

## BEST PRACTICES for STUCCO APPLICATIONS GUIDE

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### General

Exterior wall coverings, along with the roofing, flashings, windows and doors, are designed to provide a weather-resistive barrier that separates the interior of the structure from the elements. Low maintenance and attractive appearance are just two reasons why hard coat stucco has become so popular over the years. At the same time, the building industry has become aware of the need to protect the exterior wall sheathing from moisture damage.

The walls shall be constructed so that water does not accumulate within the assembly. This means creating a water-resistive plane behind the exterior veneer that allows moisture that does get into the wall to drain down and out without coming in contact with the wood framing. Detailing around windows, doors and other penetrations in the envelope is equally important in protecting the wood frame structure behind the stucco from being damaged by water infiltration.

Since the wall sheathing behind the stucco is the lateral load resisting system of the structure, in addition to the supporting surface for the exterior siding, it is important to see that continuous undetected penetrations of the siding by moisture do not create structural damage such as decay and corrosion or environmental damage which may cause health related problems such as the growth of mold and mildew. To this end, the removal of moisture that gets past the exterior envelope before it contacts the wood framing is the primary goal of the weather-resistive barrier and why it is critical that it be installed properly. This barrier is technically termed the secondary drainage plane.

This document is designed to provide guidelines for the application of stucco exterior finishes in the greater Johnson County area and is endorsed by the Johnson County Building Officials. The HBA of Greater Kansas City has a similar document.

### Installation of Exterior Sheathing Materials

Since wall bracing requirements throughout Johnson County are now predicated on continuous structural sheathing, due to extensive narrow braced panel usage, we find that most houses are being sheathed with either all-veneer plywood or oriented strand board (OSB). Either of these panels may be used as a substrate for stucco.



To increase the wall stiffness, these panels should be installed horizontally with their long dimension perpendicular to the studs. Horizontal blocking between the studs is recommended along the horizontal panel joints. This blocking can be put in flat and is recommended to provide the best performance and to eliminate the potential for cracking the stucco exterior along the joint in the sheathing. See Table 1 for recommended thickness and span rating for exterior structural panels to be used under stucco.

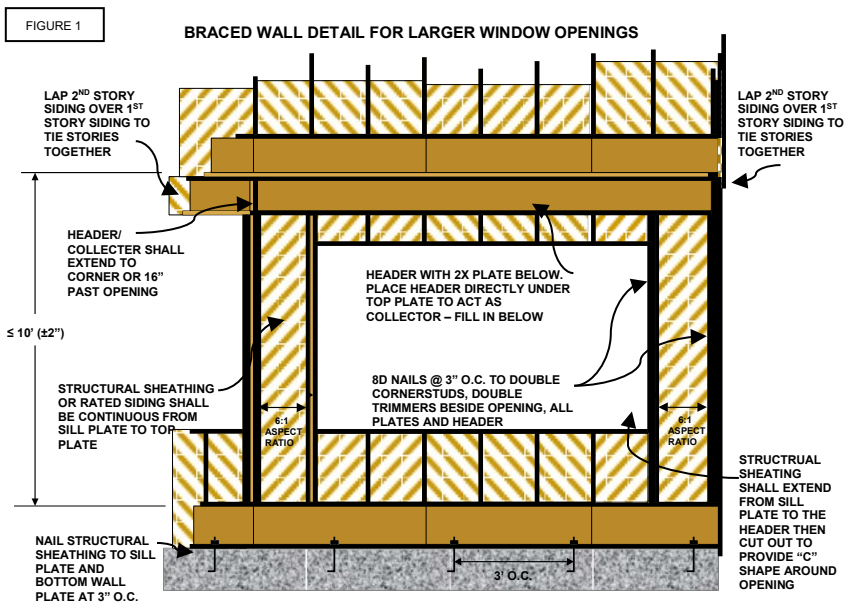
TABLE 1

RECOMMENDED THICKNESS AND SPAN RATING FOR APA RATED SHEATHING FOR STUCCO EXTERIOR FINISH

| APA Rated Sheathing <sup>(b)</sup> |                                  |  |                            |
|------------------------------------|----------------------------------|--|----------------------------|
| Stud Spacing<br>(in.)              | Panel Orientation <sup>(a)</sup> | Minimum Nominal                                      |                            |
|                                    |                                  | Thickness<br>(in.)                                   | Minimum Span<br>Rating     |
| 16"                                | Horizontal <sup>(c)</sup>        | 5/16" <sup>(d)</sup><br>5/16" <sup>(e)</sup><br>3/8" | 20/0<br>Wall-24 oc<br>24/0 |
|                                    | Vertical                         | 15/32" <sup>(f)</sup>                                | 32/16                      |
| 24"                                | Horizontal                       | 7/16"  | 24/16                      |
|                                    | Vertical                         | 19/32" <sup>(f)</sup>                                | 40/20                      |

- (a) Strength axis (long panel dimension) perpendicular to studs for horizontal application, or parallel to studs for vertical application.
- (b) Recommendations apply to all-veneer plywood, oriented strand board (OSB) or composite (APA COM-PLY) panels except as noted.
- (c) Blocking recommended between studs along horizontal panel joints.
- (d) Plywood panels only.
- (e) OSB panels only.
- (f) OSB or 5-ply/5-layer plywood panels.

If the sheathing is applied vertically, thicker panels or panels constructed to provide the cross panel stiffness necessary for a stucco substrate are recommended. Where panels are applied vertically, 5-ply/5 layer plywood or OSB is recommended by APA.





To allow for expansion due to increased moisture levels during construction, panels shall be installed with a 1/8-inch space at all panel end joints and edges. In the photo to the left, a 16d nail is used as a spacer for the panels.

Fastening panels that are 1/2-inch thick or less shall be accomplished with 6d nails while panels over 1/2-inch thick require 8d nails. The nail spacing in all cases is 6 inches o.c. at panel edges and 12 inches o.c. at intermediate

supports. Closer spacing is required on narrow braced wall panels.

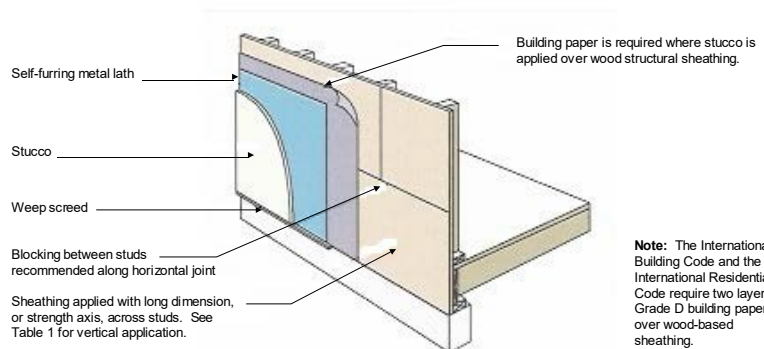
### Installation of Weather-Resistive Barrier (WRB) or Secondary Drainage Plane

The walls are a critical part of the buildings weather-resistive system. Proper design and construction are important in preventing moisture from penetrating exterior walls and causing damage to the structure.

The installation of stucco on an exterior wall surface first requires two layers of grade D, or equivalent, paper being applied over the wall sheathing

FIGURE 2

#### STUCCO APPLICATION OVER WOOD SHEATHING



**Note:** The International Building Code and the International Residential Code require two layers of Grade D building paper over wood-based sheathing.

prior to the stucco lath being installed. The first of the two layers constitutes the secondary drainage plane, which is the component that controls water infiltration.

The first layer is usually formed from either grade D style 2 paper or a house wrap. That is because these materials are water resistant yet retain a high degree of vapor permeability. Roofing material such as 15 lb. felt is not recommended because it has very low vapor permeability and moisture may be trapped and condense between the felt and the structural panels.

The process begins with the installation of the bottom course. Subsequent courses are installed horizontally, *not* at an angle, with each successive course being applied shingle style as the installation moves up the wall.



The horizontal lapping of building paper shall be a minimum of 2 inches, however, 4 to 6 inches is recommended. The end laps shall be a minimum of 6 inches. At both inside and outside corners the paper will wrap at least 6 inches around the corner. At inside corners, the weather resistive barrier shall be kept tight into the corner so lath can later be installed without voids behind it and without tearing the drainage plane.



Where roofs abut walls the paper shall overlap the vertical leg of the step or headwall flashings. The paper shall be attached with wide crown staples (at least 1-inch), cap nails, or large head nails every 12 to 18 inches. The fasteners shall be attached to the studs and not the sheathing so the lath installers can find the studs.

House wraps shall be installed before window installation. As with grade D paper, the application starts at the bottom and is applied shingle style with a horizontal lap of 6 inches and an end lap of 6 inches.

### **Installation of Windows, Doors and Trim**



Windows, doors and trim shall be installed after the weather resistive barrier is in place. First, a modified "I" cut is made in the WRB and the two sides are folded in and fastened to the sides of the framing. The bottom flap is then folded in and a bottom sill flashing is installed over the WRB.



This bottom sill flashing runs all the way across the bottom of the opening and several inches up each side, sealing the corners against moisture infiltration. The top flap is temporarily folded up out of the way until the window or door is installed. Caulking is then applied up the two sides and across the

top of the opening to provide a seal between the nailing fins of the window, or the brick mold of the door, and the WRB.



Now the window or door is ready to be installed. Once it is properly nailed in place a jamb flashing is applied over the side nailing flanges. A drip cap flashing shall then be applied across the heads of windows that are not self-flashed, and of course over all doors, with a layer of jamb flashing applied over that.

As always, the jamb flashings shall be applied in shingle fashion. The jamb flashing may be either a strip of weather resistant paper tacked in place, or a flashing tape. If a flashing tape is used, the installer should be aware of potential compatibility issues between the tape and the material it is being applied to.



At this point the top flap of the WRB is folded down over the head flashing and the corner cuts are taped. There is now one more step in the flashing process before trim can be applied.

While some trim gets installed directly over the flashing tape, the proper way is to apply a 10-inch to 12-inch strip of building paper over the flashing tape to provide a second





past the paper.

layer of paper behind everything. Now the paper backed lath can be applied with the proper 6-inch lap as it comes up to the window trim. This means there is a double layer of paper behind the joint where the stucco meets the trim. This joint will allow water penetration between the stucco and the trim, which will ultimately get to the paper behind. Double layering the paper at this point is what makes the wall and window interface water resistant. The secondary drainage plane is a safety net if water gets

Another way to apply the trim is to install it over a spacer the thickness of the stucco but narrower than the finish trim piece. This allows the stucco to be run behind the trim and virtually eliminates a potential point of water penetration.

Where dissimilar materials abut the stucco, such as wood trim or vinyl windows, the differential movement of these materials must be taken into consideration. For example, vinyl windows will move more than wood trim, which in turn will move more than stucco. Due to this movement, the builder should give serious consideration to using casing bead with backer rod and caulk at these interfaces to get a properly designed joint that will minimize water infiltration.

### **Roof Integration to the Drainage Plane**

Roof flashing is an integral part of the system and critical in keeping moisture away from structural components and out of the building. Where roof lines interface with exterior walls, the roofing felt shall be carried up the sidewall 3 to 4 inches. Metal roof flashing shall then be installed over this and extend 5 inches up the vertical wall and 5 inches under the shingles. This allows the stucco applicator to install a casing bead 2 inches above the roof deck while still providing a 3-inch overlap of the roof flashing. The roof flashing shall also be placed behind the WRB so it does not become permanently embedded in the stucco siding. This allows for future repair or replacement of the flashing. At outside corners, flashings shall



extend 2 inches past the corner with a rise of 2 inches at the extension. When the stucco wall continues past the bottom edge of the roof line, kick out flashings shall be installed where the first course of roofing abuts the stucco. This is required to divert water run-off from the roof into the gutter and keep it from getting behind the stucco at the bottom edge of the roof/wall interface. The stucco shall not be applied until proper kick out flashings have been installed.



### **Integration of Penetrations**

Generally, small penetrations through the stucco can be caulked to successfully keep water out of the wall. Some areas that warrant specific attention are:

**Plumbing Penetrations.** Sillcocks should be held away from the wall far enough to accommodate the thickness of the stucco. After the stucco is installed, the sillcock shall be caulked to the stucco wall.



**Electrical Penetrations.** Light fixtures, weatherproof receptacles, phone and even cable TV boxes should be held out from the wall to accommodate the thickness of the stucco. After the device is installed it should be caulked to the stucco wall.

### **Electric Meters.**

Electric meters should be installed over the drainage plane. A drip cap flashing shall be placed over the meter can with the vertical leg of the flashing on top of the WRB. The paper behind the lath shall go over the vertical leg of the flashing. After the stucco is installed, the sides of the meter can shall be caulked to the stucco wall.



**Other Penetrations.** Penetrations such as dryer vents, fireplace termination caps, furnace exhaust vents and AC lines shall be sealed to the stucco wall with an appropriate sealant.



### Lath Installation

Metal lath installation starts with the installation of foundation **weep screeds** which act as a plaster stop at the bottom of framed walls. It shall be attached to the bottom plate so it overlaps the juncture where the concrete foundation wall meets the bottom of the wall framing. This overlap shall be at least 1-inch. The WRB shall be placed over the flange of the weep screed and run down to the sloped portion of the screed. The paper-backed lath is then applied over this and is also placed over the top flange of the weep screed. Now any incidental moisture that flows down the surface of the paper will exit the assembly at the weep screed. If casing bead is used instead of

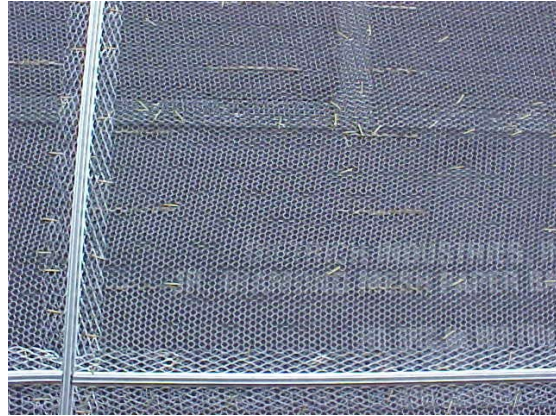


weep screed, it shall be placed on top of the metal lath so any water that penetrates to the WRB will be able to drain out behind the casing bead.

The **paper-backed lath** is now ready to be installed. The initial application can be done with 1/2-inch hammer staples. Attachment shall only be made through dimples or V-grooves in the self-furring lath so the embedment of the lath in the stucco is not reduced. After the lath is in place, the studs can be located and 7/16-inch crown staples



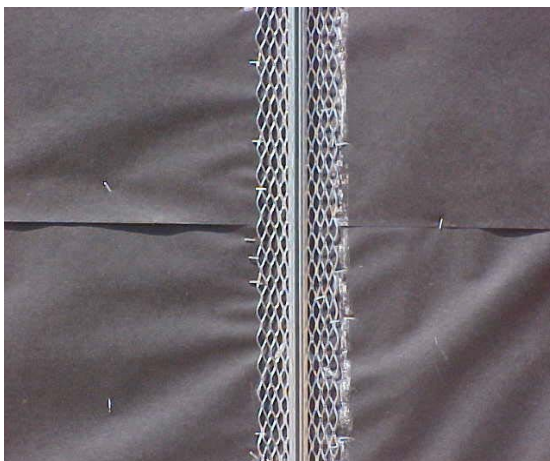
can then be used to attach the lath to the studs at a maximum interval of 7 inches o.c. Since the fasteners are required to penetrate not less than 3/4-inch into the studs, they must be long enough to allow for the extra thickness of the sheathing. One crown staple may be used to secure the horizontal lap joint at the mid point between studs. The practice of random, shotgun stapling patterns with crown staples, which creates potential leaks, will no longer be acceptable. Over stapling of the lath with any type of staples can depress the lath to a point where it is impossible to get the plaster properly imbedded into the lath. This is another reason over stapling is not acceptable.



The long dimensions of the paper-backed lath sheets must be oriented perpendicular to the structural supports and the laps must be staggered. It is acceptable to apply the long dimension parallel to framing members where walls are less than 24 inches in width. It shall also be permissible to follow the roof rake on gables with the top row of paper. The paper shall be lapped 2 inches on horizontal joints and 6 inches on vertical joints. The lath shall be lapped at least 1/2-inch at all horizontal laps and 1-inch at all end laps.

During the installation of paper-backed lath, care must be taken to assure that a metal-to-metal and paper-to-paper contact is maintained. Where metal lath overlaps the adjacent metal lath, the two are mechanically bonded together when the stucco keys through the lath and hardens.

The next step is the installation of the **casing beads**. This should be used at all junctures with dissimilar materials, such as windows, doors, roof flashing or vents. Casing beads should also be used to isolate non-load-bearing assemblies from load bearing assemblies. The casing bead should be attached directly to framing members and on top of the WRB.



**Expansion/control joints** should be installed before the lath goes on. The lath *shall not* be continuous through the control joints. The paper should be applied first and then the control joint can be installed with the lath going on separately up to the control joint. For those using paper-backed lath, a 14-inch wide strip of grade D paper can be applied behind the control joint which allows a 6-inch overlap on each side when the paper-backed lath is applied up to the control joint. The lath can then be either tied or stapled to the control joint edges.

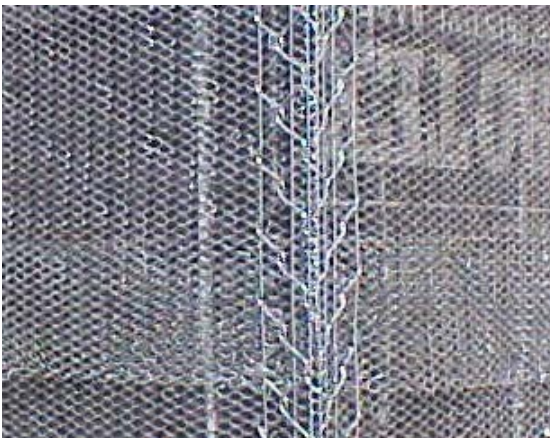
The control joint may also be installed after the lath has been applied as long as the lath is cut, without damaging the paper behind it. This allows one flange of the control joint to go under one side of the lath joint and the other flange to go on top. This also allows the inspector to tell there is a break in the lath at the control joint.

The goal of the expansion joint is to divide the total area of the stucco into smaller panels. Joints shall be placed so wall areas do not exceed 144 square feet. To accomplish this, the joints shall not be spaced more than 18 feet apart both



horizontally and vertically. Where expansion joints intersect, the vertical member shall be installed first and be continuous so the horizontal joint does not block the flow of water that might enter the joint.

One of the final accessories to be installed is usually the **corner bead**. This normally precedes the installation of horizontal expansion joints. The purpose of the external corner is for reinforcement and it does not have to be a beaded accessory. Sometimes welded wire corner reinforcement or corner lath that has no bead is used. These types of corners are fully embedded in the stucco. The traditional corner bead usually has a 3-inch by 3-inch flange width that is fastened every 7 inches o.c. along the length of both flanges.



### **Stoops, Porches and Decks**

There is one more item to consider before we are done with the lath application. That is the area where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction. Before the stoop is poured, an impervious, corrosion-resistive flashing shall be provided at the exterior

wall interface to prevent the entry of water into the wall cavity or penetration of water to the building structural framing components. The lath shall then terminate a minimum of 2 inches above the concrete flatwork with either a weep screed or a casing bead finish across the bottom of the lath.

Deck ledgers shall attach directly to the house rim with flashing applied a minimum of 5 inches up under the WRB and then wrapping over the top of the ledger board to prevent water infiltration behind the ledger. Deck ledger boards shall *not* be attached over existing stucco where connectors will create unflashed penetrations through the stucco membrane.

With the completion of the above requirements, installation of the lath assembly should be done and ready for stucco. However, **stucco wall covering of any kind should not be applied until the drywall and roofing materials have been installed.** This allows loading of the wall systems as well as eliminating any hammering on the exterior walls that could potentially cause cracking to occur.

### **Stucco Application**

The national standard for traditional stucco application can be found in ASTM C 926. This standard defines the requirements for mix portions, application and curing. In wood frame construction a typical application consists of three coats. The first is a scratch coat followed by a brown coat and then a finish coat for a total thickness of 7/8-inch. It should be noted that the International Residential Code requires a minimum thickness of 3/4-inch.

The building code recognizes alternative methods and materials for various types of construction. Products that have received a numbered evaluation report from ICC Evaluation Service would fall under the category of "alternate materials." There are several proprietary "one coat" systems that have an ICC Evaluation Service listing. These products typically come premixed and may be applied in one coat with a second topcoat being applied at a later time. Always check the manufacturer's installation instructions for proper application technique.

There are several types of acceptable top coats. Some are a portland based finish while others are acrylic, elastomeric and even latex. The contractor should be aware of potential incompatibility between some of the finishes and the base coat(s) due to alkalinity of the stucco.

### **Waterproofing and Application of Sealants**

Caulks, or elastomeric exterior sealants, are used to seal cracks between individual elements of the homes exterior. It is recommended that all joints between dissimilar surfaces in a stucco wall be caulked. This would include, but not be limited to, windows to wood trim, wood trim to stucco (wraps, corners, bands, etc.). Do not caulk metal head flashings, z-bar flashing, or anywhere water would normally escape the wall.



Backer rod and caulk is typically used between the stucco casing bead and other types of dissimilar materials to provide a good seal and prevent water infiltration into the wall cavity. Backer rod limits the depth of the caulk. The depth of a caulk joint should not exceed its width. The minimum width of a caulk joint should be 1/4-inch. This is the most watertight type of caulk joint. However, all joints between dissimilar materials should always be caulked in a stucco application even if backer rod is not used.

The ability of the joint to flex and remain adhered is greatly influenced by the type of caulking material used. A good quality acrylic-latex can be used for some applications that are less critical. For joints where water sealing is critical, or difficult to access, the use of a better material such as urethane or silicon may be warranted. In any case, become aware of the compatibility issues and the manufacturers' recommendations for a particular use. This is not a case of one sealant fits all needs!

For the answers to specific questions about stucco application, contact your local building department.

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