Stucco Information by and for Stucco Applicators
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# Safe Attachment Tables For Metal Lath and Wire to Plywood, OSB and other Structural Panels for Code Compliance

## Technical Bulletin TB 107.2

Based Upon the Florida Building Codes 7th Edition

and ASCE 7 - Wind Loading Provisions

Test Methodology ASTM E330

and the provisions of ASTM C926 and C1063

Referenced Tabulated Fastening Tables

Testing Data Included

For Designers, Contractors, Inspectors, Plans Examiners and Plastering Professionals

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## INTRODUCTION:

The fastening of metal lath seems like a simple enough task; the ICC and Florida Building and Residential codes state that the installation of metal lath conform to the requirements of **ASTM C-1063-19a “Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster”**

Section 7.3.3.1 of that standard states:

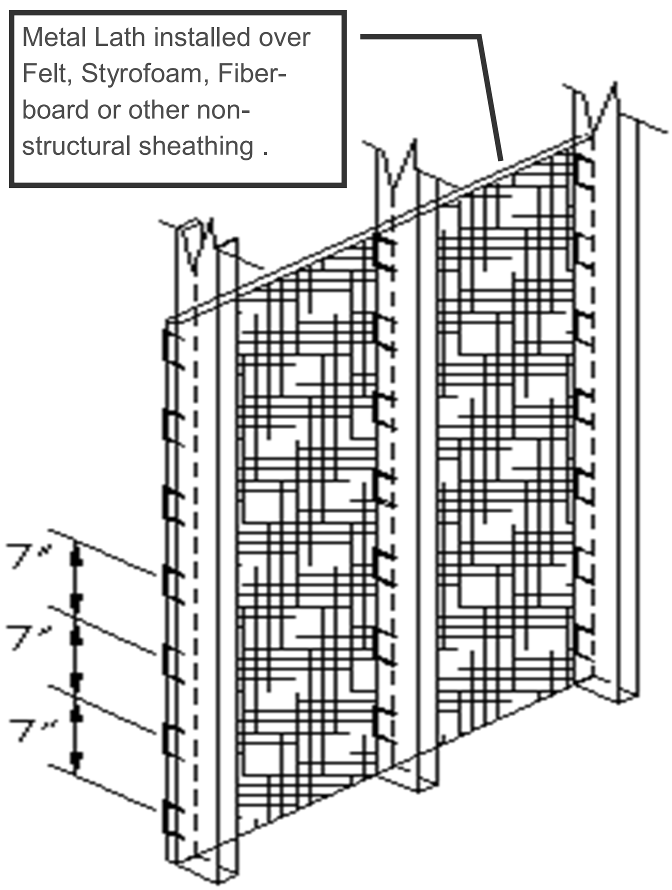


Figure 1 - ASTM C 1063-19a; 7.3.3.1

“…. Metal plaster bases shall be attached to framing members at not more than 7 in. (178 mm) on center, along framing members ….” See Figure 1 below.

ASTM C-1063 is simply requiring that the metal lath be attached to the studs (horizontally spaced 16” on center) at intervals of 7 inches vertically.

Seems simple enough, but we will soon learn otherwise. First is the failure to understand that the ASTM C-1063 standard was (and is) written for installations without a substrate covering (open framing) or where the studs are covered with non-structural sheathing such as Styrofoam boards, Asphalt Impregnated sheathing, Thermo-ply sheathing, etc… So where else would the nails be placed? Into air between the studs? or into the non structural sheathing? The provision makes sense now, doesn’t it.

These substrates are generally not acceptable for design in areas of high wind regions which require the appropriate wind loading requirements be determined and the attachment be specific for the applied loads. The standard does not factor placement over “Structural Rated Panels” (OSB or Plywood, etc...). The standard’s attachment provision was neither developed for use in high wind areas nor by approved testing or engineering data. The 7” on center requirement evolved from field applied line wire spacing (single metal wires were pulled taught for support and attachment - See Figure 1A). This application method was common in mid-western regions with a lower windspeed and humidity level than the climatic conditions such as those found in the southeast United States. Additionally, these ASTM standards (C926 Cement Plaster and C1063 Installation of Metal Lath) were developed for plastering contractors to be used by fellow plastering contractors in “real application time”. They were (and are) application standards - not design standards.

Accordingly, specific provisions were placed within these standards to permit the plastering specifier (design professional, plasterer or contractor) the ability to modify those provisions to accommodate proper application within differing regions.

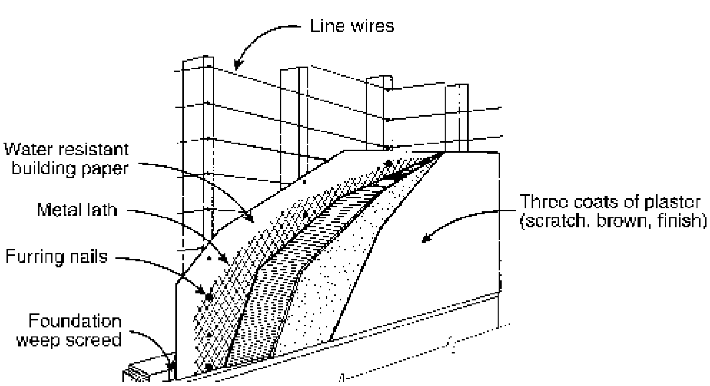


Figure 1A - Wire Line Application

Other specific adopted code provisions and requirements must always be evaluated for compliance in other regions. And, as we all know, when faced with conflicting provisions; the most restrictive provision applies.

It is herein that we will discover a major discrepancy that was always known to “old plasterers” and seasoned professionals - but relatively unknown to newer generations of design professionals, inspectors and contractors.

**CODE PROVISIONS:**

Provisions codified within the Building Codes and Standards are either written on a “prescriptive” basis or on a “performance” basis. The 7” fastener spacing provision (as previously stated) is an example of a simple “prescriptive” requirement.

A “performance” basis would state the requirement more simply such as; “Comply with Chapter 16, Structural” or “Design to limit the wall deflection to L/360 according to the wind provisions of ASCE 7” or similar language....

When performance specifications are required, calculations must be performed to determine the metal lath fastener and fastener spacing needed to prevent withdrawal and prevent cladding flexural failure based upon the aerodynamic forces (both positive and negative) that will be imposed upon the building's exterior by the wind loading provisions of Chapter 3 (residential code), Chapter 16 (building code), or the referenced ASCE-7. These forces vary by defined zones (areas) of the building's exterior.

Application of prescriptive provisions can be applied only in areas that do not exceed their stated design pressure maximums. If the wind load is higher than the prescriptive design or allowable code provision, the attachment of the wall covering must be determined using performance methodology.

*(Authors note; the Residential Code publishes these pressures in a Table with adjusting factors in Chapter 3. The Building code requires computation based upon varying spatial configurations)*

To assure this compliant attachment is achieved, the code contains a separate performance compliance provision which overrides the prescriptive provision as stated in ASTM 1063. Refer to Florida Building Code, Residential:

*(Authors note; The provisions of the Residential code are being cited for brevity. The Building Code contains similar provisions)*

**R301.2.1 Wind design criteria.**
Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(4). Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) **shall be used to determine design load performance requirements for wall coverings,** curtain walls, roof coverings, exterior windows, skylights, and exterior doors (other than garage doors)…..

**R301.2.1.1 Wind limitations and wind design required.**
The prescriptive provisions of this code for wood construction, cold-formed steel light-frame construction, and masonry construction **shall not apply** to the design of buildings where the ultimate design wind speed, $V_{ult}$, from Figure R301.2(4) equals or exceeds 115 miles per hour (51 m/s)….

**R601.2 Requirements.**
Wall construction shall be capable of accommodating all loads imposed in accordance with Section R301 and of transmitting the resulting loads to the supporting structural elements.

**R703.1.2 Wind resistance.**
**Wall coverings**, backing materials and their attachments shall be capable of resisting wind loads in accordance with Tables R301.2(2) and R301.2(3) for walls using an effective wind area of 10 square feet. Wind-pressure resistance of the siding and backing materials shall be determined by **ASTM E330** or other applicable standard test methods where wind-pressure resistance is determined by design analysis,….. *(remaining text eliminated for brevity)*

**R703.3.1 Wind limitations.**
Where the design wind pressure exceeds **30 psf** or where the limits of Table R703.3.1 are exceeded, the attachment of wall coverings shall be designed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). For the determination of wall covering attachment, component and cladding loads shall be determined using an effective wind area of 10 square feet (0.93 m2).

**R703.7 Exterior plaster.**
Installation of these materials shall be in compliance with ASTM C926, ASTM C1063... and the provisions of this code.

**R703.7.1 Lath.**
Lath and lath attachments shall be of corrosion-resistant materials. Expanded metal or woven wire lath shall be attached with 1-1/2-inch-long (38 mm), 11 gage nails having a 7/16-inch (11.1 mm) head, or 7/8-inch long (22.2 mm), 16 gage staples, spaced not more than 6 inches (152 mm), **or as otherwise approved**.

*(Authors note: the standard does not say 6 inches on center vertically at each stud or 6 inches on-center each way)*

Now, the questions at hand are; Will the prescriptive fastening requirements of the ASTM standard comply with the wind design performance criteria of the code? And, if they conflict, which provision prevails?

The latter question can be answered by referencing the following two code provisions:

**102.4.1 Conflicts.**
Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

**102.4.2 Provisions in referenced codes and standards.**
Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code or the Florida Codes listed in Section 101.4, the provisions of this code or the Florida Codes listed in Section 101.4, as applicable, shall take precedence over the provisions in the referenced code or standard.

So, we have learned that the code provisions apply over the standards for both content and conflict.

Since the current code does not provide a prescriptive fastener spacing requirement for metal lath for wind regions in excess of 115 mph $V_{ult}$, the performance requirement of the code defers determination of the fastener spacing, type and penetration points to the designer or specifier.

How did we comply in the past? Former codes contained a high wind attachment provision in the HVHZ section. Although restricted to mandatory application area of Miami -Dade and Broward, any locale in Florida could electively apply or use these provisions as well as product approvals.

This provision came from the South Florida Building Code and remained in the Florida Building Codes through the 2010 edition. Advocated by persons ignorant of its application necessity, it was deleted from the 5th edition for the sake of provision "unification". The provisions are still be applied today since they were based off a higher wind speed than the remainder of the peninsula. I have included the fastening provision for your perusal:
**HVHZ Section 4411.3** (residential code with a mirror provision in the building code):
*"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."*

These modified high wind attachment provisions served south Florida flawlessly for decades. Knowledgeable stucco designers and installers simply applied them as a minimum provision - regardless of where the building was sited within Florida.

Whether in the code today or not, they are still being used since the code requires compliance with high wind provisions and the ASTM documents contain an "Unless otherwise specified" provision for necessary regional modifications such as this.

So, back to the Florida Building Codes, 7th. Edition. If your residential home is located in a region with wind speeds in excess of 115 mph $V_{ult}$, (most all of Florida) then you must verify the fastener resistance for its design pressures (negative and positive). Fastener spacing, length and pattern **must** be determined.

We will see that this is where "the devil is in the details". Except for a few rare instances, most all other products have their design pressure rating published or known—stucco lath attachment is one of these rare exceptions. Accordingly, the Attachment Tables published herein were developed by the code approved testing methodology (**ASTM E300**) in order to determine allowable fastener loading depending upon common fasteners, placement and substrates.

To understand why this and other (stucco and lath) related issues in the standards seem simple but in fact are complicated, one needs to remember that the ASTM C-926 (stucco) and C-1063 (metal lath) standards were never developed as a design code document, but rather as a plaster's installation standard based upon a specific installation criteria and method. Later on, they were referenced into the code, but were not modified for regional or other design code application—that would make the standard too voluminous - they simply included language such as "unless other specified" to accommodate regional or needed modifications.

Simply put, they were developed (and internationally still are used today) as an installation standard for plasterers when application is over open framing or non-structural sheathing using a 3 coat cement plaster application when installed over a metal or wire lath and 2 coat when installed over block or similar substrate where the final coat is a **colored cementitious** finish coat (no paint).

In both cases the final coat is an 1/8" "colored" coat of cement - painting the surface is **not** contemplated whatsoever.

Painting the system when installed over wood framing changes the dynamics, accessories, detailing and curing properties of the system requiring major application adjustments by way of the "unless otherwise specified" provisions of the standards. Refer to other Stucco Institute newsletters for expanded discussions on other aspects of design and installation of stucco systems.

**Summary**

As developed and written for frame construction, the standard's application methodology was for developed for application over "open" stud framing (no exterior wall sheathing at all) or over non-structural sheathing such as foam boards, thermo-ply, asphalt impregnated sheathing, or other non-structural sheathing panels or heavy ply felts.

Originally, horizontal rows of wires were pulled taut and the wire lath was tied to them. With the development of more rigid laths that would span between studs, wire rows were eliminated. Since the wires had been commonly spaced 7" on center, the nailing spacing was continued.

Regardless of the origin - no testing, evaluation, or other factual basis for the fastening pattern in these ASTM documents has been codified. Until Now - See Attachment Tables contained herein.

Understanding that the standard contemplates "open framing" or "non-structural" sheathing, the ASTM provision requiring the metal lath fasteners be embedded 3/4 inch (standard minimum withdrawal depth) into "the vertical framing members" becomes self-evident.

And the requirement that the sheathing thickness be added to the fastener length? If the foam board sheathing was 3/4" thick, and the fasteners were 3/4" long, there would be no structural attachment whatsoever. So these provisions become self explanatory when you understand the basis, concept and application of the ASTM standards.

As of 2022, the ASTM documents do not address structural panels or their applications. That is up to the designer or specifier. The ASTM provisions assumes open framing or non-structural sheathing in regions where the wind speed is less than115 mph $V_{ult}$ or where aerodynamically applied wall pressures are ≤ 30 psf.

So why doesn't the standard provide for a higher wind speed installation method? First of all, the use of full structural sheathed walls is only applicable in a miniscule area of the globe—we just happen to live in this tiny slice. So, although of great importance to us, it is of little importance to the international arena.

Secondly, it does address it indirectly. The standard has always contained a statement to follow its provisions "Unless Otherwise Specified". The standard, since its inception, knew its few pages of text could not possibly cover every application, on every building, in every climatic region, in every windspeed, in every seismic zone on planet earth— remember it is an International standard.

So the "except as otherwise specified" provisions are used to allow the necessary regional modifications for successful installation of stucco assemblies and applications globally.

**ASTM C1063 WITHDRAWAL TESTS:**

So, back to the ASTM prescribed fasteners installed 3/4” into the vertical framing members spaced 7 inches on-center. Exactly what withdrawal value can be used when lath is installed as prescribed?

Two identical full size (4’ x 8’ each) wall specimens were prepared (one with a control joint and one without). 2.5 lb. expanded metal lath sheets were attached per the ASTM C-926 and ASTM C-1063 requirements; fasteners penetrating 3/4 inch into studs at 7 inch on-center vertically. Studs spaced 16 inch horizontally. The specimens were properly plastered, (2 - 3/8” coats with a finish coat) cured (21 days) and tested in an accredited laboratory for static and cyclic loading. Testing was performed on 10/16/2016.

The test protocol was performed according to the code requirement of **ASTM E330.** (attached) The report was titled:

WIND RESISTANCE EVALUATION OF STUCCO FINISH APPLIED TO PAPER-BACKED STUCCO LATH ON A WOOD FRAMED WALL

Once cured, the specimens were attached to a wall that applies static pressure in both positive and negative modes with recovery times between each repetitive increased pressure cycle. The specimen is cycled through these pulses until failure.

The ASTM 330 states that all loads must be proofed to 1-1/2 times the published rating. This factor takes into account the variables of ideal assemblage in a controlled testing environment that rarely happens in real world installations (Refer to Fastening Tables for application of safety factors (FoS).

Testing was taken to failure on both specimens. Both held for a 50 psf rating (proofed at 75 psf but the 75 psf failed to proof at the next increment. This leaves the available rating at 50 psf using the test factor of 1.5.

See Stucco Institute **Figures 2, 3, 4 and 5.** Does the crack pattern in 4 and 5 look familiar? Have you seen these failures?

Note that failure of both specimens was from negative pressure between the studs. In other words, the 7 inch on center fasteners held, but the horizontal interval of 16 inches was too great a span to keep the system from failing - it simply flexed (“cupped”) and fractured.

*Authors Note; There was some discussion if mass rupturing represented an absolute failure of the system since it did not detach from the wall altogether and might be subject to repair. Besides the testing classification of a failure - failure is certain for the following other reasons; (1) If applied over open framing or non-structural sheathing, repair would be impossible - if over structural panels, random screws might be installed at 6 inches on-center each way securing the ruptured system to its substrate. However if the wall has been painted, the application of new coat of stucco using a bonding agent over the repair would be problematic and attaching new metal lath at that point would represent more effort than removal and replacement. (2) the test was stopped at rupture - in a high wind event, the continued cycling would inevitably lead to detachment of cladding sections*.

So, to adequately attach the lath there would need to be an intermediate vertical column of fasteners in between the stud spacing fastened into a structural panel (or a random pattern of placed fasteners) in order to resist higher withdrawal values. See Stucco Institute **Figures 6 and 7.**

You might say, “Well wouldn’t the 50 psf be ample since most wind loads are 30 - 50 psf?”

No. The answer lies in the fact that this is testing to failure data. We need appropriate safety factors. We look to the code for the appropriate factor. Although many designers use a factor of 3 for cladding attachment. However the code states at:

**1709.3.1 Test procedure.**
….. the test specimen shall be subjected to an increasing superimposed load until structural failure occurs or the load is equal to **two and one-half times** the desired superimposed design load. The allowable superimposed design load shall be taken as the lesser of:

1. The load at the deflection limitation given in Section 1709.3.2.

**2. The failure load divided by 2.5.**

3. The maximum load applied divided by 2.5.

So, adjusting for failure; 50 psf x 1.5 / 2.5 equals **30 psf** allowable load using the code prescribed safety factor.

**Hey! Wait!** isn't that same maximum psf found in the code at **R703.3.1 Wind limitations?** Yes.

For a design pressure over 30 psf, prescriptive provisions of the standard are

Figure 2

Figure 3

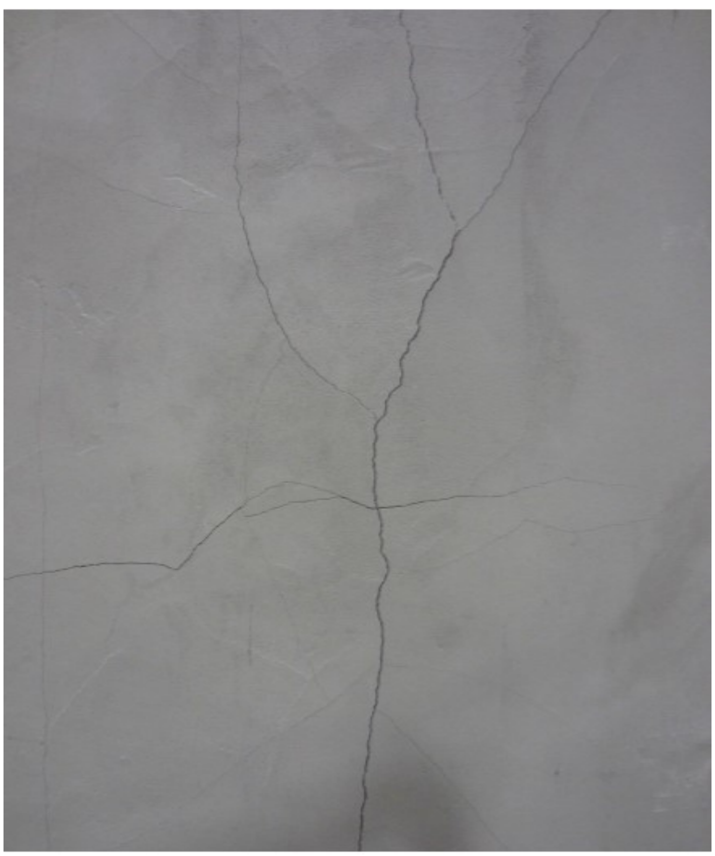

Figure 4

Figure 5

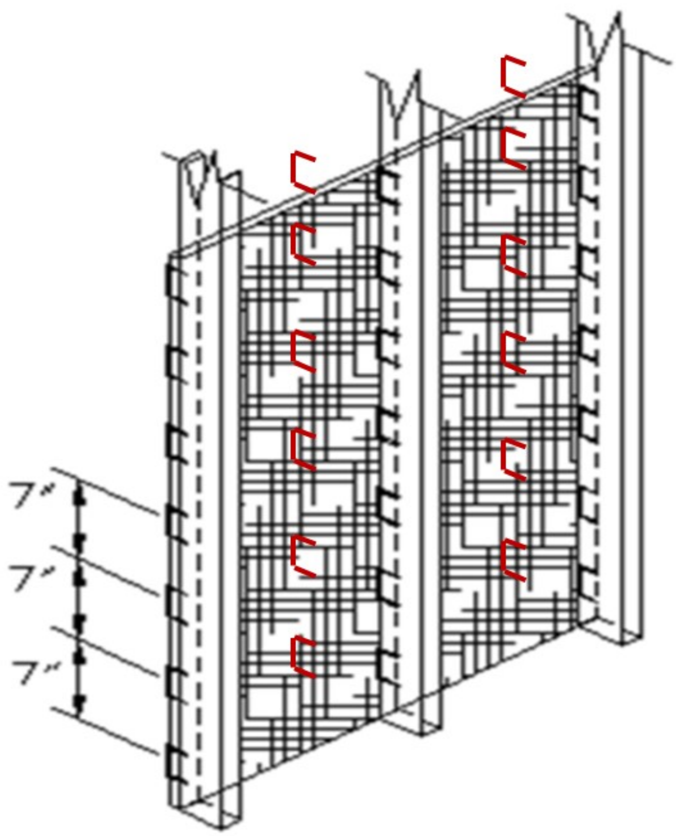


Figure 6

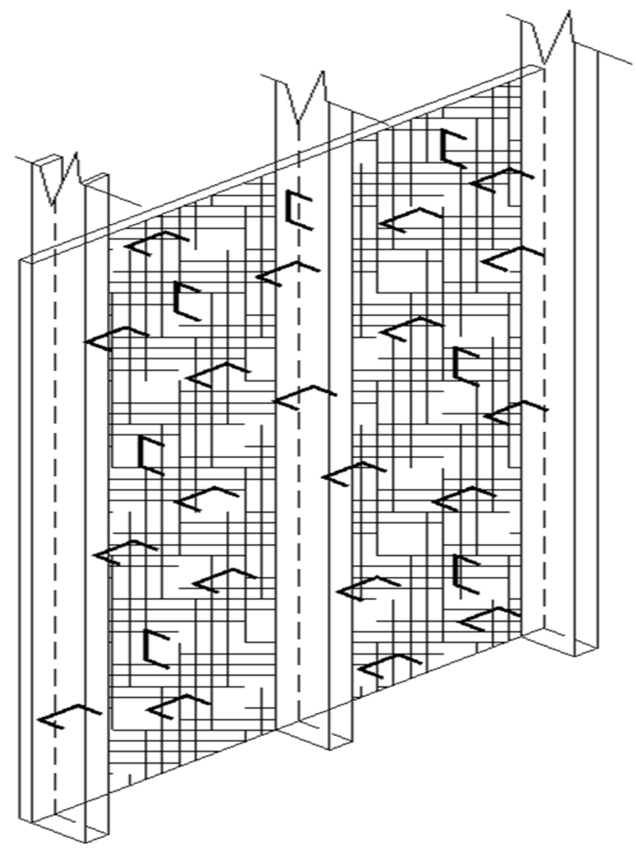

Figure 7

negated (unless prescriptively tested and approved for higher pressures). The designer is required to determine and design according to the applicable wind forces. Yep, now you're getting it.

In most national regions the 30 psf value is sufficient and prescriptive methods can be used since the windspeed is lower than high wind regions such as Florida.

Although structural components oftentimes have safety factors of 2 or in some cases 1.5, these items are interconnected in the Main Wind Force Resisting System (MWFRS) or are assembled in repetitive use combinations. Components and claddings are "stand alone" items and do not have interconnective or repetitive advantages and therefore are not subject to these more lenient factors.

So where does this knowledge leave us? How do we comply? The answer in the past was simple: If any portion of your wall area is subject to design pressures in excess of 30 psf, then you needed to add a row of intermediate fasteners in between the stud spacing to resist the cupping factor (See Figure 6) or do as we were taught 40 years ago by those "old trained" professionals and scatter your fasteners across the panel (≈ 6" o.c. each way) to ensure anchorage and to create a system wide monolithic force distribution panel (See Figure 7).

Although some "new" consultants say the "old-timers" were incorrect, the old method of attachment did not fail. As the old saying goes, "the proof is in the pudding". This pattern is shown in Figure 7.

Although the old method performed, there was still not full scale wall testing data to rely upon - Until Now. The **Safe Attachment Tables** that follow can be used for design data and all tests were performed using the code prescribed **ASTM E330** in an accredited facility.

Now, when required spacing requires attachments between the studs, there will be those that say; "the fasteners must only be placed in the studs due to the sealing of the fastener legs into the wood". They contend that this method will keep water that is migrating downward behind the stucco façade (towards the weep screed) from entering the wall cavity during its migration.

First, Note the word "weep screed" as the discharge mechanism and exit point. It is not called a "drain" screed. The water migrating down the wall is miniscule. If you have quantities of water so vast that they are migrating horizontally around fastener legs through the water resistant barrier, then you have a serious bulk water intrusion problem in need of immediate repair.

Second, assuming water was actually draining down the water resistant barrier, in a high wind region, the last place you would want that water absorbing and creating fungal growth would be at the stud line. In our high wind regions, these vertical framing members serve not only to support the gravitational (dead) loads—but also resist and transfer wall shear, uplift and other horizontal (live) loads.

Accordingly, these structural panels have an increased nailing pattern with 8d common or other approved nails at the stud line. The last thing we need is an additional line of fasteners driven into these already stressed locations.

Third, the argument fails to adjust for using a paint (coating) in lieu of a colored coat of 1/8" cement plaster. This process creates a face barrier system. Florida has used the face barrier system rather than the drain plane concept since the stuccoing of exteriors began. Notwithstanding the fact that when you paint the surface - you seal the weep screed interface preventing its functionality unless special accessories are employed. (see face barrier vs drain plane at the www.stuccoinstitute.com)

In our Florida region we usually use a face barrier system. Using a drain plane is much more difficult due to the amount of annual rainfall and average relative humidity. Not to mention the salt depositing itself on the wall surface and migrating behind the system.

Accordingly, long ago, our plasterers knew that we needed to seal the face of our stucco systems to prevent water intrusion and seal all penetrations to prevent the accumulation of salt laden vapor behind the stucco cladding. The face barrier system was employed and has successfully performed throughout the years.

The face barrier system depends upon proper details, sealants and proper application (especially regarding coating thickness) in order to perform successfully.

The face barrier system is a recognized ASTM protocol—but it is not mentioned in the ASTM stucco document. Why? Because the ASTM C-926 was developed for application of colored stucco finish that uses a required drain plane to manage infiltrating moisture. Simple as that.

With a proper face barrier system, the drain plane (underlayment) is necessary to provide protection of the wood during construction and to control initial hydration (curing) of the wet cement.

After that, its function is similar to shingle underlayment - to protect the substrate (structural wood panels) in the event of an emergency situation. If the shingles develop a leak or are partially blown off, the underlayment provides temporary or partial protection until necessary repairs can be made.

Can you install both? Yes, but the weep screed will be covered with the paint (coating) and that will render the drain plane useless unless a two piece flashing is used.

So, we return to the required fastening pattern and the "unless specified otherwise" provisions of the ASTM C-926 and C-1063.

**WHO CAN "SPECIFY OTHERWISE?**

Who is the intended authority? The architect, the engineer, the contractor, the stucco contractor, or the waterproofing contractor?

The answer is any or all of these professionals. Remember the standards are International standards so the "specifier" is intended to be the professional that was given the authority by the owner or a professional required by local regulations, if applicable. Originally, it was referring to the trained Plasterer.

Therefore the fastening pattern may be specified as prescribed by the code referenced standard, or if in excess of 30 psf, the attachment can be determined by the following **Safe Attachment Tables**.

**Does the code require metal lath inspection?**

Refer to the Florida Building Code:

**110.3.5 - Lath, gypsum board and gypsum panel product inspection.**
Lath, gypsum board and gypsum panel product inspections shall be made after lathing, gypsum board and gypsum panel products, interior and exterior, are in place, but before any plastering is applied or gypsum board and gypsum panel product joints and fasteners are taped and finished.

**Exception:** Gypsum board and gypsum panel products that are not part of a fire-resistance-rated assembly or a shear assembly.

*Note; this requirement was always intended to be for rock (gypsum) lath (base for gypsum plaster) and gypsum boards.*

*These are common components for interior fire partitions. The term lath (by uninformed practice) was extended to include "metal lath" which was not the intent of the provision without including the preface of "Metal or Wire".*

So regardless of how you interpret the foregoing, the exception is clear. So, is the lath or gypsum part of a fire rated or shear assembly? If yes, then it needs to be inspected to ensure that the fire or shear requirements and components are properly placed and assembled in accordance with the compliance documents. If no, then no inspection is required by code.

Since local ordinances can amend the inspection list found in Chapter 1 of the Florida Building Code at will, inspection of the metal lath may have been included in the local code officials checklist.

If the fastening pattern is not specified on the approved plans, I would ask the builder to submit a fastening pattern diagram or statement of spacing intervals or simply reference the appropriate **Safe Attachment Table** contained herein.

**Conclusion:**
So, we see that simple attachment of metal lath is not simple at all. The issues are quite complex and interdependent upon other interfaces in order to perform to Florida's high wind regions. Accordingly, most provisions are under the auspices of the contractor of record or the Plastering Contractor - not the Building Official, unless local amendments require the code official to inspect or monitor for code compliance.

True, Building Officials have governance over the code and plan review, but that does not mean they are responsible for quality control, or responsible to inspect and ensure all the provisions of all codes and standards are met, especially regarding waterproofing of building envelopes. That is the responsibility of the contractor of record. Building Officials are given a prescribed list of components that they are to review for code compliance at time of plan review and a separate list of components they are to inspect - both lists contained in Chapter 1 of the Code (Administration). Therein is drawn the framework of their purview and responsibility.

Imagine if building inspectors were responsible for application of all of the codes, standards, publications and documents of the code, the requirements would fill a room with data. They would need a superhuman knowledgebase and an intimate understanding of thousands of technical documents in order to perform an inspection. Fortunately they have no such mandate.

So, the quality is up the Plastering / Lathing contractor and the Contractor of Record to maintain these installation standards - its our profession to keep…

Other bulletins, newsletters, articles and manuals are posted online at www.stuccoinstitute.com . Additional articles such as “The Truth about Florida Stucco” and “Moisture Effects Behind Florida Stuccoed Walls”, “Drain Plane vs Face Barrier Systems”, “Inspecting Stucco Applications for Code Compliance” along with other articles including full scale testing building modeling, are posted at the same site.

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**Safe Attachment Tables Begin on Next Page.**

# Safe Attachment Tables

The following **Safe Attachment Tables** and their associated diagrammatic **Fastening Placement Tables** have been prepared according to testing results derived from **ASTM 330** testing data as required (and prescribed) by the ICC and Florida Building Codes.

Each Table represents a specifically prepared full wall specimen that was prepared and tested in an accredited testing facility. Although the testing specimens were largely constructed using StructaLath, Standard 2.5 expanded metal lath was also tested as an initial control. Differences were not significant.

The **ASTM 330** states that all loads must be proofed to 1-1/2 times the published rating. This factor takes into account the variables of ideal assemblage in a controlled testing environment that rarely happens in real world installations (Refer to Fastening Tables for application of code prescribed safety factors (FoS).

Many designers use as Factor of Safety (Fos) of 3 for all claddings. The code requires a Fos of 2.5 for untested specific product. Accordingly we have included all 3 values for the users consideration. We suggest that, unless a degreed design professional, all plasters and contractors use the 2.5 or 3 Fos values.

## SAFE ATTACHMENT TABLE T-1
**Refer to Fastener Placement Table F-1**

**STAPLE ATTACHMENT INTO 16" O.C. VERTICAL WOOD FRAMING MEMBERS AT 7" MAXIMUM VERTICAL INTERVALS (OR STEEL[1] )FRAMING MEMBERS WITH SCREW ATTACHMENT**

**ASTM 330 TEST METHODOLOGY RESULTS**

**2.5 Expanded Metal Lath Installed over Wood Studs Spaced 16" on center. Lath Attached with Staple or Screw[1] Fasteners Vertically Spaced 7" on center**

**Attachment according to the ASTM C-1063**

| Attachment Data and Spacing | Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement | Allowable Load in psf Using Code Applied Load FoS of 2.5 per | Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7 | Tributary Area in2 / Fasteners p/s/f |
|---|---|---|---|---|
| 16 ga.1" crown x 1" leg galvanized staples spaced 7" on center into vertical framing members spaced 16" horizontally on center | 50 | 30<br>Frequently fails for Higher Wind Areas or where modifiers adjust basic wind speed | 25 | 112 / 1.28 |

ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7*

*Author Note : Most ASTM installations are installed wholly or partially over open framing as tested in this specimen. Although there was no sheathing installed over the studs the results would have been the same since failure was in the negative direction. In other words , even if sheathing were to have been used, if the nails were placed in the same vertical stud lines, the effects would be the same since failing force was initiated on the negative pressure cycle.*

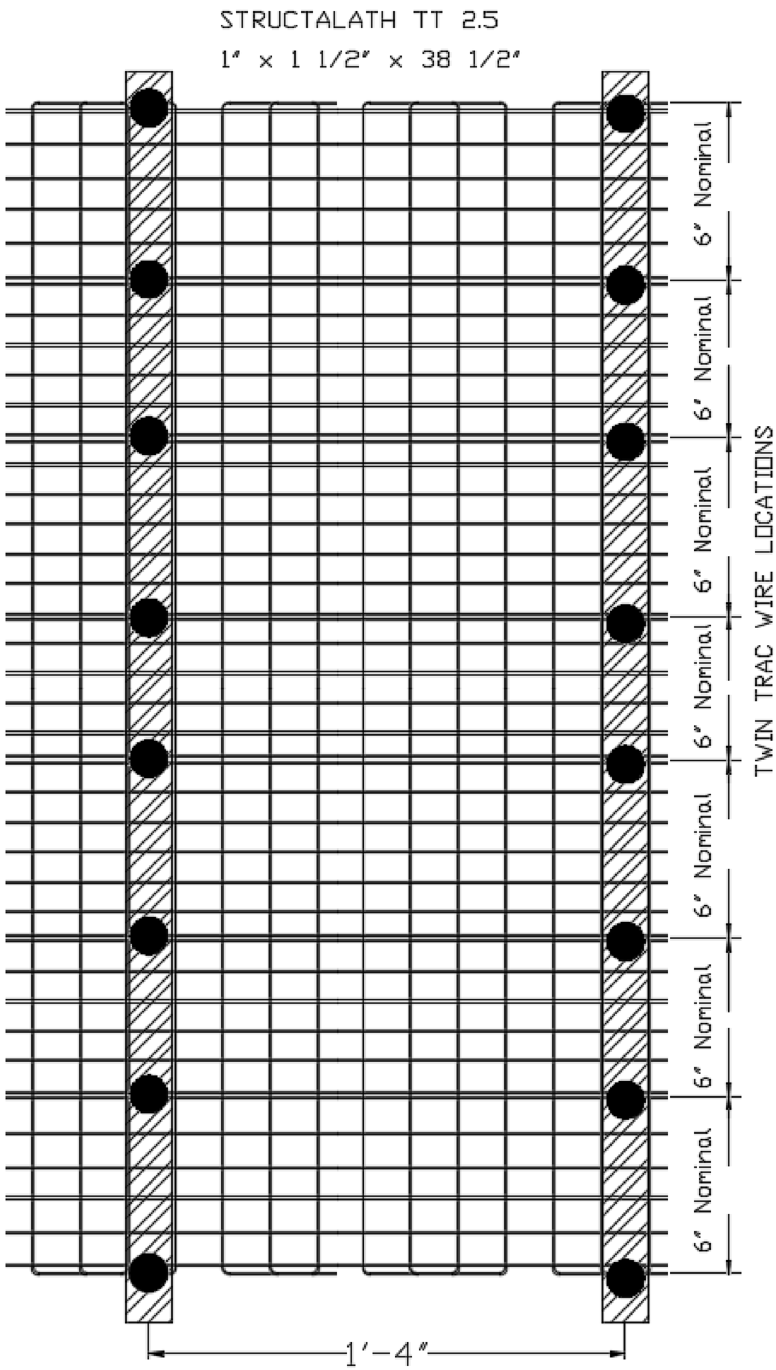
*[1] A 16" o.c. steel stud frame assembly was covered with 5/8" DensGlass sheathing. #8 x 1-1/4" Lath screws were used to attach the Metal Lath to the studs 6" o.c. vertically. 1 - "C" track was place horizontally at the 4' (midwall) point with screws attaching the lath to the midwall strap (track) 6" horizontally o.c. The wall failed to proof at a higher value than those listed above. See Table T-5 for Steel Framing configurations requiring higher values.*

## Fastening Placement Table F-1

See Table T-1 for Fasteners Specifications
Wood Studs with Staple Attachment at Vertical Studline
Steel Studs with Screws Placed in the Vertical Studline
Studs may be Covered with Wood, Gypsum, Foam, Fiberboard or Other Sheathing
If Expanded Metal Lath is Used, Fasteners May be vertically Spaced at 7" o.c.

Drawing NTS - Illustrative only



## Safe Attachment Table T-2
## Refer to Fastener Placement Table F-2

### Staple Attachment to Structural Wood Panels ≈ 6” o.c. each way

### ASTM 330 TEST METHODOLOGY RESULTS

**StructaLath No. 17 SFRC Twin Trac 2.5 installed over 1/2 nominal (7/16 minimum) structural panel sheathing attached to studs or sub-framing per design using 1” leg x 1” crown, 16ga. galvanized steel staples spaced maximum 6” o.c. along the horizontal dimension on the twin track. The rows were spaced vertically a maximum 6” o.c. and offset 3” o.c. from the preceding row.**

| Attachment Data and Spacing | Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement | Allowable Load in psf Using Code Applied Load FoS of 2.5 per 1709.3 | Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7 | Tributary Area in2 | Fasteners p/s/f |
|---|---|---|---|---|---|
| 16 ga.1” crown x 1” leg galvanized staples spaced 6” vertically into structural wood sheathing panel and fastener pacing of 6” horizontally on center with each row placement offset 3” to achieve a staggered pattern | 60 | 36<br>May meet basic load requirement for buildings sited in a “B” exposure classification where modifiers do not raise design pressures | 30 | 36 | 4 |
| ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - o.c. = on center - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7.* | | | | | |

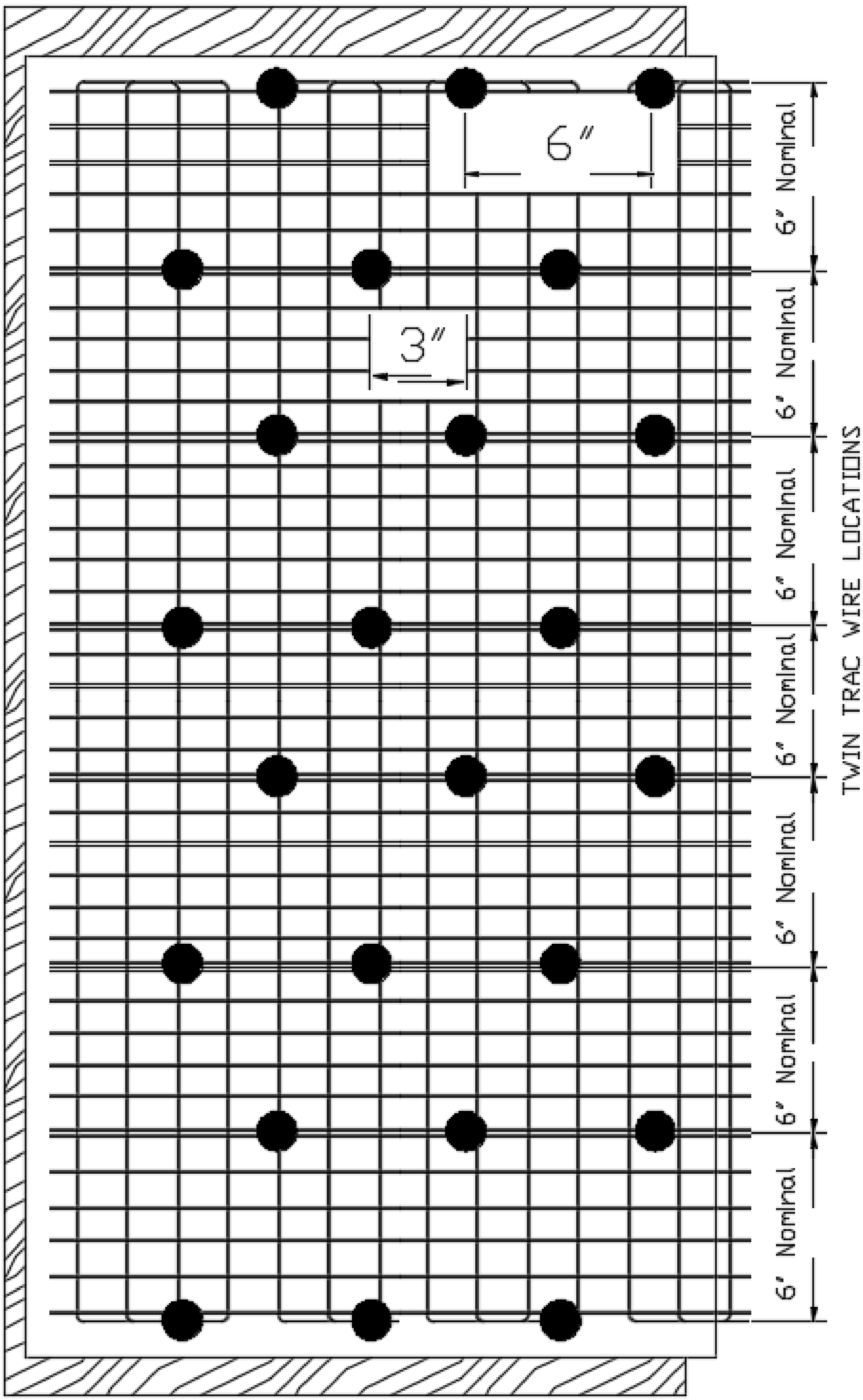
## Fastening Placement Table F-2

See Table T-2 for Fasteners Specifications

Studs Covered with Structural Panel Sheathing; 1/2” Nominal Thickness

Staples Placed 6” O.C. Each Way - Fasteners Offset Every Other Row

Drawing NTS - Illustrative only



## Safe Attachment Table T-3
## Refer to Fastener Placement Table F-3

### Screw Attachment to Structural Wood Panels ≈ 6” Vertical and 16” Horizontal

### ASTM 330 TEST METHODOLOGY RESULTS

**StructaLath No. 17 SFRC Twin Trac installed with screws spaced maximum 16” o.c. along the horizontal dimension. Attachment rows spaced vertically 6” o.c. and offset 8” o.c. from the preceding row.**

| Attachment Data and Spacing | Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement | Allowable Load in psf Using Code Applied Load FoS of 2.5 per 1709.3 | Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7 | Tributary Area In2 | Fasteners p/s/f |
|---|---|---|---|---|---|
| StructaLath No. 17 SFRC Twin Trac 2.5 was installed with #8 x 1” truss-head, K-lath screws spaced maximum 16” o.c. along the horizontal dimension on the twin track. The attachment rows were spaced vertically a maximum 6” o.c. and offset 8” o.c. from the preceding row. | 100 | 60 | 50 | 96 | 1.5 |
| | | Frequently meets design attachment requirements | | | |
| ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - o.c. = on center - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7* | | | | | |

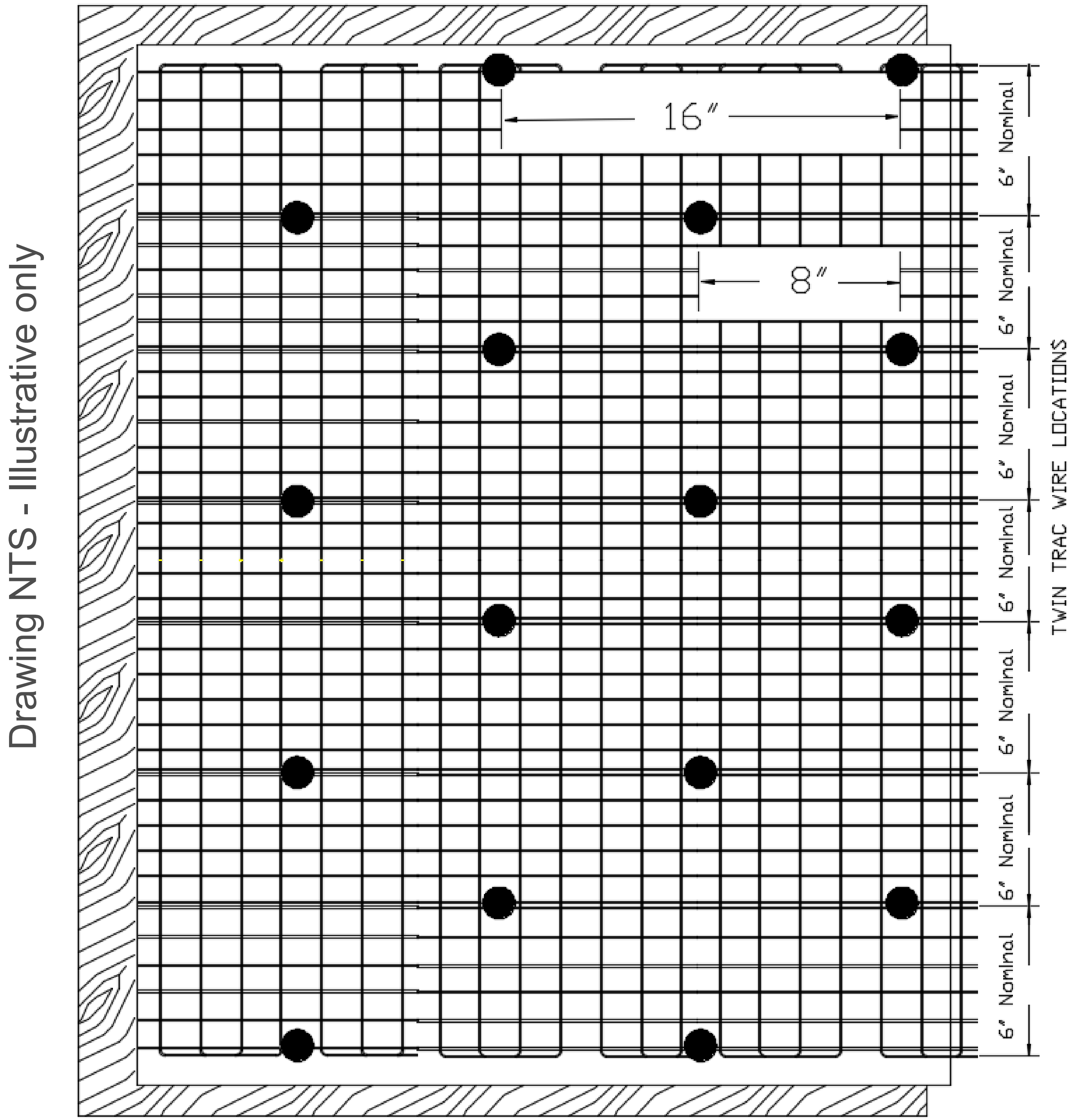
  

## Fastening Placement Table F-3

See Table T-3 for Fasteners Specifications

Studs Covered with Structural Panel Sheathing; 1/2” Nominal Thickness

Screws Placed 16” O.C. Horizontally - 6” Vertically - Fasteners Offset 8” Every Other Row



## Safe Attachment Table T-4
## Refer to Fastener Placement Table F-4

### Screw Attachment to Structural Wood Panels ≈ 6" Vertical and 12" Horizontal

### ASTM 330 TEST METHODOLOGY RESULTS

**StructaLath No. 17 SFRC Twin Trac installed with screws spaced maximum 12" o.c. along the horizontal dimension. Attachment rows spaced vertically 6" o.c. and offset 6" o.c. from the preceding row.**

| Attachment Data and Spacing | Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement | Allowable Load in psf Using Code Applied Load FoS of 2.5 per 1709.3 | Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7 | Tributary Area In2 | Fasteners p/s/f |
|---|---|---|---|---|---|
| StructaLath No. 17 SFRC Twin Trac 2.5 was installed with #8 x 1" truss-head, K-lath screws spaced maximum 12" o.c. along the horizontal dimension on the twin track. The attachment rows were spaced vertically a maximum 6" o.c. and offset 6" o.c. from the preceding row. | 150 | 90 | 75 | 72 | 2 |

Should meet any design attachment requirement

ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - o.c. = on center - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7*

*The requirement for 2 fasteners p/s/f was a South Florida Building Code requirement for over 50 years. Unknowledgeable professionals lobbied for consolidation of text and it was eliminated by the Florida Code Commission in the 2010 Florida Building Code. That has proven to be a serious unintended error in Florida.*

## Fastening Placement Table F-4

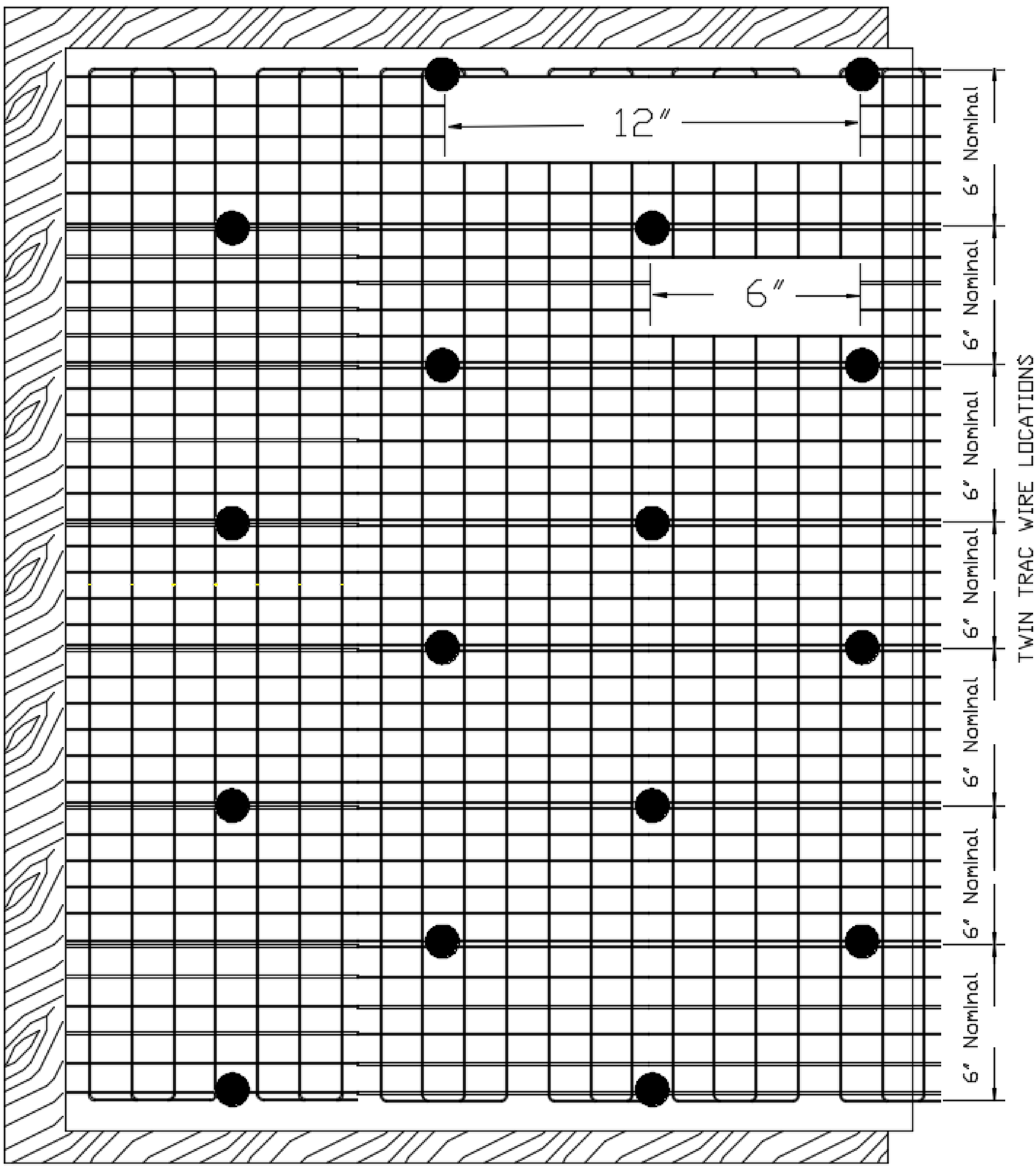
See Table T-4 for Fasteners Specifications

Studs Covered with Structural Panel Sheathing; 1/2” Nominal Thickness

Screws Placed 12” Horizontally - 6” Vertically . Fasteners Offset 6” Every Other Row

South Florida Building Code Pattern

Drawing NTS - Illustrative only



## Safe Attachment Table T-5
## Refer to Fastener Placement Table F-5

### Screw Attachment to Steel Studs Covered with fiberglass mat gypsum sheathing (DensGlass®)

### ASTM 330 TEST METHODOLOGY RESULTS

**StructaLath No. 17 SFRC Twin Trac 2.5 installed with K-lath screws (3 threads minimum penetrating through stud flange) spaced a maximum 6” o.c. along Vertical Studs spaced 16” o.c., and 4” o.c. spacing at Horizontal Rows spaced 24” o.c.**

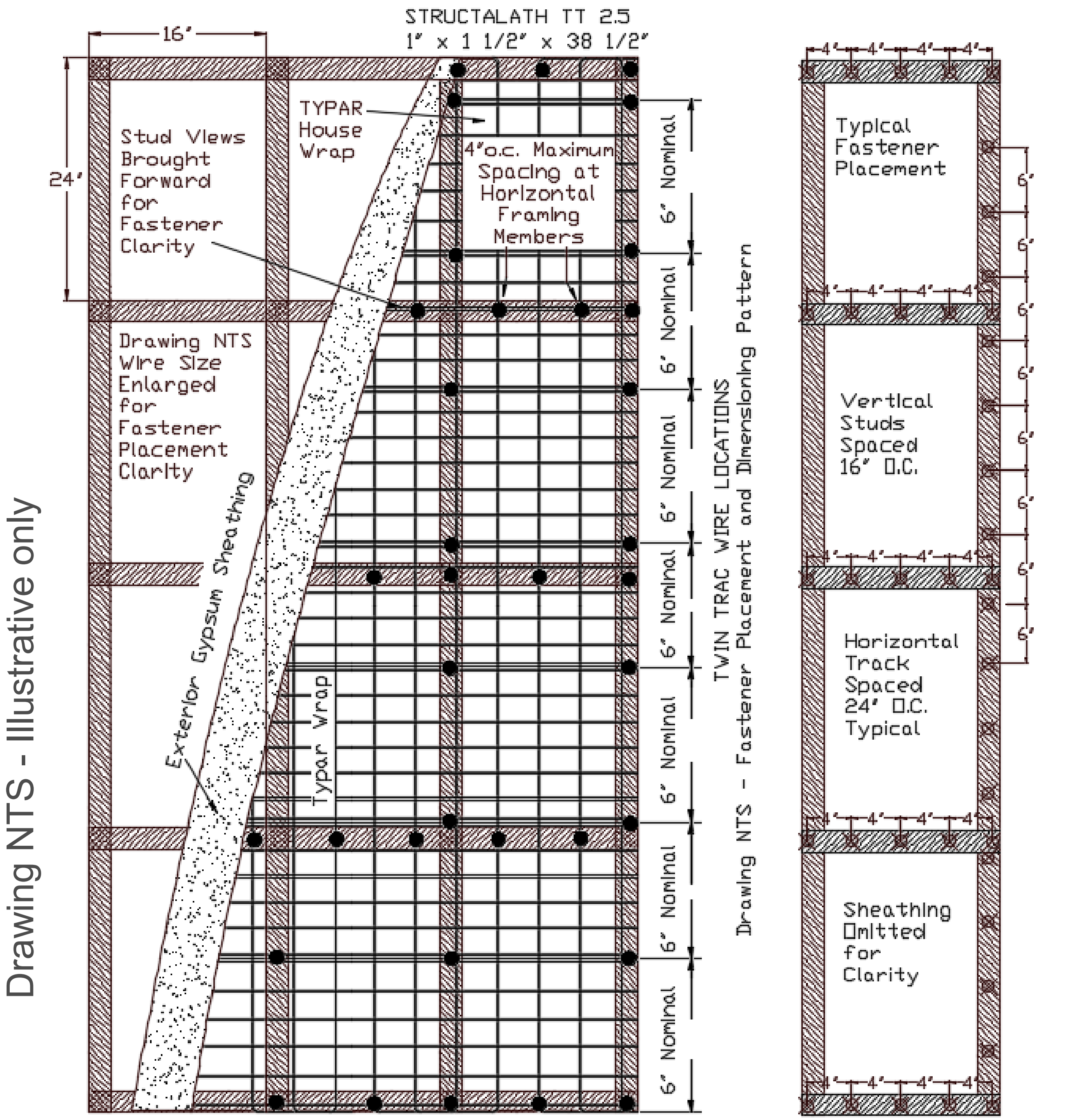
| Attachment Data and Spacing | Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement | Allowable Load in psf Using Code Applied Load FoS of 2.5 per 1709.3 | Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7 | Tributary Area In2 | Fasteners p/s/f |
|---|---|---|---|---|---|
| StructaLath No. 17 SFRC Twin Trac 2.5 was installed with #8 x 1” (minimum) truss-head K-lath screws installed into vertical steel studs spaced 16” o.c. Vertical attachment was 6” into the stud at each twin track (approximately 6” o.c.). In addition, the lath was attached at each c-stud strap placed horizontally 2’ o.c. at 4” o.c. spacing between studs along the twin track. | 120 | 72<br>Should meet most any design attachment requirement | 60 | **96** | 1.5<br>Does not include the horizontal fasteners placed 4” o.c. at each horizontal strap placed 2’ o.c. |

ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - o.c. = on center - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7*

## Fastening Placement Table F-5

See Table T-5 for Fasteners Specifications

Studs Covered with Exterior Gypsum Panel Sheathing (DensGlass); 1/2” Nominal Thickness, Screws Placed 6” o.c. At Vertical Studs Spaced 16” o.c. and 4” o.c. at Horizontal Framing Spaced 24” o.c.




Note: If 3/4” Structural rated wood panels are used, horizontal mid framing members may be eliminated provided fastener pattern remains as diagrammed and #8 - 3/4” pointed Tek Screws are used for attachment of the lath.

# ASTM E330 Testing and PRI Report Data Follow