



ASTM E 330 STRUCTURAL TEST REPORT

Rendered to:

ELDORADO STONE, LLC

STYLE: CASTLE ROCK

Report No.: 69947.01-901-44
Test Date: 01/15/07
Through: 01/22/07
Report Date: 02/14/07
Record Retention Date: 02/09/11
Revision 1: 07/28/15

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ELDORADO STONE, LLC
P.O. Box 489
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Project Summary: Architectural Testing, Inc. was contracted by Eldorado Stone, LLC, to perform structural testing on their Castle Rock faux stone veneer products at Architectural Testing's facility in Kent, Washington. Test specimen description and results are reported herein.

Test Methods: The specimen was evaluated in accordance with ASTM E 330, *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtin Walls by Uniform Static Air Pressure Difference (MODIFIED)*

Test Specimen Description:

General Description: Three 8' wide by 8' high wall samples were prepared. Each wall sample was constructed of Douglas - Fir nominal 2 x 4 plates and 2 x 4 studs spaced 16" on center. Each of the intermediate studs was attached to the top and bottom plates with two 3" drywall screws. 7/16" thick OSB sheathing was fastened to the stud wall with 1-5/8" drywall screws spaced approximately 8" apart. One layer of 60 minute WRB was stapled to the sheathing. The 2.5 lb expanded metal lath was applied over the WRB with the staples fastened into the studs every 6". A bed of mortar was applied over the lath and allowed to cure overnight. Following the application of the mortar the individual faux stones were applied in the grouted method. The wall samples were allowed to cure for no less than 28 days and then subjected to tests.

Test Description:

General Description: Each of the wall samples was subjected to positive and negative structural load tests at 57.6 psf and 60 psf pressure differentials. Loads were held for 60 seconds. Deflection gauges were used to measure the deflection of the wall assembly. Gauges were mounted to the exterior face of the faux stone in line with the top, bottom and mid-span of the centermost stud. At the conclusion of each load, the faux stone was inspected for cracking. Net deflections and visual observations are reported below.

Test Results:**Test Specimen #1 (Installer: ACCS – 2):**

<u>Pressure</u>	<u>Net Deflection</u>	<u>Observations</u>
57.6 psf (positive pressure) (150 mph wind speed)	0.19"	No damage or cracking observed
57.6 psf (negative pressure) (150 mph wind speed)	0.47"	No damage or cracking observed
60.0 psf (positive pressure) (153 mph wind speed)	0.19"	No damage or cracking observed
60.0 psf (negative pressure) (153 mph wind speed)	0.48"	No damage or cracking observed

Note #1: After completion, loads and inspections at 57.6 psf and 60 psf pressure differentials, a negative pressure differential of 110 psf (207 mph wind speed) was applied and held for 10 seconds. Following pressure release a visual inspection revealed no visible cracks in the faux stone.

Test Specimen #2 (Installer: LPCS - 1):

57.6 psf (positive pressure) (150 mph wind speed)	0.20"	No damage or cracking observed
57.6 psf (negative pressure) (150 mph wind speed)	0.50"	No damage or cracking observed
60.0 psf (positive pressure) (153 mph wind speed)	0.22"	No damage or cracking observed
60.0 psf (negative pressure) (153 mph wind speed)	0.54"	No damage or cracking observed

Note #2: After completion, loads and inspections at 57.6 psf and 60 psf pressure differentials, a negative pressure differential of 110 psf (207 mph wind speed) was applied and held for 10 seconds. Following pressure release a visual inspection revealed no visible cracks in the faux stone.

Test Specimen #3 (Installer: LYCS - 3):

57.6 psf (positive pressure) (150 mph wind speed)	0.34"	No damage or cracking observed
57.6 psf (negative pressure) (150 mph wind speed)	0.45"	No damage or cracking observed
60.0 psf (positive pressure) (153 mph wind speed)	0.34"	No damage or cracking observed
60.0 psf (negative pressure) (153 mph wind speed)	0.53"	No damage or cracking observed

Note #3: After completion, loads and inspections at 57.6 psf and 60 psf pressure differentials, a positive pressure differential of 110 psf (207 mph wind speed) was applied and held for 10 seconds. Following pressure release a visual inspection revealed no visible cracks in the faux stone.

A copy of this report will be retained by Architectural Testing, Inc. for a period of four years from the original test date. This report is the exclusive property of the client so named herein and is applicable to the sample tested. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory. This report may not be reproduced, except in full, without approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC:

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Technician

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Director - Regional Operations

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Attachment (pages):

Appendix A: Alteration Addendum (1)

Appendix B: Eldorado Stone *Installation Procedures* (6)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	02/14/07	N/A	Original report issue
1	07/28/15	Cover page, Page 1	Expiration Date changed to Record Retention Date.

APPENDIX A
Alteration Addendum

Note: No alterations were required.

APPENDIX B

Eldorado Stone Installation Procedures

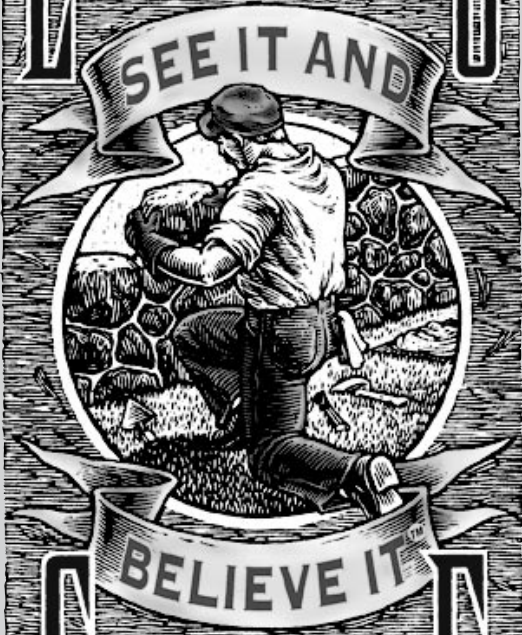
I N S T A L L A T I O N

H A N D M A D E

A R C H I T E C T U R A L

F L O O R A D O

SEE IT AND



BELIEVE IT

S T O N E N E V E R E E R S

H A N D L A I D

P R O C E D U R E S

THERE ARE TWO BASIC VARIATIONS OF THE STONE INSTALLATION PROCEDURE.

1, The Standard installation procedure (which includes grouted and overgrouted) and 2, The Jointless or Dry-Stacked installation procedure. The Standard installation procedure leaves grouted joints between all stones. The Jointless or Dry-Stacked installation procedure fits stones tightly together without grouted joints. While much of the installation procedure is the same for both variations, differences will be noted throughout these instructions. Brick installation is covered under the standard installation procedure.

1. ESTIMATING STONE QUANTITIES NEEDED

Two components, flats and corners, are used for most installations. Flats are applied to the flat wall surface and are ordered in square feet. Corners are applied to outside corners and are ordered in lineal feet. Using corners around window and door openings provides added dimension and depth and enhances the finished design.

1 DETERMINE THE TOTAL PROJECT SQUARE FOOTAGE by multiplying the length times the height of each surface area to be covered and then deducting the area of all openings such as doors and windows.

2 DETERMINE THE LINEAL FOOTAGE OF CORNER STONES needed for the project by measuring the lineal feet of outside corner areas to be covered including any doorways and windows that will have corners.

3 DETERMINE THE SQUARE FOOTAGE OF FLAT STONES REQUIRED for the project by multiplying the lineal footage of corner stones needed by 1/2 (One lineal foot of corner stones equals approximately 1/2 square foot of flat stone) and subtracting this corner square footage from the total project square footage. This will give you the square footage of flat stone required. However, some extra quantity of flats is desirable for best fitting and for cutting and trimming.



Fig. 1 Prepare surface



Fig. 2 Trim stone to fit



Fig. 3 Apply mortar



Fig. 4 Install corners first

2. PREPARING THE SURFACE

OVER SHEETROCK, WALLBOARD, PANELING, PLYWOOD OR OTHER RIGID WOOD-RELATED SHEATHING Cover the wall surface with a weather-resistive barrier. The barrier shall be equal to that provided for in the U.B.C. Standard No. 14-1 for kraft waterproof building paper or asphalt-saturated rag felt. The building paper or felt shall be applied horizontally with the upper layer lapped over the lower layer not less than 2 inches. Where vertical joints occur, the felt or paper shall be lapped not less than 6 inches.

Then install a 2.5 lb. diamond mesh expanded metal lath or an 18 gauge woven wire mesh. Exterior applications will require a galvanized metal lath, however a non-galvanized black metal lath may be used for interior applications. Overlap lath sides by not less than 3/8" and lath ends by not less than 1". Attach the lath using galvanized nails or staples 6" on center vertically and 16" on center horizontally, penetrating studs a minimum of 1". (Be sure to attach the metal lath with the small cups pointing upwards.) Continuously wrap metal lath a minimum of 16" around all outside and inside corners. Then apply a 1/2" thick scratch coat of mortar over the metal lath and allow it to set.

**Use of OSB as backing material for our stone may cause cracking.*

OVER OPEN STUDS Apply paper-backed galvanized 3.4 lb. 3/8" rib expanded metal lath to the studs using galvanized nails or staples every 6" vertically on stud centers with a minimum 1" penetration. Overlap lath sides by not less than 1/2" and lath ends by not less than 1 inch. For metal studs use corrosion-resistant self-tapping screws with a 3/8" head that provides 3/8" minimum penetration beyond the inside metal surface. Then apply a 1/2" thick scratch coat of mortar over the metal lath and allow it to set 48 hours.

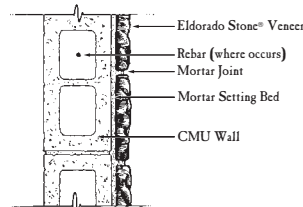
OVER METAL PANELS Surface preparation is the same as for "over sheetrock, wallboard, paneling, plywood, or other rigid wood related sheathing", (see above) except the metal lath should be attached using self-tapping screws with a 3/8" head that provides 3/8" minimum penetration beyond the inside metal surface.

OVER CLEAN (UNPAINTED, UNSEALED, UNTREATED) BRICK, BLOCK, CONCRETE OR OTHER MASONRY SURFACES No surface preparation is necessary, however for added insurance to minimize cracking or bond failure, use a metal lath and scratch coat. Newly poured concrete surfaces should be examined closely to ensure the surface does not contain form oil or other types of release agents. A method to determine their pres-

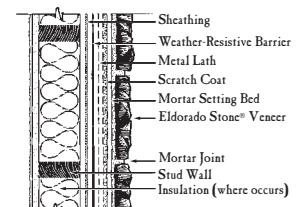
ence is by spraying surface with water. If water beads up or runs off the wall, the presence of a release agent is likely. If a release agent is present, acid etch, wire brush surface, or use a metal lath and scratch coat. It is imperative that the concrete surface is free of form release contamination if lath and scratch coat is not used to ensure a proper bond.

OVER PAINTED, SEALED OR TREATED BRICK, BLOCK, CONCRETE OR OTHER MASONRY SURFACES The surface must either a) be cleaned back to the original surface by sandblasting, water blasting, acid etching or wire brushing or b) have metal lath attached using corrosion-resistant concrete nails with a scratch coat applied over the metal lath.

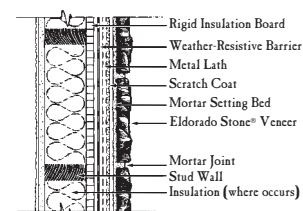
OVER RIGID INSULATION BOARD Surface preparation is the same as for "over sheetrock, wallboard, paneling, plywood or other rigid wood related sheathing" except the spacing for nails or staples should be 6" on center vertically and 16" on center horizontally, penetrating studs a minimum of 1".



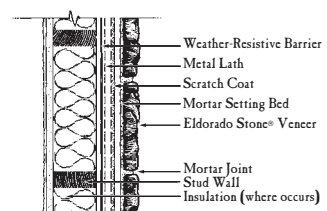
OVER CMU WALL



OVER SHEATHING



OVER RIGID INSULATION



OVER OPEN STUD FRAMING

Eldorado Stone® detail drawings for installation over four basic substrates.

3. PREPARING THE MORTAR

Mortar should be mixed to a firm but workable (not too wet, not too dry) consistency.

1 MORTAR MIX FOR STANDARD INSTALLATION (GROUTED JOINTS):

Use Type N or Type S mortar mix as follows:

A. SUGGESTED MIX-TYPE N MORTAR 2 PARTS TYPE-N MASONRY CEMENT 3 TO 5 PARTS MASONRY SAND WATER OR 1 PARTS PORTLAND CEMENT 1 PART LIME 3 TO 5 PARTS MASONRY SAND WATER	B. ALTERNATIVE MIX-TYPE S MORTAR 3 PARTS TYPE-S MASONRY CEMENT 5 TO 7 PARTS MASONRY SAND WATER OR 2 PARTS PORTLAND CEMENT 1 PART LIME 5 TO 7 PARTS MASONRY SAND WATER
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This mortar can be colored to complement the stone by adding iron oxide pigments available from your dealer.

2 MORTAR MIX FOR JOINTLESS/ DRY-STACKED INSTALLATION:

A. SUGGESTED MIX 3 PARTS PORTLAND CEMENT 2 PARTS THINSET MORTAR* (SEE IMPORTANT NOTE BELOW) 7 PARTS MASONRY SAND WATER
B. ALTERNATE MIX #1 2 PARTS PORTLAND CEMENT 1 PART LIME 7 PARTS MASONRY SAND BONDING AGENT AND WATER (PREBLENDED 1:1)
C. ALTERNATE MIX #2 3 PARTS TYPE-S MASONRY CEMENT 7 PARTS MASONRY SAND BONDING AGENT AND WATER (PREBLENDED 1:1)

*Note: for exterior applications use only "latex modified thinset for exterior use, meeting ANSI -A118.4".

For the best finished appearance, the Jointless/Dry-stacked mortar color should blend with the stone base color to help conceal the joint lines. Ask your dealer for mortar colors.

The mortar mix for Standard installation (see above) may be used for the Jointless/Dry-stacked scratch coat if desired, but may not be used for applying the stone.

4. APPLYING THE STONE

PROPER USE Carefully follow these recommended installation instructions and check your local Building Code requirements as these vary by area. Eldorado Stone® should only be applied to structurally sound surfaces incorporating good building practices.

It is important to divert water run-off away from stone surfaces by using cant strips, gutters and flashing. Run-off or splashing may stain the material. Water run-off combined with severe freeze-thaw conditions can result in surface damage. The use of Eldorado Stone® Caps can be used to provide adequate run-off protection. Corner or flat pieces should not be used on exterior horizontal planes or to cap walls in high freeze-thaw areas. Retaining walls must be water-proofed at the fill side and incorporate provisions for adequate drainage.

Eldorado Stone® should not be used below water level or in applications that subject the material to chlorine or chemicals that may discolor the stone.

LAYING OUT THE STONE Before you begin, lay out a quantity of stone (25 s.f. minimum) near the work area to give you a selection to choose from. When installing stone, try to achieve a balanced pattern of shapes, sizes, colors, thicknesses and textures by selecting and mixing the various stones. Select and mix stones from different boxes throughout the installation.

STARTING For standard installation procedure, Eldorado Stone® is applied from the top down. This helps to keep the stone clean. For Jointless/Dry-stacked installation, stone is applied from the bottom up.

Install the corners first for easiest fitting. Corner pieces have a long and a short return. These should be alternated in opposite directions on the wall corner.

FITTING STONES Stones should be installed with uniform size grout joints. A consistent 1/2" or less space around the stones is desirable. Long, straight, unbroken joint lines should be avoided.

When installing Eldorado Brick®, as well as coursed and horizontal styles of Eldorado Stone®, special attention should be given to keeping the work level. Chalk lines should be snapped every 4" to 8" as a guide for keeping the installation level and then a level should be used during the installation of individual pieces. Also, it is of particular importance to frequently stagger the joint lines both vertically and horizontally.

TRIMMING STONES For best fit, stones can be cut or shaped using a hatchet, widemouth nippers or a mason's trowel edge. Straight cuts can be made with a diamond or carbide saw blade. Cut edges



Fig. 5 Then install flat stones



Fig. 6 Grout joints



Fig. 7 Finish joints

should be turned so they are not visible (down when below eye level and up when above eye level). To conceal cut or broken edges, cover them with mortar when grouting (back cutting the stone edges will also help with concealment).

SETTING THE STONE Using a mason's trowel, apply a 1/2" thick even layer of mortar to the entire back of the stone. Then press the stone firmly into place on the prepared wall surface, squeezing the mortar out around all edges. Using a gentle wiggling action while pressing the stone will ensure a good bond.

For Jointless/Dry-stacked installations it's important when setting the stone, that the edges of the stone are properly sealed with mortar to ensure satisfactory bond. This can be achieved by following these steps. **1.** Apply workable mortar generously to the back of each stone to allow ample mortar to squeeze out around all edges of the stone as it is pressed onto the wall. **2.** Right after setting each stone, use a mason's trowel or a margin trowel to remove any excess mortar and to fill any voids along the stone's exposed edges. This serves not only to help seal the stone edges but also allows for tighter fitting of following stones. **3.** Just prior to setting each stone, apply a thin bead of mortar with a grout bag to the edges of all previously installed, adjacent stone.

If any mortar accidentally gets on the stone face, do not try to wipe it off as it will smear and stain the stone. The mortar should be allowed to set until dry and crumbly, and then brushed off with a dry whisk broom.

WETTING THE STONE AND SUBSTRATE Under certain conditions the stone and substrate may need to be wetted. If the stone is being installed onto a very hot/dry surface or in a hot/dry climate, the stone and wall surface should be wet to prevent excessive absorption of moisture from the mortar. This can be done by spraying water onto wall surface and back of stone (you may also dip stone into a container of water). In either case the stone and the wall surface should be allowed to dry for a few minutes after wetting to eliminate excess surface water. For Jointless/Dry-stacked installations it will be necessary to wet the stones regardless of the weather conditions. For cold weather installations, applications should be protected from temperatures below freezing, so the mortar may set up properly as recommended in section "2104.3 Cold-weather construction" of the International Building Code.

GROUTING THE JOINTS There are three distinct grout techniques, each with their own unique look: Standard Joints (Raked), Dry-Stack Joints and Overgrout Joints (Historically referred to as a sack finish). These three joint

finishes play a major role when it comes to finishing a job that has the look and feel of real stone.

A Standard Joint (Raked) is achieved by laying each stone roughly one finger width apart from each other, then a grout bag is used to fill the joints with mortar, forcing grout into any voids. Be careful not to smear grout onto the face of the stone. Any mortar that accidentally gets on the stone should be allowed to set until dry and crumbly, and then brushed off with a dry whisk broom.

Dry-Stack joint stonework is accomplished by "dry" fitting each stone prior to installation. Each piece can be laid with virtually no joint. Even though you've used mortar to set the stone to the surface, when complete, the finished look will appear as though no mortar was used to install stone. However, it is sometimes desirable to do touch-up grouting to fill noticeable voids and to conceal cut or broken stone edges.

Overgrout, an increasingly popular way to achieve an old-world look is a technique that tends to make the stonework appear rustic and aged. The grout overlaps the face of the stone, widening the joints and making them very irregular. It's important that the joint's mortar be applied without air pockets and are filled completely to the substrate. Overfill joints when applying grout. Mortar should be right between being too wet and too crumbly. The overgrout technique uses almost every stone shipped because broken edges can be hidden by grout.

FINISHING THE JOINTS When the mortar joints become firm (normally 30-60 minutes), use a wooden or metal striking tool to rake out the excess mortar to the desired depth while at the same time forcing the mortar into the joints so as to thoroughly seal the stone edges. Be careful not to work the joints too soon or the mortar will smear.

After working the joints, use a whisk broom to smooth the joints and clean away any loose mortar from the joints and stone face. Loose mortar and mortar spots which have set for only a few hours clean up easily and should never be allowed to set up overnight.

CAUTION: Do not use wet brushes or sponges to wipe the joints or clean mortar off the face of the stone as it will smear and stain. Also, never use wire brushes or acid on the stone surface.

CLEANING To clean dirt or other particles from the stone, use a granulated type detergent mixed with water and a soft bristle brush. If efflorescence occurs, as it does with most masonry products, it is usually caused by moisture migration through the masonry substrate when the stone is saturated. Once the moisture is on the masonry surface, it evaporates, depositing the dissolved salts in the form of efflorescence. The efflorescence will disappear naturally with time. To clean the efflorescence right away, scrub surface with a soft bristle brush and a solution of 1 part white household vinegar mixed with 5 parts water.

COMPLETION Sealing the stone is not necessary, however it may be desirable for attaining deeper colors and for minimizing possible staining in certain applications such as "at grade", where mud might splash onto the stone or on fireplaces which are exposed to smoke and soot. Only good quality masonry sealers that are of the "penetrating breathable" type and either Silane or Siloxane based should be used. The sealer should be tested for color change on several loose stones before application, as sealers will darken stone.



Fig. 8 Whisk away loose mortar



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