



Manufactured Stone Veneer Installation Procedures



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**SECTION 04700
SIMULATED MASONRY
(MANUFACTURED STONE VENEER AND ACCESSORIES)**

Environmental Stoneworks (“ESW”)

PART 1 INTRODUCTION

1.1 OVERVIEW

The attached installation instructions are intended for use with Environmental Stoneworks manufactured stone veneer and accessories. Building code requirements can vary from area to area – please check with your local jurisdiction for building code requirements that apply.

1.2 STANDARD AND REFERENCES

A American Society for Testing and Materials (ASTM); Philadelphia, PA. (215) 299-5420,

- 1) ASTM C 39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- 2) ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- 3) ASTM C 140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
- 4) ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
- 5) ASTM C 150 - Standard Specification for Portland Cement.
- 6) ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- 7) ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- 8) ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- 9) ASTM C 778 - Standard Specification for Standard Sand.
- 10) ASTM C 847 - Standard Specification for Metal Lath.
- 11) ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete.
- 12) ASTM C 1059-Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- 13) ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- 14) ASTM C 1032 - Standard Specification for Woven Wire Plaster Base.
- 15) ASTM C 932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
- 16) ASTM C 482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
- 17) ASTM C 348 Standard test Method for Flexural Strength of Hydraulic-Cement Mortars.
- 18) ASTM F 1667 – Standard Specification for Driven Fasteners, Nails, Spikes & Staples



- B American National Standards Institute (ANSI); New York, (212) 642-4900,**
1) ANSI A118.4 Specification for Latex-Portland Cement Mortar.

1.3 PROJECT SITE CONDITIONS

A Environmental Requirements

- 1) Surface shall be completely free of moisture determined by sight, touch or measuring instruments. Do not apply stone veneer to surfaces which have visible traces of ice or frost.
- 2) If ambient temperatures are below freezing (32° F)., follow cold weather masonry procedures as called for ACI-530/ ASCE 6-95/ TMS 602-95.

B Safety Requirements

- 1) Construct and maintain scaffolding in strict conformity with manufacturer's recommendations.
- 2) Provide training for all employees potentially or actually exposed to fall hazards.
- 3) Verify employee compliance to subcontractor's Safety Program by providing written verification including name of employee, date of training, type of training, signature of the trained employee, and signature of the proctor.

PART 2 MATERIAL REQUIREMENTS

2.1 Stone Veneer units:

- 1) Environmental Stoneworks ("ESW") stone veneer is engineered from Portland cement, expanded shale fine, expanded shale medium, mineral iron oxide color, and various other chemical additives. The product is engineered to achieve a specified strength, color, and texture and resistance to effects of weathering.
- 2) ESW stone veneer is engineered in various shapes and patterns to simulate natural stone and are installed in a non-load bearing veneer and trim capacity e.g., drip ledge and quoins, caps etc...
- 3) Thickness: 1-1/8-5-1/4 inches
- 4) Weight: maximum of 15 lbs/SF
- 5) Density to be determined under ASTM C 567
- 6) Compressive Strength: Minimum of 1,800 PSI when tested in accordance with ATSM C 192
- 7) Water absorption: less than 22% when tested in accordance with ASTM C-140 or UBC standard 15-5
- 8) Freeze-thaw: less than 3% mass loss when tested in accordance with ASTM C 67
- 9) Shear Bond Strength: minimum of 50 PSI when conducted in accordance with ASTM C 482
- 10) Thermal Resistance: $R \geq .865$ when tested at a thickness of 1.0 inch (25.4 mm) in Accordance with ASTM C 518



- 11) Smoke and fuel contribution: UL listed 0/0
- 12) Flexural strength: tested in accordance with ASTM C 348, Section 4.4
- 13) Tensile strength: tested in accordance with ASTM C 190, Section 4.5
- 14) Weather resistance: Mix design proven by test results to be resistant to degradation by weather.

2.2 Weather Resistive Barrier (“WRB”): ASTM D 226, No. 15 non-perforated asphalt-saturated organic felt paper or a house-wrap product supported by a current evaluation report showing equivalency to Grade D building paper.

2.3 Reinforcing (Lath): Corrosion resistant minimum 2.5 lbs per square yard expanded metal lath that complies with ASTM C 847, or, corrosion resistant minimum 18 gauge woven wire mesh that complies with ASTM C 1032. For open studs and non solid sheathing (e.g. rigid insulation board) use corrosion resistant minimum 3.4 lbs per square yard, 3/8” paper backed lath (paper backing shall meet the requirements of ASTM D226 to be considered a substitute for Weather Resistive Barrier). Any alternative lath material shall carry an evaluation report that rates the lath as an acceptable substitute to the above listed materials.

2.4 Fasteners:

2.4.1 Galvanized steel fasteners (staples or nails) for wood stud (open, rigid sheathing, rigid foam insulation) applications; achieve penetration into wall framing members with minimum of 6 inch vertical centers and 16 inch horizontal centers. Nails shall be 8d common wire nails (shank diameter of 0.131”) and staples shall be a minimum of 7/16” crown width.

2.4.1.1 Length of fasteners should meet the following guidelines:

2.4.1.1.1 Staples

2.4.1.1.1.1 Open stud framing (wood): length sufficient to penetrate wood stud by at least one inch.

2.4.1.1.1.2 Rigid sheathing over wood framing: length sufficient to completely penetrate rigid sheathing and also make penetration into wood studs by at least one inch.

2.4.1.1.1.3 Rigid foam insulation over wood framing: length sufficient to penetrate wood stud by at least one inch.

2.4.1.1.2 Nails

2.4.1.1.2.1 Open stud framing (wood): length sufficient to penetrate wood stud by at least 1 ½”

2.4.1.1.2.2 Rigid sheathing over wood framing: length sufficient to completely penetrate rigid sheathing and also make penetration into wood studs by at least 1 ½”.

2.4.1.1.2.3 Rigid foam insulation over wood framing: length sufficient to penetrate wood stud by at least 1 ½”.



2.4.2 For poured concrete surfaces where metal lath is to be applied (in lieu of utilizing a concrete bonding agent), use concrete fastening pins with washers applied (or equivalent nails rated for fastening to concrete). Pins shall have a minimum shank length of 3/4 in. with a 0.145 in. head diameter and utilize a 16 gage washer.

2.4.3 For metal surfaces and metal stud applications, self tapping screws with minimum of 3/8 inch heads of sufficient length to penetrate at least 3/8" inches beyond metal surface.

2.5 Weep Screed (if required by plans and specifications or local code): Foundation Weep Screed shall be a minimum 0.019-inch (No. 26 galvanized sheet gauge), corrosion resistant weep screed with a minimum vertical attachment of 3 ½ inches. Weep screed should have holes with a minimum diameter of 3/16 inch spaced at a maximum of 33 inches on center.

2.6 Concrete Bonding Agent: Concrete bonding agents shall meet the requirements of ASTM C 1059 or ASTM C 932.

2.7 Mortar:

2.7.1 Portland Cement: Portland Type I/II Cement, ASTM C 150

2.7.2 Masonry Cement: Masonry Type N Cement, ASTM C 270

2.7.3 Masonry Sand: Natural or manufactured sand per ASTM C 144 that is clean and free from deleterious amounts of loam, clay, silt, soluble salts, and organic matter.

2.7.4 Pigment: Mineral oxide pigments (powder or liquid), ASTM C979

2.7.5 Water: Potable water clean and free from injurious amounts of oils, acids alkalis, salts, organic minerals or other deleterious substances.

2.7.6 Mix (by volume): One (1) part Portland Cement Type I/II to One (1) part Masonry Cement Type N to Three (3) parts Masonry and water added to achieve a firm and moist consistency; Pigment added to achieve desired color (if required)

<OR>

2.7.7 Masonry Cement: Masonry Type S Cement, ASTM C 270

2.7.8 Masonry Sand: Natural or manufactured sand per ASTM C 144 that is clean and free from deleterious amounts of loam, clay, silt, soluble salts, and organic matter.

2.7.9 Pigment: Mineral oxide pigments (powder or liquid), ASTM C979

2.7.10 Water: Potable water clean and free from injurious amounts of oils, acids alkalis, salts, organic minerals or other deleterious substances.

2.7.11 Mix (by volume): One (1) part Masonry Cement Type S to Three (3) parts Masonry and water added to achieve a firm and moist consistency; Pigment added to achieve desired color (if required)

2.8 Flashing, Caulk and Sealant: Shall meet local building code requirements.

2.9 Metal Accessories: All galvanized finish unless otherwise noted.



PART 3 EXECUTION REQUIREMENTS

3.1 EXECUTION AND COORDINATION

- 3.1.1 Before commencing, review all adjacent products and other subcontractor's work that precedes the installation of manufactured stone veneer to ensure that proper conditions exist and there are no recognizable deficiencies or errors.
- 3.1.2 Immediately notify appropriate customer project contact or supervisor of any variations, inconsistencies, omissions, or conflicts between the installation of manufactured stone veneer and other products or in the design of the project or local building codes.

3.2 PREPARATION

- 3.2.1 Before commencing any work activity around or adjacent to exterior openings and penetrations, ensure that flashing, caulking or sealants have been applied (by responsible party).
- 3.2.2 As appropriate, mask and protect windows, doors, hardware, trim, fixtures and similar items prior to placing mortar. Do not remove any items without authorization from the customer project contact or supervisor.

3.3 INSTALLATION AND APPLICATION

(See Appendix A for complete Installation Drawings associated with each type of application and relevant steps in this section **)**

- 3.3.1 **Material Sourcing:** Furnish manufactured stone veneer, related accessories and installation materials to the project in take-off quantities that include an allowance for appropriate breakage and waste. Consult with manufacturer for instructions on how to estimate take-off quantities.
- 3.3.2 **Weather-Resistive Barrier ("WRB"):**
 - 3.3.2.1 Install weather resistive barrier (per manufacturer's instructions) over all exterior surfaces designated to receive stone veneer and require waterproofing.
 - 3.3.2.2 WRB may be installed in two layers for added water/moisture protection (optional – per customer specifications)
 - 3.3.2.3 WRB shall be applied horizontally with the upper layer lapped over the lower layer at not less than 2 inches. Lap weather-resistive barrier not less than 6 inches at the vertical joints. In the case of applications with two layers, start with two horizontal layers at the bottom of exterior wall or structure. Then overlap next layer over first two layers by a distance equal to half of the width of the WRB stock material. Next, overlap this layer with the next layer of WRB equal to half the width of WRB such that



each section of WRB has two layers applied. Repeat until exterior structure is covered.

3.3.3 **Flashing, Caulk and Sealant:**

3.3.3.1 Inspect and verify that all flashing, caulking and sealants have been properly installed to the best of your knowledge. Before proceeding, notify customer project contact or supervisor of any issues related to these items so that proper installation can be verified and any issues addressed.

3.3.3.2 WRB shall be integrated with all flashing materials in such a manner so as to prevent water penetration into structure.

3.3.4 **Concrete Bonding Agent**

3.3.4.1 Concrete bonding agent may be used on new poured concrete or old concrete surfaces that have been properly cleaned and prepared.

3.3.4.2 Surface applied bonding agents: apply bonding agent over concrete surface with a brush or roller per manufacturer's instructions. Ensure that complete and uniform coverage is achieved.

3.3.4.3 Integral applied concrete bonding agents: mix concrete bonding agent into mortar per manufacturer's instructions. Any mortar which utilizes an integral bonding agent shall achieve minimum shear bond strength of 50 PSI when tested in accordance with ASTM C482.

3.3.4.4 A combination of surface applied bonding agent and integral bonding agent (mixed in the mortar) can be utilized so long as use in this manner is approved by the manufacturer of each respective agent.

3.3.4.5 Alternatively, metal lath may be installed on new or old poured concrete surfaces as well as masonry surfaces using approved fasteners for these applications provided that the concrete or masonry surfaces are in acceptable condition so as not to jeopardize the structural or aesthetic integrity.

3.3.5 **Metal Lath and Accessories**

3.3.5.1 Install metal lath using approved fasteners (see section titled "Fasteners") with the long dimension perpendicular to the supports. Lap lath not less than 2 inches all around vertically and horizontally.

3.3.5.2 Terminate lath 2 inches on the sill plate and/or flange of the weep screed or as directed by project specifications and or local building codes.

3.3.5.3 Metal lath can be installed with the small cups pointing upward to better capture mortar scratch coat (though this is not required).

3.3.5.4 Double lap metal lath around all inside and outside corners to provide an adequate overlap based on wall construction and fastening method. Do not pull lath too tightly at corners or edges.

3.3.6 **Weep Screed** (if required by plans and specifications or local code): Install Foundation Weep Screed per manufacturer's instructions and integrate with WRB and metal lath. Weep screed shall have a minimum of 3 ½ inches attachment flange at or below the foundation plate line on exterior walls in



accordance with ASTM C926. The exterior lath shall cover and terminate on the attachment flange of the weep screed.

- 3.3.7 **Clearances and Special Installation Considerations:** Weep Screed and/or stone should be held a minimum of 4" above finished grade or per local code and building practices. Weep screed and/or stone shall be held at a clearance above hard surfaces a minimum of 2" or as per local code and building practices. However, weep screed terminations that meet concrete surfaces that are supported by a foundation do not require this clearance.

3.3.8 **Mortar Scratch Coat:**

3.3.8.1 Apply mortar scratch coat with sufficient pressure to form full keys through and embed into the metal lath with sufficient thickness of material to cover the metal with a uniform layer ($\frac{1}{4}$ to $\frac{1}{2}$ inch).

3.3.8.2 In the case of paperbacked, 3.4 lb $\frac{3}{8}$ in. lath applied to open studs, mortar scratch coat total thickness is to be between $\frac{1}{2}$ to $\frac{3}{4}$ inches. Permit the mortar scratch coat to cure to a point where manufactured stone veneer can be applied without damage. Cure time varies with ambient temperature and humidity. Measure coat thickness from the back plane of the lath or from the front face of the solid backing to the outer surface exclusive of texture variations, voids, dimples or ribs.

3.3.8.3 Scoring the surface of the mortar scratch coat (once it becomes firm) in a horizontal direction may be performed to increase the surface bonding properties when manufactured stone is applied. This is an optional procedure.

3.3.8.4 When installing a mortar scratch coat over masonry or concrete surfaces, pre-wet surface to a damp condition to avoid excessive absorption of moisture from the mortar scratch coat. This will help ensure full hydration of mortar cement and a sufficient bond as well as minimize the risk of mortar shrinkage and cracking.

3.3.8.5 Install masonry control joints if called for by architectural plans and specifications or local code.

3.3.9 **Manufactured Stone Veneer**

3.3.9.1 If mortar scratch coat is completely dry or ambient conditions cause rapid drying conditions, then re-wet with water so that surface is damp. There shall not be any free water on the surface when the manufactured stone veneer is applied.

3.3.9.2 Apply $\frac{1}{2}$ inch thick layer of mortar to the entire inside surface area of the stone.

3.3.9.3 Press stone firmly into place with pressure to ensure tight contact with and complete coverage of the base coat allowing mortar to fill texture and voids on the back of the unit. Work the units with slight lateral motion while applying pressure to improve bonding.

3.3.9.4 Terminate stone at base of exterior wall or structure per local building codes and project specifications. If weep screed is utilized, then terminate stone application at the appropriate point per manufacturer's specifications (Do not cover weep screed).



3.3.9.5 Grout Joints:

3.3.9.5.1 Standard Joints.

3.3.9.5.1.1 Mortar shall be a type and quality consistent with that specified in the Material Requirements section of this document.

3.3.9.5.1.2 Fill joints with mortar (mortar bag) forcing mortar into all voids.

3.3.9.5.1.3 Allow mortar to become thumb print hard.

3.3.9.5.1.4 Tool mortar joint to desired shape and finish using a pointing tool, wooden stick, brush or other tool to the desired depth.

3.3.9.5.1.5 Once mortar is sufficiently set, use a dry brush to clean excess mortar. Do not use a wet brush to clean excess mortar. Do not use any acid or chemical based products to clean excess mortar.

3.3.9.5.2 Joint less or Dry Stack conditions:

3.3.9.5.2.1 No mortar joint is necessary when stone has been properly applied per instructions above. Manufactured stone veneer should be installed in a tight fitting, random ashlar pattern with minimum voids and each stone veneer unit closely resting on top of adjacent pieces. Pieces should be cut using an approved masonry saw or cutting tool. Pieces with exposed cuts should be placed within courses and pointed away from view at entries and exits to a building.

3.4 QUALITY CONTROL

3.4.1 Each project should be inspected on a periodic basis to ensure that installation is being performed per these instructions as well as any local building codes or project specifications.

3.5 CLEAN-UP

3.5.1 All masonry debris and installation materials shall be removed from the ground, window wells, concrete surfaces and other areas not intended for stone veneer.

3.5.2 Manufactured stone veneer and related installation material debris shall be cleaned-up per procedures and conditions called for at the jobsite.



4 MAINTENANCE AND CARE

4.1 Scuffing

- 4.1.1 Surface scuffing is a normal occurrence on all natural stone and is caused by processing and handling. This is a natural attribute that adds to the aesthetic appeal of stone products used in building construction.
- 4.1.2 Some scuffing will occur on manufactured stone veneer due to handling and transport to and at the jobsite, thus enhancing its close resemblance to the look of natural stone.
- 4.1.3 Light scuffing can be removed in some cases by following the cleaning procedures outlined in this document. In cases where excessive scuffing is experienced, consult your local Environmental Stoneworks representative for further instruction.

4.2 Cleaning

- 4.2.1 Dirt and other particles can be removed from the manufactured stone surface by using a mild soap detergent mixed with water and a non-metal bristle brush. Do not over scrub the surface as permanent discoloration may occur.
- 4.2.2 Avoid applying acid or chemical (petroleum) based cleaners to the manufactured stone as permanent damage may occur and will void manufacturer warranty.
- 4.2.3 Pressure washing and other methods of cleaning should only be done after consulting Environmental Stoneworks for proper instruction and limitations.

4.3 Efflorescence

- 4.3.1 Efflorescence has been in existence since the beginning of time. Its presence is noticeable throughout various structures, statues, monuments and building projects worldwide utilizing masonry and concrete building products.
- 4.3.2 Efflorescence is a white crystalline deposit that is composed of salts, lime and/or other minerals. These deposits may become visible on many types of building surfaces such as concrete, stucco, grout, masonry, brick, natural stone, clay, ceramic tile and even wood. The salts and minerals are water-soluble and generally come from the ground or where cementitious or alkali substances exist and travel to the surface, using moisture as their carrier, and when the moisture evaporates what is left behind are salts and minerals on the surface.
- 4.3.3 On occasion, efflorescence may occur with manufactured stone veneer. In situations where this happens, it can be removed from the surface of the product once it is dry by using a stiff bristle brush and clean water applied lightly. The area should then be rinsed to remove the residue. In severe situations, a solution of 1 part white vinegar and 5 parts clean water can be utilized.
- 4.3.4 It should be noted that efflorescence will go away over time as salts, lime and other minerals migrate to the surface and are removed or the product is no longer subject to repetitive water saturation.
- 4.3.4 In situations where water exposure is frequent and cannot be avoided, a breathable, penetrating sealer can also be used to minimize water penetration and saturation of manufactured stone. See instructions on sealing below.



4.4 Sealing

- 4.4.1 Sealing of manufactured stone is not required, although some customers may choose to utilize a sealer to protect against staining and water penetration.
- 4.4.2 Sealing the stone with a high quality breathable concrete sealer is recommended. Allow stone to cure before sealing. CAUTION! Some sealers will change the appearance of the stone. Try some on a sample piece before applying it to your completed project.
- 4.4.3 Contact your local Environmental Stoneworks representative for more information on sealing.



5 WARRANTY – INSTALLATION

(Only Applies When Installation Is Provided by Environmental Stoneworks)



Environmental StoneWorks One (1) Year Limited Warranty – Installation

Environmental StoneWorks' ("ESW") warrants that its installation of materials will be free from defects in workmanship for a period of one (1) year from the date of installation.

There are no warranties which extend beyond the Warranty described on this page. THERE SHALL BE NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF HABITABILITY, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. The exhibition of any sample or model by ESW was intended as an approximation only and shall not be regarded as part of the basis of the bargain and shall not create an express or implied warranty that the workmanship shall conform to the sample or model.

All claims for defective workmanship must be presented to ESW in writing at the address set forth below within thirty (30) days of discovery of the defective workmanship. Failure to timely provide such written notice constitutes a waiver of the claim. ESW shall be given a reasonable opportunity to inspect the claimed defective workmanship. ESW will, at its option, repair or replace any workmanship determined to be defective. This is the sole exclusive remedy under this Warranty.

This Warranty covers only defects in workmanship performed by ESW. This Warranty does not cover DEFECTS or damages IN ANY WAY resulting from LACK OF REASONABLE OR NECESSARY MAINTENANCE, NEGLIGENCE, building settlement, wall movement, contact with chemicals, stain or paint, discoloration due to airborne contaminants, and staining or oxidation. This Warranty is void if THE STRUCTURE ONTO WHICH THE MATERIALS INSTALLED DOES NOT CONFORM TO APPLICABLE BUILDING CODES, OR the materials installed by ESW or appurtenances thereto are misused, mishandled, altered, damaged or modified.

ESW IS NOT LIABLE FOR SPECIAL, INCIDENTAL AND CONSEQUENTIAL DAMAGES including, without limitation, personal injury, damage to property, damage or loss to equipment, lost profits or revenues, and rental costs. This limitation of damages applies even if the exclusive remedy fails its essential purpose. The price paid for ESW's installation includes consideration for limiting the remedies and ESW's liabilities as set forth herein.

This Warranty is extended only to the original purchaser of ESW's products and all transferees prior to and including the first owner of the structure to which the products are applied. This Warranty shall not be transferable or assignable to any other party. Any action for breach of this Warranty must be commenced within one (1) year after the cause of action has accrued.

Environmental Stoneworks
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Denver, CO 80216

Eff. 7/14/2006



6 WARRANTY – PRODUCT



Environmental StoneWorks 50 Year Limited Warranty – Products

Environmental StoneWorks' ("ESW") products shall be free from defects for a period of fifty (50) years from the date of purchase when they are installed in accordance with the manufacturer's written instructions and used on a structure that conforms to local building codes.

ESW will, at its option, repair or provide, free of charge, new product to replace any products determined to be defective. This is the sole exclusive remedy under this Warranty. ESW is not liable for special, incidental and consequential damages including, without limitation, labor costs to remove or replace defective products.

This Warranty covers only manufacturing defects in products manufactured by ESW. This Warranty does not cover damage resulting from building settlement, wall movement, contact with chemicals, stain or paint, discoloration due to airborne contaminants, and staining or oxidation. This Warranty is void if the products or appurtenances thereto are misused, mishandled, altered, damaged or modified.

This Warranty is extended only to the original purchaser of ESW's products and all transferees prior to and including the first owner of the structure to which the products are applied. This Warranty shall not be transferable or assignable to any other party.

Any action for breach of this Warranty must be commenced within one (1) year after the cause of action has accrued.

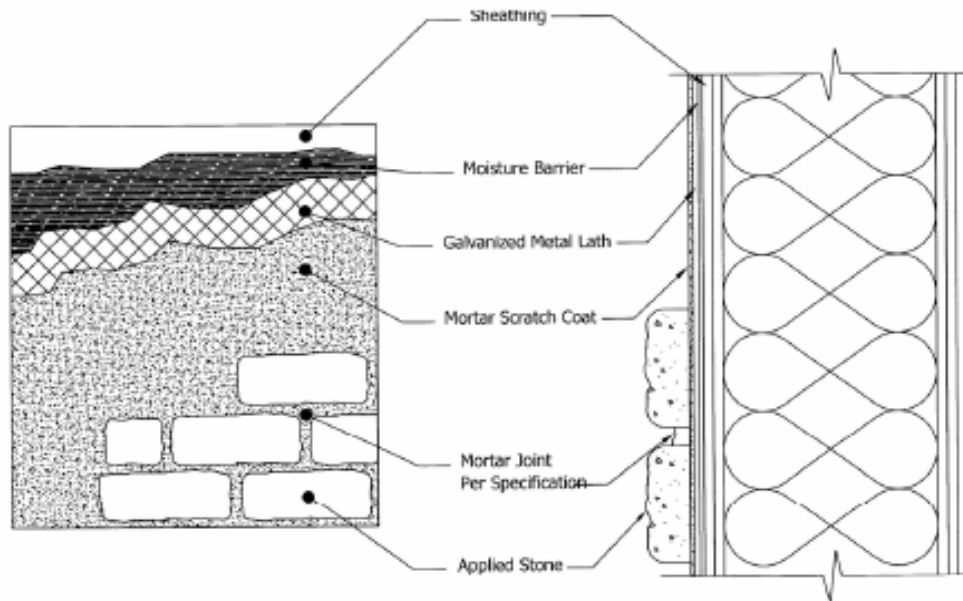
Environmental Stoneworks
Corporate Offices
6300 E. Stapleton Drive, South
Denver, CO 80216

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APPENDIX A – INSTALLATION DRAWINGS

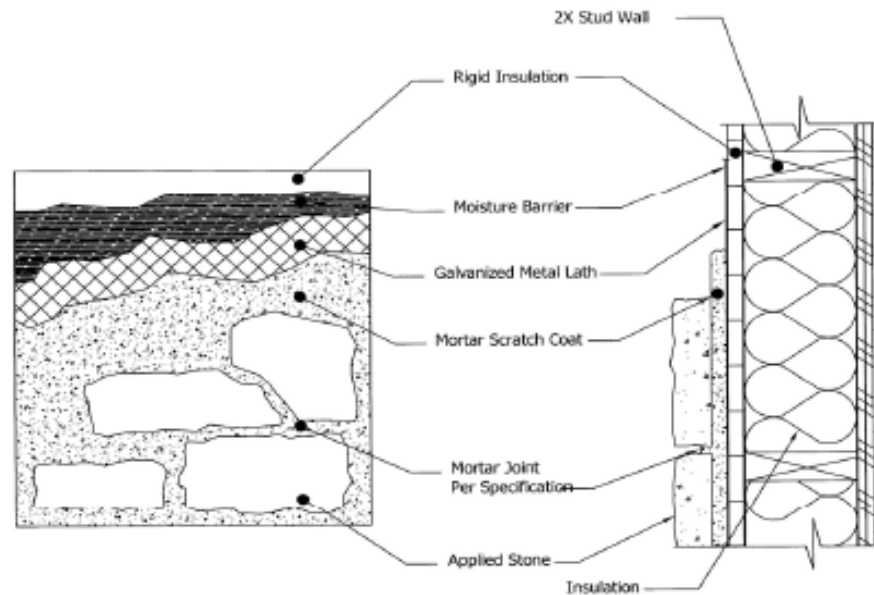
Installation Over Rigid Sheathing With Wood Framing



Specifications:

- **Weather Resistive Barrier:** No. 15 non-perforated asphalt-saturated organic felt paper or a house-wrap product supported by a current evaluation report showing equivalency to Grade D building paper complying with ASTM D-226
- **Galvanized Metal Lath:** Corrosion resistant minimum 2.5 lbs per square yard expanded metal lath that complies with ASTM C 847 (complying with local codes in effect) or corrosion resistant minimum 18 gauge woven wire mesh that complies with ASTM C 1032. See detailed Manufactured Stone Veneer Installation Procedures for fastener specs.
- **Mortar Scratch Coat and Mortar Joints (if applicable),** proportions by volume:
 - Portland Type I/II Cement ASTM C-150 (1 part), Masonry Type-N Cement ASTM C-270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm, moist consistency, pigment (powder or liquid) ASTM C979 optional, <or>
 - Masonry Type-S Cement ASTM C270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm and moist consistency, pigment (powder or liquid) ASTM C979 optional
- **Manufactured Stone Veneer and Accessories:** meeting ICC-ES AC-51 Criteria
- **Applied:** per Environmental Stoneworks Manufactured Stone Veneer Installation Procedures

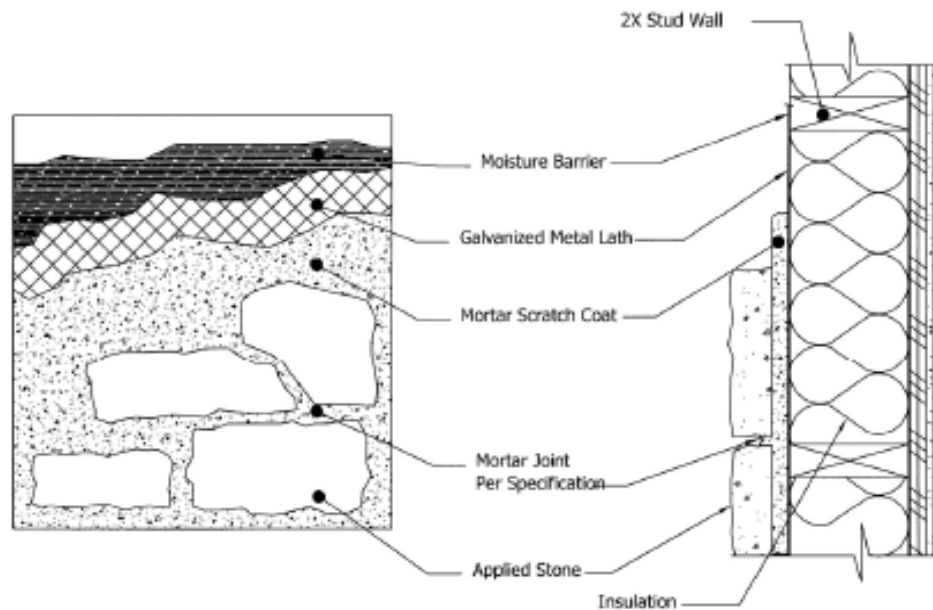
Installation Over Rigid Insulation With Wood Framing



Specifications:

- **Weather Resistive Barrier:** No. 15 non-perforated asphalt-saturated organic felt paper or a house-wrap product supported by a current evaluation report showing equivalency to Grade D building paper complying with ASTM D-226
- **Galvanized Metal Lath:** Corrosion resistant minimum 2.5 lbs per square yard expanded metal lath that complies with ASTM C 847 (complying with local codes in effect) or corrosion resistant minimum 18 gauge woven wire mesh that complies with ASTM C 1032. See detailed Manufactured Stone Veneer Installation Procedures for fastener specs.
- **Mortar Scratch Coat and Mortar Joints (if applicable),** proportions by volume:
 - Portland Type I/II Cement ASTM C-150 (1 part), Masonry Type-N Cement ASTM C-270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm, moist consistency, pigment (powder or liquid) ASTM C979 optional, <or>
 - Masonry Type-S Cement ASTM C270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm and moist consistency, pigment (powder or liquid) ASTM C979 optional
- **Manufactured Stone Veneer and Accessories:** meeting ICC-ES AC-51 Criteria
- **Applied:** per Environmental Stoneworks Manufactured Stone Veneer Installation Procedures

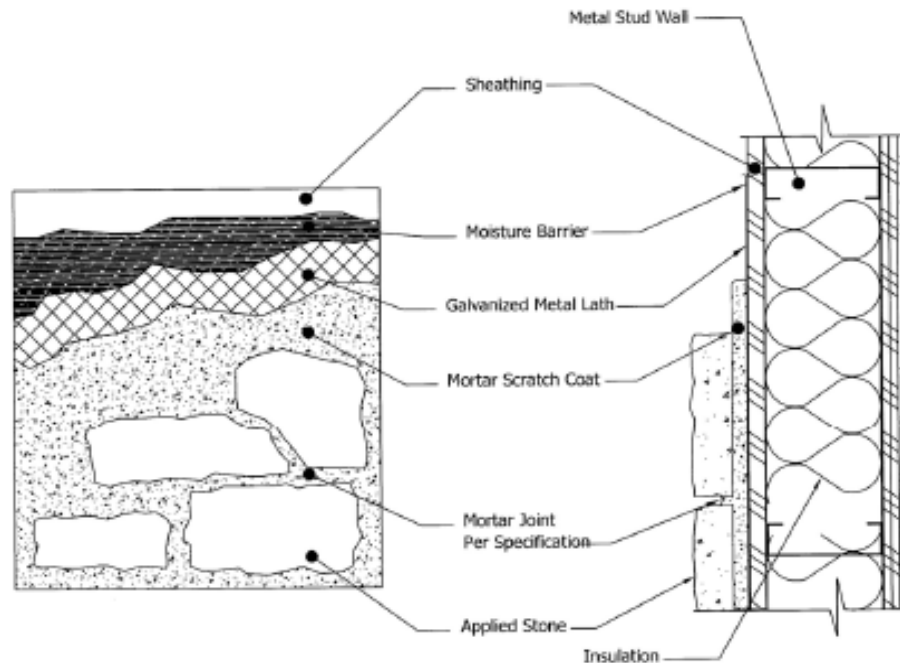
Installation Over Open Stud Framing (Wood)



Specifications:

- **Weather Resistive Barrier:** No. 15 non-perforated asphalt-saturated organic felt paper or a house-wrap product supported by a current evaluation report showing equivalency to Grade D building paper complying with ASTM D-226
- **Galvanized Metal Lath:** Corrosion resistant minimum 3.4 lbs per square yard, 3/8" paper backed lath (paper backing shall meet the requirements of ASTM D226 to be considered a substitute for Weather Resistive Barrier); complying with local codes in effect). See detailed Manufactured Stone Veneer Installation Procedures for fastener specs.
- **Mortar Scratch Coat and Mortar Joints (if applicable),** proportions by volume:
 - Portland Type I/II Cement ASTM C-150 (1 part), Masonry Type-N Cement ASTM C-270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm, moist consistency, pigment (powder or liquid) ASTM C979 optional, <or>
 - Masonry Type-S Cement ASTM C270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm and moist consistency, pigment (powder or liquid) ASTM C979 optional
- **Manufactured Stone Veneer and Accessories:** meeting ICC-ES AC-51 Criteria
- **Applied:** per Environmental Stoneworks Manufactured Stone Veneer Installation Procedures

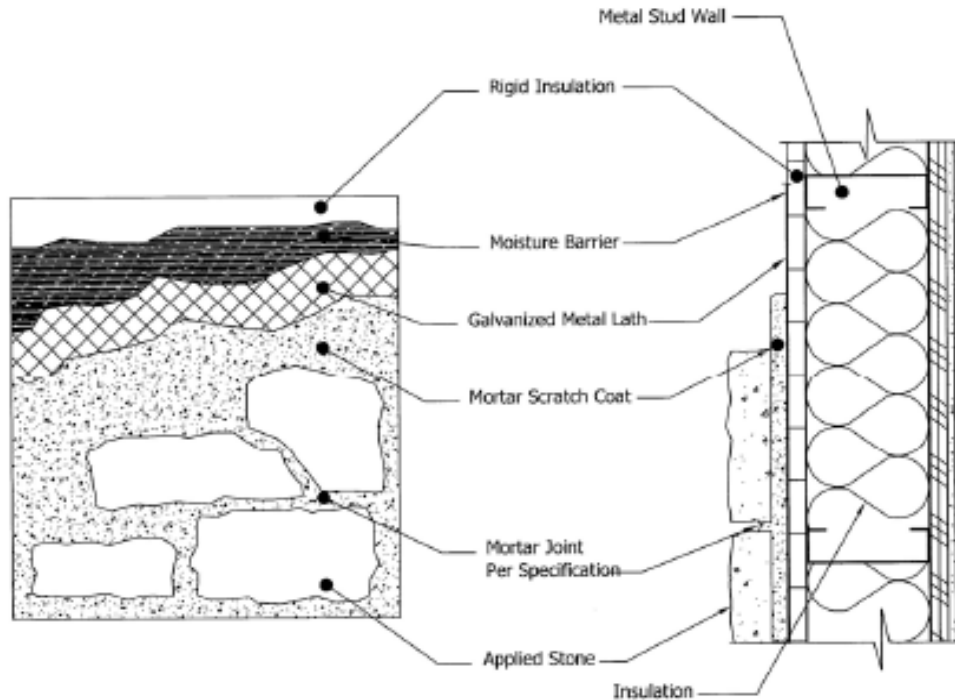
Installation Over Rigid Sheathing With Metal Framing



Specifications:

- **Weather Resistive Barrier:** No. 15 non-perforated asphalt-saturated organic felt paper or a house-wrap product supported by a current evaluation report showing equivalency to Grade D building paper complying with ASTM D-226
- **Galvanized Metal Lath:** Corrosion resistant minimum 2.5 lbs per square yard expanded metal lath that complies with ASTM C 847 (complying with local codes in effect) or corrosion resistant minimum 18 gauge woven wire mesh that complies with ASTM C 1032. See detailed Manufactured Stone Veneer Installation Procedures for fastener specs.
- **Mortar Scratch Coat and Mortar Joints (if applicable),** proportions by volume:
 - Portland Type I/II Cement ASTM C-150 (1 part), Masonry Type-N Cement ASTM C-270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm, moist consistency, pigment (powder or liquid) ASTM C979 optional, <or>
 - Masonry Type-S Cement ASTM C270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm and moist consistency, pigment (powder or liquid) ASTM C979 optional
- **Manufactured Stone Veneer and Accessories:** meeting ICC-ES AC-51 Criteria
- **Applied:** per Environmental Stoneworks Manufactured Stone Veneer Installation Procedures

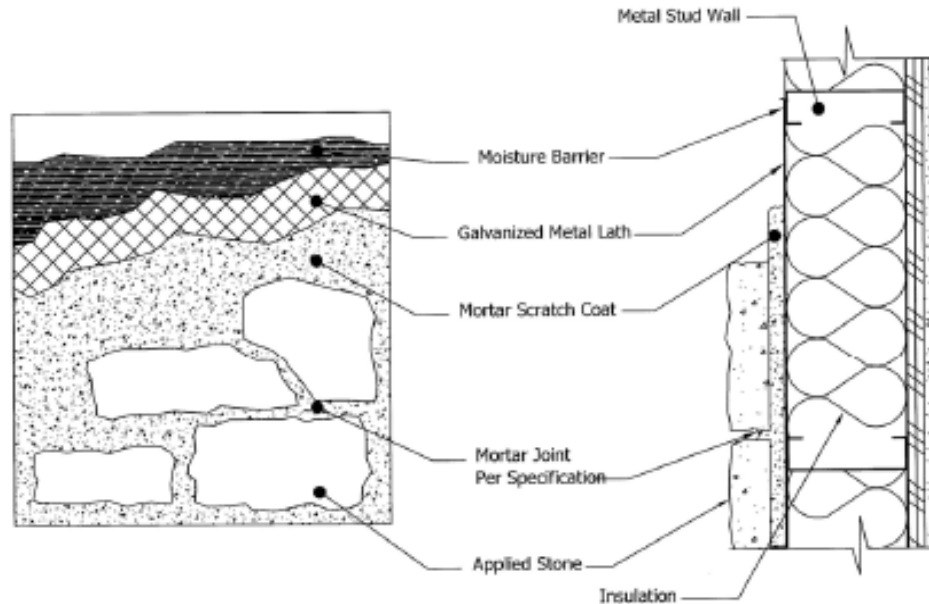
Installation Over Rigid Insulation With Metal Framing



Specifications:

- **Weather Resistive Barrier:** No. 15 non-perforated asphalt-saturated organic felt paper or a house-wrap product supported by a current evaluation report showing equivalency to Grade D building paper complying with ASTM D-226
- **Galvanized Metal Lath:** Corrosion resistant minimum 2.5 lbs per square yard expanded metal lath that complies with ASTM C 847 (complying with local codes in effect) or corrosion resistant minimum 18 gauge woven wire mesh that complies with ASTM C 1032. See detailed Manufactured Stone Veneer Installation Procedures for fastener specs.
- **Mortar Scratch Coat and Mortar Joints (if applicable),** proportions by volume:
 - Portland Type I/II Cement ASTM C-150 (1 part), Masonry Type-N Cement ASTM C-270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm, moist consistency, pigment (powder or liquid) ASTM C979 optional, <or>
 - Masonry Type-S Cement ASTM C270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm and moist consistency, pigment (powder or liquid) ASTM C979 optional
- **Manufactured Stone Veneer and Accessories:** meeting ICC-ES AC-51 Criteria
- **Applied:** per Environmental Stoneworks Manufactured Stone Veneer Installation Procedures

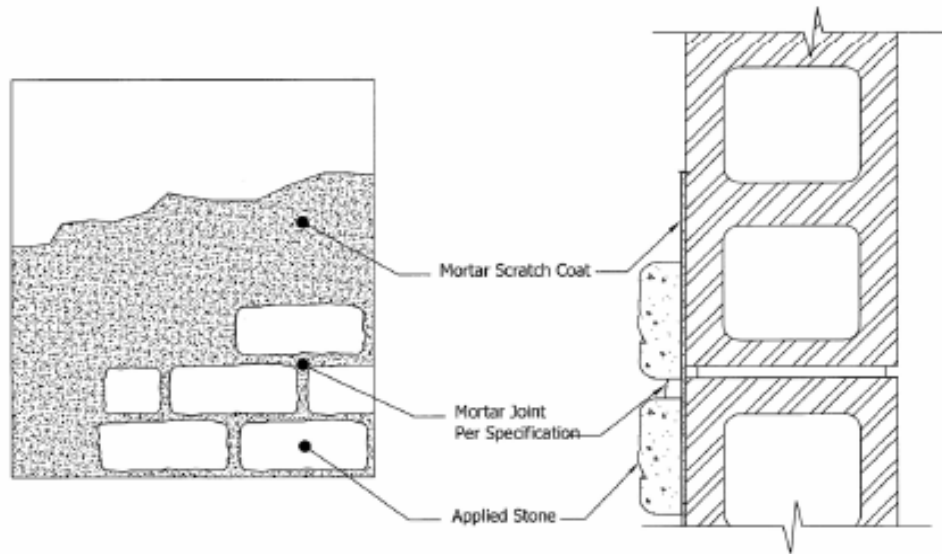
Installation Over Open Stud Framing (Metal)



Specifications:

- **Weather Resistive Barrier:** No. 15 non-perforated asphalt-saturated organic felt paper or a house-wrap product supported by a current evaluation report showing equivalency to Grade D building paper complying with ASTM D-226
- **Galvanized Metal Lath:** Corrosion resistant minimum 3.4 lbs per square yard, 3/8" paper backed lath (paper backing shall meet the requirements of ASTM D226 to be considered a substitute for Weather Resistive Barrier); complying with local codes in effect). See detailed Manufactured Stone Veneer Installation Procedures for fastener specs.
- **Mortar Scratch Coat and Mortar Joints (if applicable),** proportions by volume:
 - Portland Type I/II Cement ASTM C-150 (1 part), Masonry Type-N Cement ASTM C-270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm, moist consistency, pigment (powder or liquid) ASTM C979 optional, <or>
 - Masonry Type-S Cement ASTM C270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm and moist consistency, pigment (powder or liquid) ASTM C979 optional
- **Manufactured Stone Veneer and Accessories:** meeting ICC-ES AC-51 Criteria
- **Applied:** per Environmental Stoneworks Manufactured Stone Veneer Installation Procedures

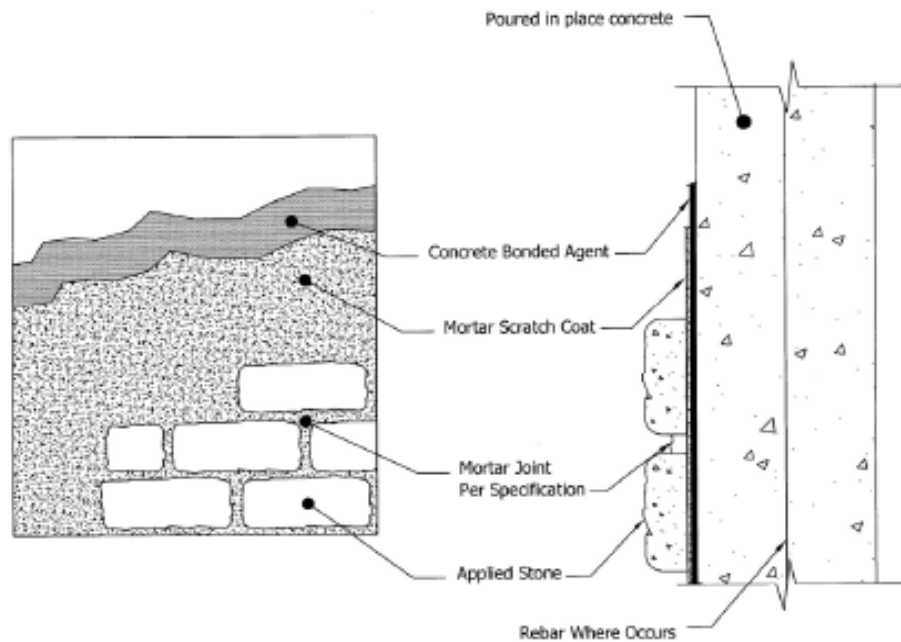
Installation Over CMU Block Wall or Unfinished Masonry Surface



Specifications:

- Mortar Scratch Coat and Mortar Joints (if applicable), proportions by volume:
 - Portland Type I/II Cement ASTM C-150 (1 part), Masonry Type-N Cement ASTM C-270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm, moist consistency, pigment (powder or liquid) ASTM C979 optional, <or>
 - Masonry Type-S Cement ASTM C270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm and moist consistency, pigment (powder or liquid) ASTM C979 optional
- Manufactured Stone Veneer and Accessories: meeting ICC-ES AC-51 Criteria
- Applied: per Environmental Stoneworks Manufactured Stone Veneer Installation Procedures

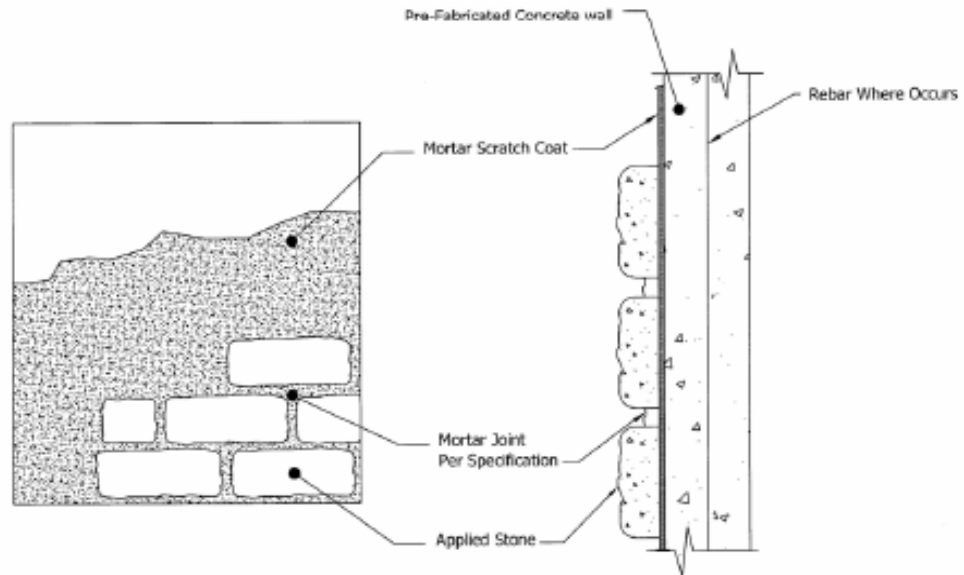
Installation Over Poured Concrete Surfaces



Specifications:

- **Concrete Bonding Agent:** Surface applied bonding agents that meet ASTM C 1059 or ASTM C 932. Integrally mixed (in mortar scratch coat) can be used such that mortar achieves minimum shear bond strength of 50 PSI when tested in accordance with ASTM C482. As an alternative to concrete bonding agent, corrosion resistant minimum 2.5 lbs per square yard expanded metal lath that complies with ASTM C 847 and applied with appropriate concrete fasteners may be used. Use concrete fastening pins with washers applied with a powder actuated fastening tool. Pins shall have a minimum shank length of 3/4 in. with a 0.145 in. head diameter and utilize a 16 gage washer.
- **Mortar Scratch Coat and Mortar Joints (if applicable),** proportions by volume:
 - Portland Type I/II Cement ASTM C-150 (1 part), Masonry Type-N Cement ASTM C-270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm, moist consistency, pigment (powder or liquid) ASTM C979 optional, <or>
 - Masonry Type-S Cement ASTM C270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm and moist consistency, pigment (powder or liquid) ASTM C979 optional
- **Manufactured Stone Veneer and Accessories:** meeting ICC-ES AC-51 Criteria
- **Applied:** per Environmental Stoneworks Manufactured Stone Veneer Installation Procedures

Installation Over Tilt-up Concrete Structures



Specifications:

- **Concrete Bonding Agent:** Surface applied bonding agents that meet ASTM C 1059 or ASTM C 932. Integrally mixed (in mortar scratch coat) can be used such that mortar achieves minimum shear bond strength of 50 PSI when tested in accordance with ASTM C482. As an alternative to concrete bonding agent, corrosion resistant minimum 2.5 lbs per square yard expanded metal lath that complies with ASTM C 847 and applied with appropriate concrete fasteners may be used. Use concrete fastening pins with washers applied with a powder actuated fastening tool. Pins shall have a minimum shank length of 3/4 in. with a 0.145 in. head diameter and utilize a 16 gage washer.
- **Mortar Scratch Coat and Mortar Joints (if applicable),** proportions by volume:
 - Portland Type I/II Cement ASTM C-150 (1 part), Masonry Type-N Cement ASTM C-270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm, moist consistency, pigment (powder or liquid) ASTM C979 optional, <or>
 - Masonry Type-S Cement ASTM C270 (1 part), Masonry sand ASTM C-144 (3 parts), water added to achieve firm and moist consistency, pigment (powder or liquid) ASTM C979 optional
- **Manufactured Stone Veneer and Accessories:** meeting ICC-ES AC-51 Criteria
- **Applied:** per Environmental Stoneworks Manufactured Stone Veneer Installation Procedures