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**IMPORTANT INFORMATION**

This document is written for the purposes of providing general guidelines for the installation of Old World Stone Veneer natural thin stone veneer. It is not intended as a specific or all-inclusive set of instructions. Old World Stone Veneer and its affiliates do not make any expressed or implied warranty or guarantee regarding the information and procedures provided in this guide. Various projects or circumstances may require methods or procedures not addressed in this guide. Alternative methods and/or materials may be required due to project specifications, requirements, or conditions. Installers should consult local building codes to ensure compliance. It is the responsibility of the installer to consult applicable project professionals (architects, designers, engineers, etc.) to determine ultimate applicability of this guide to any project and ensure that all building codes (local, regional, national, or international) are followed. Old World Stone Veneer and its affiliates cannot be held liable for any information contained herein. The installation procedures for natural thin stone veneer are extremely similar to the procedures for manufactured stone veneer. The MVMA installation guidelines provide many in-depth details that may be helpful in your installation of natural thin stone veneer. These guidelines may be found on the NCMA website at [www.ncma.org](http://www.ncma.org).

## **PART 1: REFERENCES**

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**ANSI** - American National Standards Institute ([www.ansi.org](http://www.ansi.org))

**ANSI 118.4** - American National Standards Institute Specifications for Polymer Modified Dry-Set Cement Adhesive Mortars

**ANSI 118.15** - American National Standards Institute Specifications for Enhanced Polymer Modified Dry-Set Cement Adhesive Mortars

**ASTM C270** - Standard Specification for Mortars for Use in the Construction Of Non-Reinforced And Reinforced Unit Masonry Structures

**ASTM C847** - Standard Specification for Metal Lath

**ASTM C1063** - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement Based Plaster

**ASTM D226** - Standard Specification for Asphalt Saturated Organic Felt Used in Roofing and Water Proofing

**ASTM C1325** - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units

**ASTM International** - A standards development organization that serves as an open forum for the development of international standards.

**CMU** - Concrete Masonry Unit (Often referenced as concrete block)

**Continuous Insulation (CI)** - Foam or plastic insulation affixed to the exterior of a building structure which wraps the circumference of the structure without the interruption of other building elements.

**MVMA** - Masonry Veneer Manufacturers Association ([www.ncma.org](http://www.ncma.org))

**WRB** - Weather Resistive Barrier

## **PART 2: PROJECT PLANNING**

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### **Verify Site Conditions**

It is important to ensure that the area on which Old World Stone Veneer (OWSV) will be installed is structurally sound. If there is any doubt, consult a local professional to determine the suitability for natural thin stone.

### **Building Code Requirements**

All applicable building codes and safety procedures for the project must be followed. Project safety is not addressed in these guidelines. It is the responsibility of the project management to ensure that all appropriate safety procedures are followed for the project.

## **PROJECT PLANNING** continued

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### **Estimating Quantities Needed**

Flats are measured by the square foot. To calculate the square footage of an area, multiply the length (in feet) by the width (in feet). Subtract the area of any sections that will not be covered with stone veneer (such as windows & doors) to calculate the square footage needed for the project.

Corners are measured by the lineal foot. This is measured as the actual height of the corner requiring coverage. Since corners will cover some of the surface area of the wall, it is recommended to subtract 0.5 square foot from the quantity of flats for each lineal foot of corners. This is only a general guideline, and the exact square footage coverage will vary with each box. Some stones may cover more or less than 0.5 square foot.

Depending on the installer and application, a small percentage of waste may be required to sufficiently cover the job. 5-10% is considered an acceptable amount of waste.

## **PART 3: SURFACE PREPARATION**

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### **WEATHER RESISTIVE BARRIER (WRB)**

#### **Wood or Metal Studs**

Prepare 2 layers of a Weather Resistive Barrier (WRB). WRB should be a #15 felt conforming with ASTM D226 or a Grade D 60 minute building paper (Super JumboTex is a popular Grade D 60 minute building paper). The first layer of WRB may be either traditional house wrap or a WRB meeting the above requirements. Various liquid WRB are also available. Consult the manufacturer of the WRB to ensure that it is suitable for use with natural thin stone veneer and to obtain installation instructions.

When installing over OSB, it is important to ensure that the OSB sheets have been adhered with an appropriate gap between the pieces. This allows for expansion should the OSB swell. If OSB swells, it may cause cracking on the wall. For interior applications, a WRB is typically not required.

Drainage mat (Rainscreen) products are becoming increasingly popular. These are typically installed on top of the WRB to allow a cavity for water to drain. Consult applicable building codes to determine if a drainage mat is required in your area. Certain drainage mat products may be considered a WRB. Consult the manufacturer of the drainage mat product to determine if it qualifies as a WRB and if any specific installation procedures should be followed.

#### **Cement Board**

Install cement board according to the manufacturer's recommendations. Tape all joints with a tape approved by the cement board manufacturer. Install WRB according to cement board manufacturer's instructions. If using a liquid WRB, consult the manufacturer of the WRB to ensure that it is suitable for use with natural thin stone veneer. For interior applications, a WRB is typically not required. Ensure cement board complies with ASTM C1325 & ICC-ES AC308.

## **SURFACE PREPARATION** continued

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### **Concrete Block (CMU) or Poured Concrete Walls**

Over clean CMU block or poured concrete walls (CMU block or concrete that has not been sealed, painted, or otherwise coated), thin stone veneer may be installed without a WRB. While not required, liquid applied WRBs are often advantageous to prevent moisture from wicking through the wall. Natural stone veneers and manufactured concrete products are often porous, and without a liquid WRB, it may be possible for a small amount of moisture to wick through the wall in extreme conditions. Liquid applied WRBs provide a good protection against this wicking. See part 3 for more information on preparing poured concrete walls to receive material.

Over painted, sealed, or otherwise coated CMU block or concrete, liquid applied WRBs are not recommended, as they may not adhere well to the coating. If a WRB is desired, a single layer of WRB may be used. WRB should be a #15 felt conforming with ASTM D226 or a Grade D 60 minute building paper (Super JumboTex is a popular Grade D 60 minute building paper).

### **Other Considerations**

Certain products may qualify as WRBs that are outside the scope of this installation guide. Consult with the manufacturer of these items to ensure that they qualify as a WRB when used for the installation of natural thin stone veneer.

Drainage mats (often called rainscreen) may be required depending on your local jurisdiction and application. Contact your local code office to see if this item is required.

### **Flashing**

Weep screed, drip cap, and casing bead should be used as required by applicable building codes. Flashing should be installed prior to the WRB to ensure that the WRB overlaps the flange of the flashing element. All window, doors, and other intrusions should be properly flashed as per the requirements of window or door manufacturer. The MVMA installation guide has many flashing details that can be applied to the installation of natural stone.

Aluminum flashing is not recommended. Use either galvanized steel or plastic.

### **Installing the WRB**

Refer to manufacturer's instructions for the specific WRB being used. WRB should always be installed so that a plane is formed between the 2 layers.

WRB should be installed horizontally starting at the bottom of the wall, overlapping each layer 2" over the previous layer. The bottom layer of WRB should be overlapped over weep screed or present flashing. Vertical seams should be overlapped at least 6". Staple or nail WRB to the wall, fastening to studs where possible. Spacing for fasteners should be 6" to 12" vertically. Avoid unnecessary fasteners as they increase the potential for water penetration.

It is extremely important to properly overlap the layers of WRB and to install the WRB in the proper sequence with the other flashing materials present on the project.

When using liquid applied WRBs, follow the manufacturer's recommendations to ensure proper installation.

## **SURFACE PREPARATION** continued

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### **WIRE LATH**

#### **Wood or Metal Studs**

2.5 or 3.4 lbs./sq. yd. self-furring wire lath conforming to ASTM C847 should be used over both wood and metal studs. For open studs, 3.4 lbs./sq. yd. self-furring wire lath is recommended to provide additional rigidity and support.

For installation over wood framing, use 1.5" roofing nails spaced no more than 7" vertically on studs. Fasteners must penetrate stud no less than 0.75". For horizontal framing applications use 1.5" roofing nails driven flush to the plaster base. Wire staples may be used, provided they are 1.5" driven flush and contain a crown of not less than 0.75". They must penetrate studs no less than 0.75". Screws may be used for either vertical or horizontal framing applications provided they penetrate studs no less than 0.625".

For installation over metal studs, fasten screws no more than 7" vertically on studs. Use screws that will project no less than 0.375" into the metal studs.

#### **Cement Board**

No wire lath is required with cement board applications, provided proper mortars are used for bonding the stone veneer to the cement board. Type S mortar is not suitable for bonding to cement board. See part 4 of this guide for more information.

#### **Concrete Block (CMU) or Poured Concrete Walls**

Over clean CMU block or concrete (CMU block or concrete that has not been sealed, painted, or otherwise coated), no wire lath is required. Over sealed, painted, or otherwise coated CMU block or concrete, 2.5 or 3.4 lbs./sq. yd. self-furring wire lath conforming to ASTM C847 should be used.

When attaching wire lath to CMU block or poured concrete walls, a power or powder actuated fastener is recommended at the corners as well as the long dimensional midpoint of the wire lath. Additional fasteners (either power or powder actuated or stub nails) should be fastened in rows no more than 16" on center and spaced no more than 7" vertically. They should be a minimum of 0.75" with a head size of at least 0.375".

#### **Other Considerations**

Wire Lath should be installed horizontally with the cups facing up. All joints should overlap a minimum of 1" horizontally and vertically. Wire Lath should always be attached to studs and never to sheathing. Refer to ASTM C1063 for additional information. There may be other commercially available products that may be used in place of 2.5 or 3.4 lbs./sq. yd. self-furring wire lath. Consult the manufacturer of these products to ensure that they are appropriate for natural thin stone veneer installation. Ensure that the product used allows for the scratch coat to be adequately thick.

Ensure that proper corrosion resistant fasteners are being used for the type of lath being used. Like coatings should be used on the fasteners and the lath. For example, galvanized fasteners should be used with galvanized wire lath. Consult the manufacturer of the lath product to ensure that compatible products are used.

If installing over continuous insulation (CI) greater than 0.5" thick, consult the manufacturer of the insulation or an engineer to ensure that proper fasteners are used.

## **SURFACE PREPARATION** continued

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### **SCRATCH COAT**

#### **Over Wire Lath**

A scratch coat with a thickness of approximately 0.5" should be applied to the wire lath. It is extremely important that the lath be entirely encapsulated in the mortar mix. The scratch coat may or may not be grooved prior to drying. Whether the scratch coat should be grooved or not depends on the type of bonding mortar being used. See the manufacturer's recommendations to determine whether the mortar being used works best with a smooth or rough scratch coat. A smooth scratch coat is often used for liquid applied WRBs.

Various mortars may be used for the scratch coat, but typically Type N or Type S mortars conforming to ASTM C270 are used. For Type N or Type S mortars, the mortar should be mixed thoroughly adding enough water to achieve the proper consistency. The mortar mix should be firm enough that it can be held at a 45° angle from horizontal without sliding off the trowel. Once properly mixed, the mortar should be troweled onto the wall, fully embedding the lath as it is applied.

If bonding mortar requires a rough scratch coat, a scarifier or otherwise similar tool may be used to roughen the scratch coat before it is dried. The scratch coat should be nearly dry at the time the scarifier is used, but should still be soft enough for the scarifier to create small grooves approximately 0.125" deep. Grooves should be created horizontally and should not expose the wire lath.

Allow the scratch coat to dry (a minimum of 24 hours is recommended) before applying the stone veneer.

#### **Over Cement Board**

No scratch coat is required over cement board; however, joints should be taped and sealed according to the manufacturer's recommended practices. Also, ensure that the bonding mortar being used is compatible with cement board installation. Type S mortar is not suitable for bonding to cement board. See part 4 of this guide for more information.

#### **Over Concrete Block (CMU) or Poured Concrete Walls**

A scratch coat is not necessary for installation over clean CMU or poured concrete walls. If the surface is not clean and wire lath is required, follow the preparation steps for a scratch coat over wire lath. If wire lath is not being used, it is extremely important that all sealers, release agents, etc. have been removed from the wall before starting the installation of stone veneer. This may be achievable by simply cleaning the wall with a water or sand blasting technique, but if the wall cannot be completely cleaned, the installation of wire lath may be required. It is recommended in all instances to clean the wall before starting the installation even if the wall appears visually clean. A liquid applied WRB may be beneficial to use in these applications, but is not required.

When adhering directly to a poured concrete wall without a scratch coat or wire lath, it is extremely important to ensure that the bonding mortar being used is compatible with installation over these substrates. Consult the mortar manufacturer to confirm compatibility. Additionally, these mortars will likely require a certain Concrete Surface Profile (a standardized measurement of a concrete's texture/roughness) for the mortar to bond. This roughness is typically achieved by some sort of blasting (shot, bead, or high pressure water).

## **PART 4: INSTALLING NATURAL STONE VENEER**

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### **Bonding Requirements**

Polymer modified mortars that adhere to ANSI A118.4 or A118.15 should be used. Because natural thin stone veneer pieces have smooth backs, Type S or N mortars should not be used for bonding the stone to the scratch coat. When bonding to cement board, directly to CMU, or directly to poured concrete walls, a polymer modified mortar that is designed to adhere to these substrates **MUST** be used. Additionally, certain more sensitive products require that premium mortars be used for bonding to maintain durability. Modified thinsets are popular for these applications; ARDEX and Laticrete are two well-known companies that produce mortars that meet these standards and are designed to work for these applications.

Mixing of polymer modified mortars is usually accomplished with a drill motor and a mixing blade. These mortars typically come pre-blended and only need the appropriate amount of water added before mixing.

The method for applying the mortar to bond the stone veneer to the wall varies depending on the brand and type of mortar used. Consult the mortar's manufacturer for specific installation recommendations. Following are general guidelines for the 2 most common installation methods. For both methods, it is important to ensure that the entire back of each piece of stone is being covered and that there are no voids in the mortar between the stones and the wall.

### **Common Installation Methods**

#### Mortaring Stone Backs

Fully coat the entire back of the piece of the stone, ensuring no voids are left on the surface of the stone. Typically 0.375" to 0.5" of mortar will be required on the back of each stone. Firmly press the stone onto the wall and gently shift it on the wall back and forth approximately 1" to 2" to ensure that the mortar is fully and evenly distributed on the back of the stone. After the stone is adhered to the wall, the mortar behind the stone should typically be 0.25" to 0.375" thick. For dry-stacked applications, no scratch coat should be visible between the stones after they are installed.

After mortar is initially mixed, it should not be tempered with additional water. It can be remixed as necessary to loosen up the mix and add workability.

#### Mortaring Wall Surface and Stone Backs

This method works best on a smooth scratch coat and with modified thinset mortars.

Using a notch tooth trowel (typically 0.5"), work mortar vertically on the wall, creating vertical grooves. Apply a thin layer of mortar to the back of the stone. Place the stone on the wall and shift the stone right to left approximately 1" to 2" creating a full bond. Typically, an area of several square feet is skimmed on the wall at a time to reduce labor; however, care must be taken to avoid skimming too large an area. The skimmed area must not start to harden before stone can be applied.

In this application, the stones should not grind against the scratch coat when they are being pressed and shifted onto the wall. If the stone contacts the scratch coat during this process, it should be removed, and more mortar should be added.

### **Fitting Stones**

Typically, corners are installed before flats. Both flats and corners are most successfully installed when starting at the bottom and working up. Also, starting with the corners and working towards the center of the wall tends to allow for a more fluid installation.

A large selection of stone should be laid out prior to installing to create the proper mix. A minimum of 25 to 50 square feet should be laid out to work from at all times. Blending stones from multiple crates or boxes is also strongly recommended. Failure to do so may create color inconsistencies on the wall.

## **INSTALLING NATURAL STONE VENEER** continued

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Care should be taken to fit the stones as tightly together as is required by the project specifications. If the stones are being installed in a dry-stacked application, it is important to remember that there are no additional cleaning or finishing steps after the installation of the stones; after the bonding mortar hardens, the project is complete. If any undesired gaps are present, they must be filled before the mortar hardens. For dry-stacked applications, it is important to clean and smooth any mortar that is visible between the stones before it hardens. For mortar joint applications, space the stones far enough apart to achieve the desired mortar joint size. Keep in mind that gaps between the stones tend to appear larger after the mortar joint (grout) is completed.

Cutting and fitting is often required to create the desired finished appearance, especially in dry-stacked applications. If sawing is required, the use of a wet saw is strongly recommended to reduce potentially harmful airborne particulates that may be released during sawing. If a wet saw is not used, other protective measures should be taken to control the dust generated by sawing or otherwise altering the product. It is the responsibility of the installer to consult any applicable SDS relating to the installation and to follow all recommended safety procedures.

**Important Note:** Once the stones have been adhered to the wall and the mortar begins to harden, the bond should not be disturbed. Any disturbance could create a weak bond that may cause the stone to loosen from the wall in the future. If a bond is disturbed after the mortar has started to harden, it is best to remove and reattach the stone with fresh mortar.

### **Grouting**

If the stone is not being installed in a dry-stacked application, a mortar joint (grout) will need to be added between the stones to complete the installation.

Type S or Type N mortar may be used for grouting. Other mortars may be commercially available for the specific use of grouting stone veneer or natural thin stone veneer. Consult with the manufacturer of these mortars to make sure they are suitable for natural thin stone veneer installation. Iron oxide pigments may be added to the mortar if a colored mortar joint is required. The weight of pigments added should be no more than 10% of the total cement weight.

A 12 to 24 hour cure time at 70° F is recommended prior to grouting the stone. Type N and Type S mortar are mixed to the same standards as the scratch coat. This mix is then typically troweled into a pointing (grout) bag. The mix in this bag is then squeezed into the joints and allowed to dry to the point where they can be compressed with a smooth striking tool with no smearing.

A striking tool (slicker) is then used to “push” the mortar into the joints, filling in all the voids between the stones and creating the desired finish. There are several different methods for grouting and finishing that can be used for thin stone veneer.

#### Standard Mortar Joint

A standard mortar joint is typically raked back (pressed back with a striking tool) to provide relief (variance in depth from the face of the stone to the mortar joint) to the profile of the stone. The level of relief can vary depending on the desired appearance. When raking back the mortar joint, it is important not to remove too much mortar (so as to reveal the scratch coat or create voids). In addition to increasing the beauty of the stone, a mortar joint also helps to keep water from being trapped behind the stones.

#### Overgrout

Overgrout joints are minimally raked to simply fill all the voids behind the stone. They are typically filled fuller during the bagging process and remain nearly flush with the face of the stone when finished.

#### Other Techniques

There are many other grouting techniques beyond the scope of this guide, such as beaded, v-joints, etc.

For all mortar joint installations, after the joints have been compressed with a striking tool, they often require additional tooling or brushing. This is typically done with a dry stiff brush. The amount and timing of the tooling can greatly affect the final appearance of the grout joint. In most applications, tooling and brushing is done when the mortar is nearly dry but still workable and “brushable.”



## **PART 5: OTHER CONSIDERATIONS**

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*This is not an all-inclusive list of considerations, but it is a list of common code considerations as well as other application-specific techniques to consider.*

### **Clearance To Grade**

On a wood or steel framed wall, base flashing (such as weep screed) should be at least 4" above grade. Over paved or finished surfaces, this can be reduced to 2". When the stone meets grade on a CMU or concrete wall, maintain a clearance of 2" above grade. Regardless of substrate, clearance can be reduced to 0.5" when installing stone above a paved walking surface supported by the same foundation that supports the wall. When a CMU or concrete wall requires a WRB and wire lath, maintain a clearance of 4" above grade or 2" above paved or finished surfaces. These clearances allow proper water drainage and prevent water from wicking up the base of the installation area.

### **Mechanical Support (When Necessary)**

Natural thin stone typically is under the 15 pounds per square foot code limit for adhered stone veneer, however accessories (such as sills) often exceed this limit. For products that exceed this limit, mechanical anchors that comply with local building code should be used. Often, the mechanical anchor can be a small metal L bracket such as a USP JA1 bracket.

### **Additional Flashing**

Wall caps and sills should be used when applicable to help properly shed water away from the natural stone installation. Sills should be used on horizontal transitions to help shed the water over the face of the stone.

Weep screed should be used at the vertical termination of the stone installation. Casing bead should be used around all windows and doors. Additional flashing should be used above all windows and doors to properly divert moisture.

### **Avoidances**

Natural stone should not be consistently exposed to moisture, salt, or other chemicals. Consistent moisture can cause naturally present minerals in the stone to oxidize and can accelerate the wear of the stone, altering its appearance. Salt or other chemicals may cause reactions with these minerals that may discolor or deface the stone.

### **Cold or Hot Weather Requirements**

For cold weather installations, it is important to prevent the mortar mix from freezing before curing; however, accelerants are not acceptable to use to prevent freezing, as they weaken the bond of the mortar. The only acceptable method to prevent freezing is tenting (or otherwise enclosing) and heating the work area to maintain a temperature within the mortar's workable range until it cures. Heating of sand and water prior to mixing is also helpful to maintain a higher batch temperature. The air temperature in the work area should remain above 32° F during this time, and the stone pieces should be at least 45° F. The typical cure time for most mortars is around 48 hours. Grouting should be done while work area temperatures are 68° F or above. Consult the mortar manufacturer for specific curing details and cure times.

## **PART 6: CARE AND MAINTENANCE**

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### **Maintenance**

As Old World Stone Veneer is a natural stone, very little maintenance is required to maintain its durability. Since it is a natural product, various surface stains may appear over time as a result of the oxidation of minerals that naturally occur in the stone. These stains do not typically detract from the look of the stone and often add to its beauty.

### **Cleaning**

It is best to avoid acidic or alkaline cleaners as well as metal brushes. Acids can react with minerals in the stone causing either deterioration or discoloration. A mild detergent and water with a soft bristle brush is usually the best method of cleaning. Always test an area before cleaning. Mortar can usually be easily removed from the stone by brushing it off after it begins to dry (and no longer smears) but before it fully dries. Should efflorescence occur on the mortar (grout) joints, it may be possible to rinse it off with water. If that fails, a solution of 1 part distilled vinegar and 6 parts water may be applied to the mortar joints by gently scrubbing them with a soft bristle brush.

### **Sealers**

If a sealer is desired, the sealer used should be breathable. Siloxane based sealers are common for these applications. Consult with the manufacturer of the sealer to confirm that it is suitable for use with natural stone veneer. Always test sealers on a small area or loose piece before applying to the entire job.