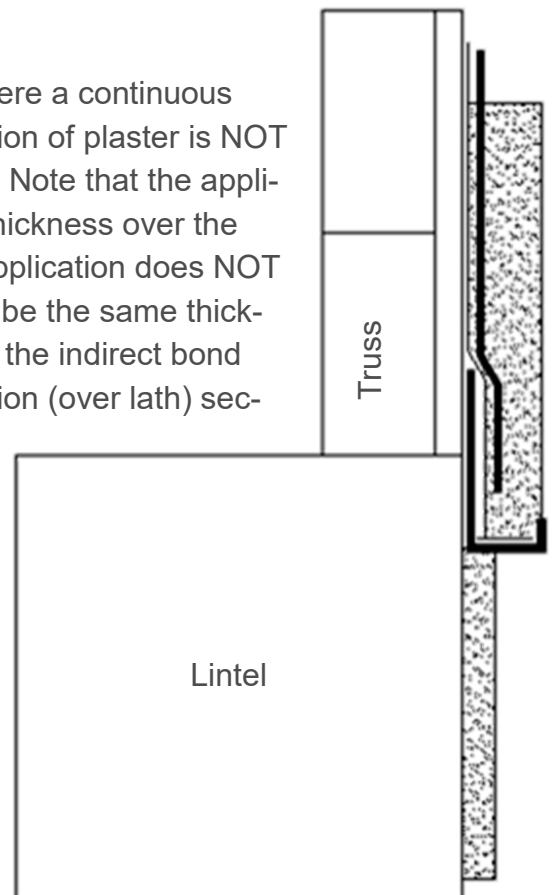


This method is use where a continuous application of plaster is desired. Note that the application thickness over the direct application needs to be the same thick-ness as the indirect bond application (over lath) sec-tion.

Both Methods are Code Com-pliant. Note that the “casing stop” shown below can serve as a “weep screed - It will weep at it capture flange . See ASTM C 1861



This where a continuous application of plaster is NOT desired. Note that the appli-cation thickness over the direct application does NOT need to be the same thick-ness as the indirect bond application (over lath) sec-tion.



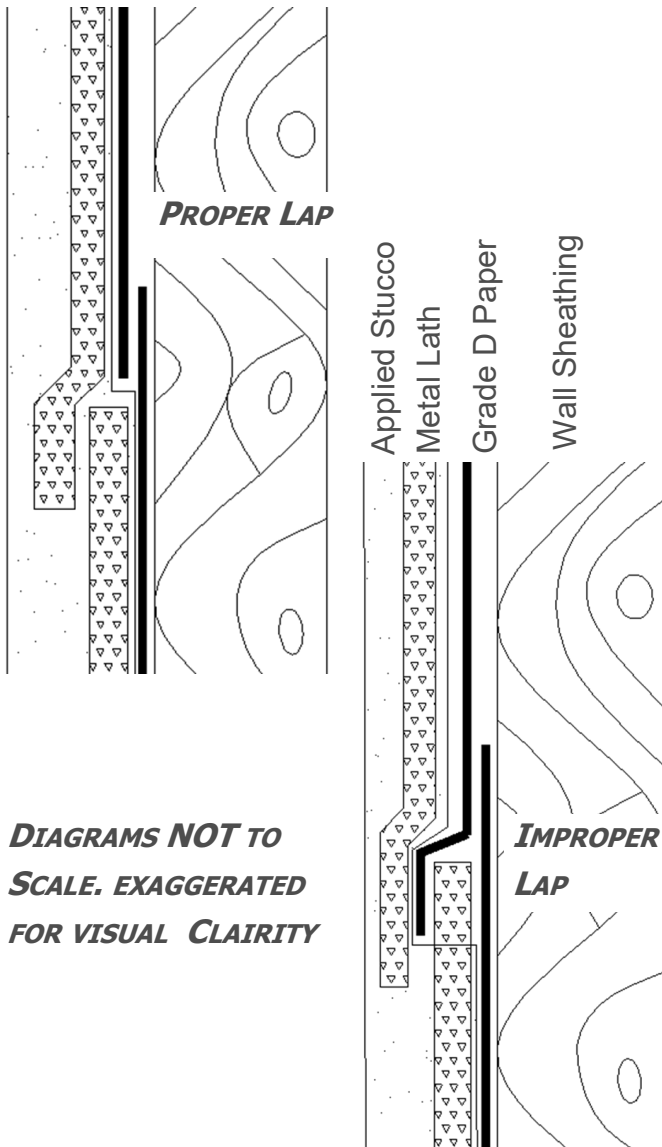
MYTH

THE ASTM C926 (STUCCO) AND C1063 (LATH) PAPER AND WIRE LAP REQUIREMENTS:

Common Contentions:

Where metal plaster base with backing is used, the vertical and horizontal lap joints shall be backing on backing metal on metal.

Note, this is an issue that can occur when paper-back lath is being applied.



**DIAGRAMS NOT TO
SCALE. EXAGGERATED
FOR VISUAL CLAIRITY**

DEPENDS

Yes / NO-Conditional, NO

Yes, when the system is being installed as a water management (drain plane) system. The paper must lap only the paper (metal must ALWAYS lap metal). This will ensure that:

- (1) Any migrating moisture will continue downward towards the foundation (or other) weep screed.
- (2) If the paper laps over the metal there will be a slight reduction in the stucco thickness. This can cause the final 1/8" color coat to cure unevenly and can lead to a future horizontal color or line blemish along the finished wall.
- (3) If the paper over metal lap if continues horizontally down a longer wall, it can cause a potential horizontal weakened point.
- (4) The paper laps over the metal it will keep the inward metal lath from receiving the plaster. Although sufficient keying most likely will exist, the metal can become subject to migrating moisture.

NO-Conditional. These precepts apply to longer horizontal wall sections. Minor infractions of this conditions around fenestrations and openings do not pose any problems. (*This was a detailed in a full scale model at the Stucco Institute*)

NO-Conditional. if the paper is being used as "bond breaker" layer over a water management layer.

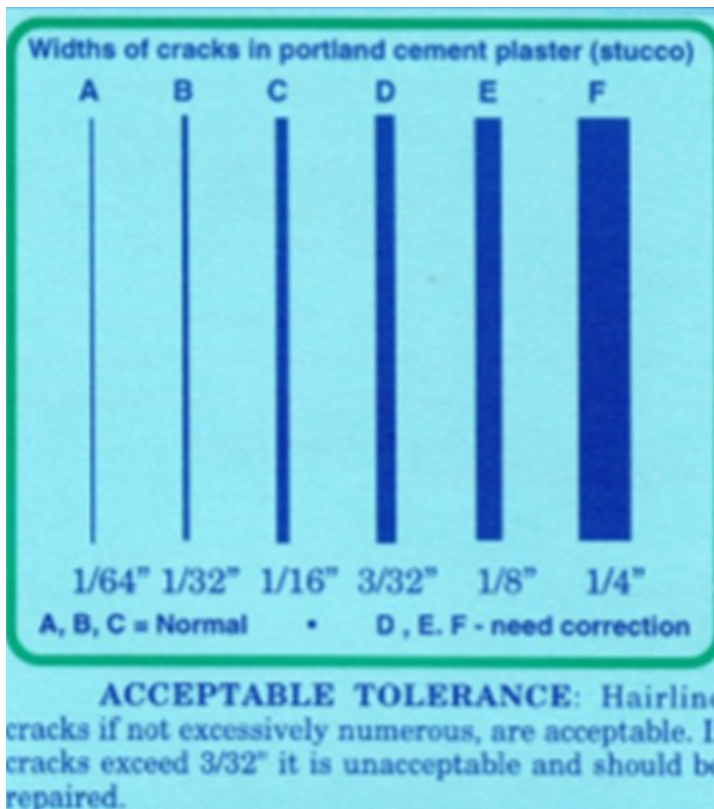
NO, if a face barrier system is used. Minor cracking is bridged by coating and moisture is managed at the walls face barrier.

MYTH

MINOR WALL CRACKING IS NORMAL AND WILL NOT AFFECT THE SYSTEM

Common Contention:

The ASTM states “stucco shall not however be considered waterproof” Therefore minor wall cracking is normal and expected - causing no measurable harm to the system



DEPENDS

Yes / No

Yes, over indirect bond applications when the system is being installed per the ASTM C 926 and C 1063 using its designated water management (drain plane) system with a colored shell finish as a final colored shell coat.

It is an accepted fact that these stucco facades crack. The ACI-524 Defines and groups them as follows:

14.2.1 General—Plaster cracks should be classified by type before determining a method of repair. Crack types include: shrinkage cracks, check cracks, plastic-shrinkage cracks, craze cracks, and structural movement cracks such as tensile stress cracks.

Bucholtz in Publication 172 quantifies allowable lineal footage of cracks according to their width (see figure this page). He further states:

“Based on observation of thousands of stucco installations, suggest that the term “excessive cracking” can be applied to stucco when the total lineal footage of cracking exceeds one lineal foot of 1/16” cracks per 100 square foot of plaster. If cracks are 1/32”, then two linear feet per 100 square feet of plaster can be considered normal. If cracks are 1/64th of an inch, then four linear feet per 100 square feet of stucco is not excessive.

But excessive or not, cracks constitute an aesthetic problem that can be easily remedied. Let's get away from the irresponsible suggestion that stucco be removed and replaced.

CONTINUED ON NEXT PAGE...

MYTH

MINOR WALL CRACKING IS NORMAL AND WILL NOT AFFECT THE SYSTEM

CONTINUATION

The standard states “stucco shall not however be considered waterproof” Therefore minor wall cracking is normal and expected - causing no measurable harm to the system

**EXEMPLARY PHOTOS CONTINUED ON NEXT
PAGE...**

DEPENDS

Yes / No

Yes, If installed in a fairly arid region using a water managed system using colored stucco finish and where interior humidities are higher than exterior - providing a wall drying mechanism .

Yes, over indirect bond applications when the system is being installed as a Face Barrier System where the final color coat is and applied coating in conjunction with sealants - both designed to reject bulk water and most vapor at its outermost surface. Although minor cracking can occur, most barrier coatings have a ability to “bridge” these occurrences over mass wall assemblies and substantially protect the wall assembly.

NO, If installed as a Face Barrier system indirectly (lath) applied over framed substrates.

Unlike the water managed systems (meant for arid regions where average outside humidifies are lower than interior), Face Barrier Systems are meant to impede bulk water or high vapor transmission. Accordingly physical cracks, other than hairline (limited to ≈ 0.004 inch), should be overcoated with wall coating and/or sealants replenished. Larger cracks (0.025 and larger) may need repair with an elastomeric putty prior to touching up with the overcoat.

These walls should be inspected annually and after any high wind event. They should be initially replenished and replaced at the 5 year mark.

Larger crack repair usually involves working the smooth putty compound into the crack with a plastic putty knife and then “rolling” over the repair with a close nap dry finger roller.

“Hairline” crack - no maintenance required
(although it could be coated over)

Crack in need of fresh overcoat (simple
touchup reapplication of coating)



Close up of proper application of wall coating. No cracks, minimal pinholes and adequate mil thickness. Note “swirl” like marks behind texture. These indicate proper densification of the base coat (using a green handled float to recharge water and densify during initial hydration) during original application. Also note the lack of these in the upper photographs.



MYTH

**THE ASTM C926 (STUCCO)
AND C1063 (LATH) -**

CORNER BEADS ARE REQUIRED AND ATTACHMENT IS TO BE 7" ON-CENTER - ON EACH FLANGE OR "LEG" OF THE BEAD

Common Contention:

Corner Beads are required and they are to be secured with fasteners or adhesive spots spaced 7" o/c directly opposite the bead's nose. Furthermore they are required whether the wall is framed with lathing or CMU (block) or other cementitious wall construction.

**CONTINUED ON NEXT PAGE,
SEE DRAWINGS NEXT PAGE...**

Yes / No

YES / NO, The Standard states:

"Attach lathing accessory attachment flanges to substrate to ensure proper alignment during application of cement plaster. Secure lathing accessory attachment **flanges** at 7 in. (178 mm) maximum intervals along framing members".

Note that this says FLANGES (plural), as it pertains to differing accessories. It does not say "secure the lath accessory flanges at 7" on center and at each side of a corner bead's flange or secure at all separate flanges.... See examples next page.

So,

YES, if the accessory has a flange (See figure C-1 and C-2 on next page).

But,

NO, that does not mean the requirement applies to each side of the corner bead separately. A corner bead has two "legs", but it is ONE flange separated by a ground (bead). Just like an expanded flange casing bead (stop) which has one flange but two "legs".

A corner bead is one unit, not two separate detachable or separate flanges serving separate items. Besides unnecessary - over fastening of corner bead flanges can twist the bead, cause blowouts in substrates, and makes installation more difficult.

Remember, the purpose of accessory attachment is to provide for minimum stabilization during the application of the cement plaster. Once its flanges are embedded and the fresh cement cures, attachments become non functional. **Continued....**

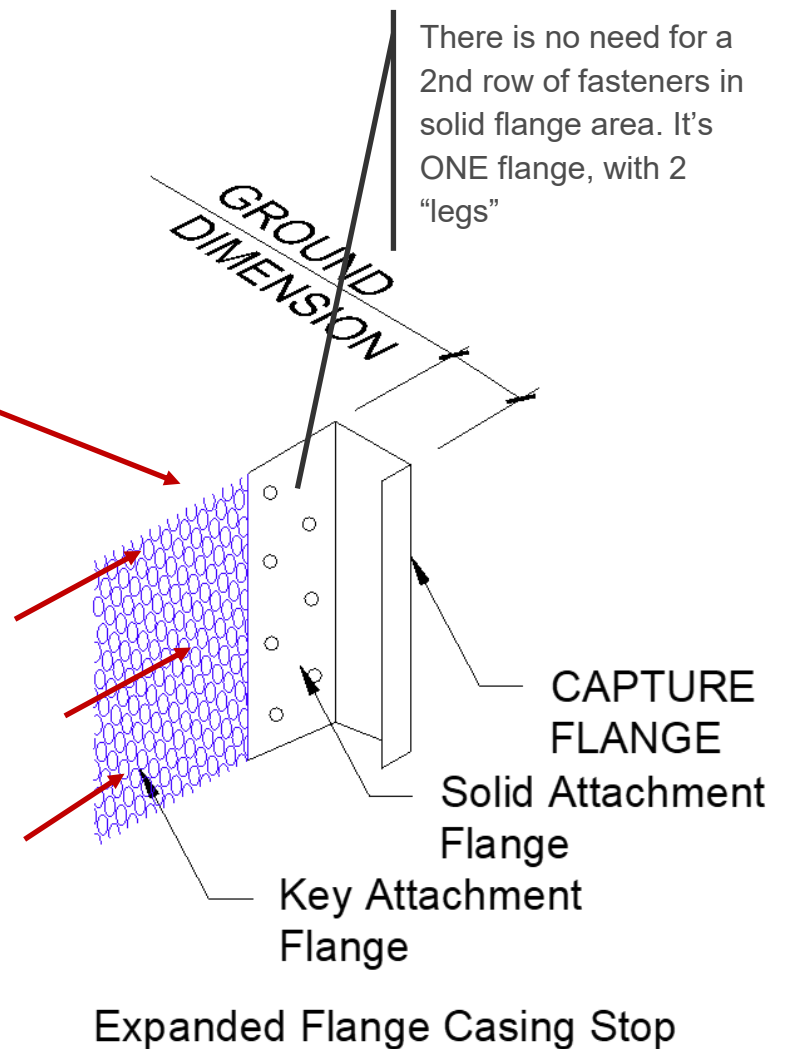
CONTINUED...

Note that the example C-2 has two flange sections, with two “legs”, but it does **NOT** require two rows of fasteners 7” o/c. This should provide context as to the control joint application requirements. *(See next page)*

Figure C-2

Place Fasteners 7” o/c along the Expanded Flange. One flange, two areas

7” Vertical Spacing



And No, Corner Beads are **not required** over any wall construction whatsoever. In fact, the preferred method by traditional plasters is not to use them at all (especially on residential work) - preferring to wrap the lath around the wall corners and manually “Rod” or strip form the corner thereby creating solid cement corners with no voids or gaps. This “rodding” method also applies to direct bond (CMU a/k/a Block) applications as well.

**Control Joint attachment
Drawings on next page...**

CONTINUED...

DRAWINGS C-1

CORNER BEAD OVER FRAME WALL

Note that the corner bead example below has its flange attached 7" o/c. This is a single flange accessory formed at a 90 degree angle at its ground.

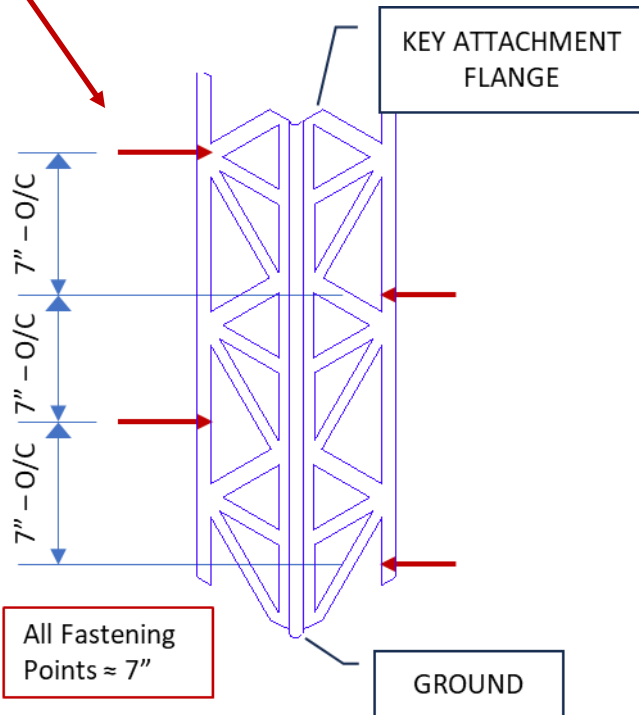


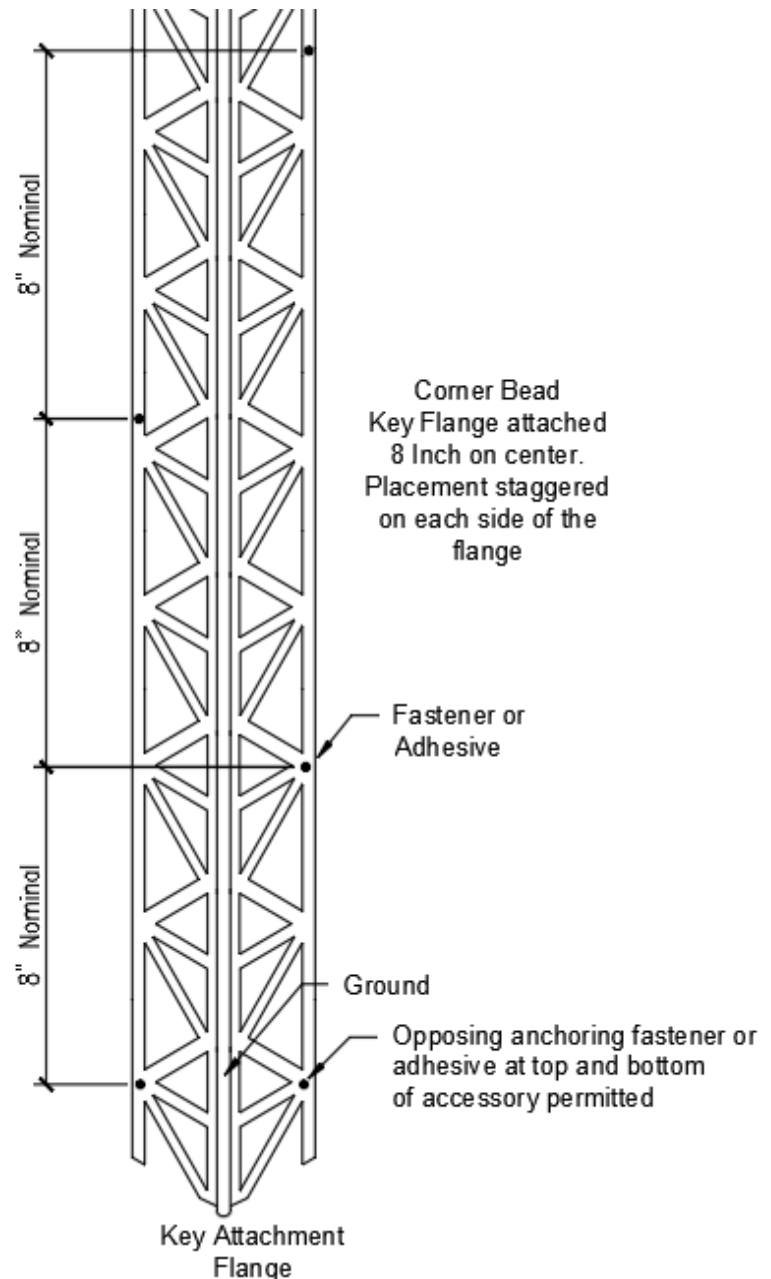
Figure C-1

EXTERNAL CORNER REINFORCEMENT

The standard simply states 7" o/c to keep harmony with its other spacing provisions. This should be considered a $\geq$ dimension since fasteners need only be sufficiently spaced to secure the accessory during the plaster application process.

CORNER BEAD OVER CMU (BLOCK) WALL

If the corner bead is being installed on a cement block (CMU) corner - change the spacing to the approximate center of a block - alternating each side. This yields a spacing $\approx 8"$ o/c .



Drawings are NOT to SCALE

MYTH

***THE ASTM C926 (STUCCO)
AND C1063 (LATH) - FASTENERS THAT AT-
TACH LATH TO CMU OR CONCRETE SUB-
STRATES MUST BE 3/4" IN LENGTH. NO
"STUB" NAILS OR SHORTER PINS ARE AL-
LOWED***

Common Contention:

Concrete "stub" nails or "T" nails shorter than 3/4" are not allowed to attach lath or accessories to CMU (block) or poured concrete walls. All fasteners must be 3/4" long and their attachment pattern must comply with the 7" vertical, 16" horizontal spacing prescribed by the standard.

Yes / No

YES, The standard does require fasteners into CMU or poured concrete to be concrete nails, pins, etc. **IF** you are attaching lath to the wall **STRUCTURALLY**. Generally, all fasteners require 3/4" minimum embedment to attain reliable structural withdrawal and/or shear values.

No for Spacing, The standard applies its standard fastening pattern of 7" vertical and 16" horizontal. This may suffice for lower wind speed regions but is considered insufficient for high wind regions which commonly apply the high wind pattern of 2 fasteners per f^2 applied in a scattered pattern for convex loading resistance and to avoid head and bed joints.

CMU's have a common face dimension of 8" x 16", the standard's pattern may cause vertical alignment (or close alignment) with the block's bed joints and the 16" spacing may cause alignment with the their head joints. Therefore a scattered pattern has historically been used to assure adequate anchorage.

No for non-structural, For attachment of accessories, shorter fasteners (stub) nails must be used. The accessories are non-structural and only need to hold the accessory in place until application of the plaster. Furthermore, placement of 3/4" nails close to concrete or masonry corners / intersections will frequently break the substrate.

No for non-structural, Strip lath, or lath lapped and "Pinned" to the concrete until the placement of the plaster. Such areas are "scatter nailed" as necessary for them to lay flat or temporarily be held in place during plastering activities.

MYTH

***THE ASTM C926 (STUCCO)
AND C1063 (LATH) - ALL LATH LAPS NEED TO
BE WIRE TIED***

Common Contention:

Horizontal lath laps must be wire tied between vertical framing members at intervals not exceeding 9 inches..

SEE DRAWINGS NEXT PAGE...

CONDITIONAL

Yes / No

Yes, The Standards are “Application Standards” written by experienced plasters to be used (and understood) in real time by experienced plasters in the field . The standards were developed (and are still predominately used throughout Climate Zones 3-6) for application over open framing (or covered with non-structural sheathing such as asphalt impregnated sheathing or 1/4” Ther-moPly or Styrofoam. The system uses an 1/8” cement colored final shell coat for its finish placed over its 3/8” scratch coat and cured 3/8” brown coat, collectively referred to as its “base coat”. (no paint contemplated or allowed)

All plasterers understand this next precept; Without the horizontal tying, when applying your scratch coat, two specific problems arise;

(1) Your trowel will push in-between the sheets of lath making it extremely difficult to continually apply the plaster (*see Figure T-1 on next page*) and

(2) The horizontal movement of the lath will cause a back bulge of cement at the lap mudline causing a fracture plane and because of its difference of thickness - it will cause a horizontal bleed line through the final color coat. (*see Figure T-2 next page*).

No, If your application is over structural panels, (which are not addressed within the standard) none of these problems will ever occur. Therefore tying laps over structural panels is a solution without a problem and completely unwarranted. This is a plasterer “known” and is modified by the “unless otherwise specified” allowance.

CONTINUED...

*HORIZONTAL LATH LAPS MUST BE WIRE TIED BETWEEN VERTICAL FRAMING MEMBERS AT INTERVALS NOT EXCEEDING 9 INCHES.. **NOT NEEDED OVER STRUCTURAL PANELS***

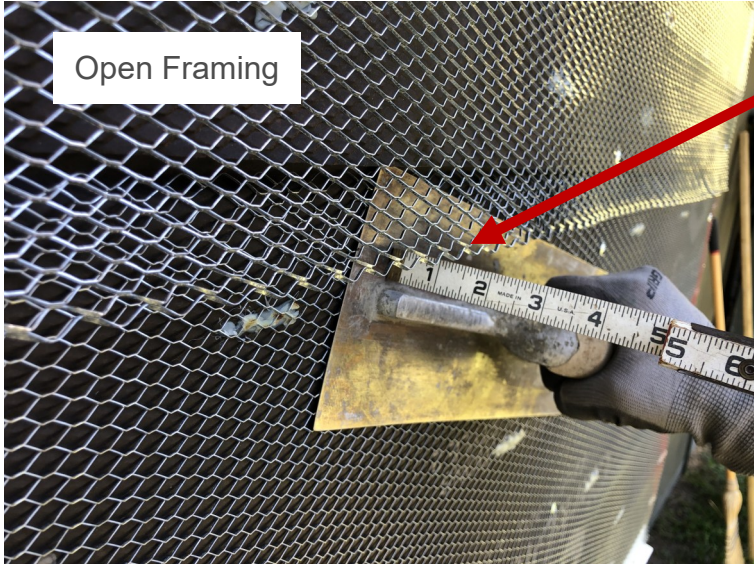


Figure T1 - Without horizontal lap tying between vertical framing members, the trowel EASILY pushes the lower sheet open over 1" in depth. This will result in a back bulged lap mudline.

This will **not** happen when applied over structural panels. Simply add a fastener if sheets need "pinned" (tied) to each other if needed.

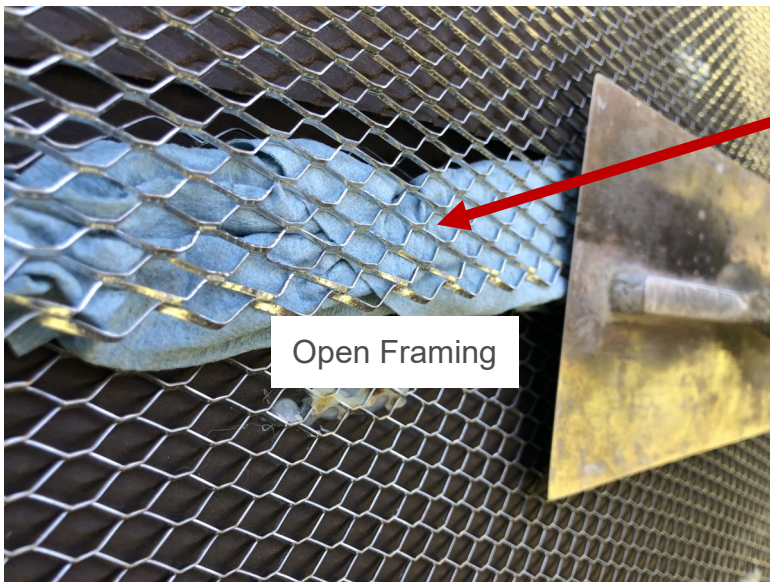


Figure T2 - Without horizontal lap tying between vertical framing members, the blue paper towel displays the amount of wet plaster that will bulge behind the upper sheet. This will create a fracture plane. It also will cause the color coat to cure unevenly resulting in a horizontal color bleed.

*This will **not** happen when applied over structural panels. Simply add a fastener to the lap if loose.*