

SUPPLEMENTAL INFORMATION

VERTICAL SURFACES / EXTERIOR STONE VENEER

SECTION 1. INTRODUCTION

1.01 Installation Methods. There are several methods by which exterior stone cladding can be installed. Consideration should be given to the various features of each method in making a selection for a particular installation. See detailed illustrations of examples at the close of this section.

For additional information, refer to Chapter 13 Installation – General Information.

1.02 Geographic Methods. Some installation methods and materials are not recognized and may not be suitable in some geographic areas because of local trade practices, building codes, climatic conditions, or construction methods. Therefore, while every effort has been made to produce accurate guidelines, they should be used only with the independent approval of technically qualified persons.

1.03 General Precautions. During construction, the General Contractor shall protect all stone from staining and damage.

SECTION 2. RELATED COMPONENTS

2.01 Anchorage Hardware: All anchors in contact with exterior stone are to be non-corroding.

2.02 Joint Fillers. When using adhesion installation methods, grout joints shall be a minimum of 1/4" wide. Apply grout to full depth of stone. Silicone-based building sealants that remain flexible with a modulus capable of accommodating anticipated inter-panel movements are recommended for vertical work. Verify the sealant is non-staining to the specified stone material.

2.03 Gypsum Plaster. The use of gypsum plaster (molding plaster) setting spots for exterior stone is not acceptable practice.

2.04 Shims shall be stainless steel or high-impact plastic or approved equal. Shim size shall distribute the loads to ensure that point loading does not affect stones performance.

A) Where permanent setting pads are required, 90 durometer neoprene or high-impact plastic is recommended.

2.05 Insulation. Because heat is easily transmitted through stone when stone is part of a system assembly, insulation should be provided by other Contractors. Insulation should never be placed directly against the stone.

2.06 Control and Expansion Joints. In exterior stone walls, expansion joints may be provided to reduce the damaging effect of building and/or veneer movements due to thermal expansion, structural live load deflection, seismic displacement, and other applicable movements based on project conditions and material properties. Because of the many conditions and structural systems in which stone can be installed, the Specifying Authority or engineer of record shall show locations and details of expansion joints on project drawings and/or calculations.

SECTION 3. HYSTERESIS

3.01 Hysteresis is a phenomenon that affects certain "true" marbles. Unlike most stones, which return to their original volume after exposure to higher or lower temperatures, these marbles show small permanent increases in volume after each thermal cycle. This can result in differential expansion within the stone, which is more likely to be accommodated or restrained in thick veneers than in thin ones. If it is not restrained, bowing of the marble panels ensues. Bowing also stretches the face, which makes

stones more porous and increases their vulnerability to corrosion from acids in the atmosphere and deterioration from freezing and thawing effects. If marbles with this tendency are selected, research shall be performed to determine the minimum thickness needed to overcome effects of hysteresis.

SECTION 4. EXTERIOR STONE VENEER - PRODUCT DESCRIPTION

4.01 Basic Use. Exterior cladding or facing for structural elements.

1. Thickness Limitations for Mechanically Attached Systems. As a general rule, stone panel thickness should be a minimum of 1-1/4". However, panel sizes and thicknesses may also be dictated by local codes, wind load requirements, areas of usage, and material performance as determined by ASTM standard specifications. Refer to ASTM C1528 for recommendations of minimum stone thickness.

2. Fabrication. Exterior veneer units are precut and prefinished to dimensions specified on shop drawings and are typically delivered to the job site ready to install.

3. Finishes. Most commercially available stone thicknesses are suitable for exterior veneer. Some stones, notably marbles, may not retain a polished finish in exterior environments.

4. Colors. Most of the commercially available varieties are suitable.

5. Panel Sizes. Panel sizes are subject to the size and soundness of the block yielded by the quarry. Generally, panel dimensions of greater than 5'-0" (1.5 m) can create supply and/or anchorage difficulties. The designer is encouraged to verify obtainable dimensions with the quarry of the material prior to finalizing the design.

SECTION 5. TECHNICAL DATA

5.01 Each stone variety used for exterior veneer should conform to the applicable ASTM standard specification and the physical requirements contained therein. The specification for each stone type follows:

A) **Granite:** ASTM C615 Standard Specification for Granite Dimension Stone

SECTION 6. ENGINEERING

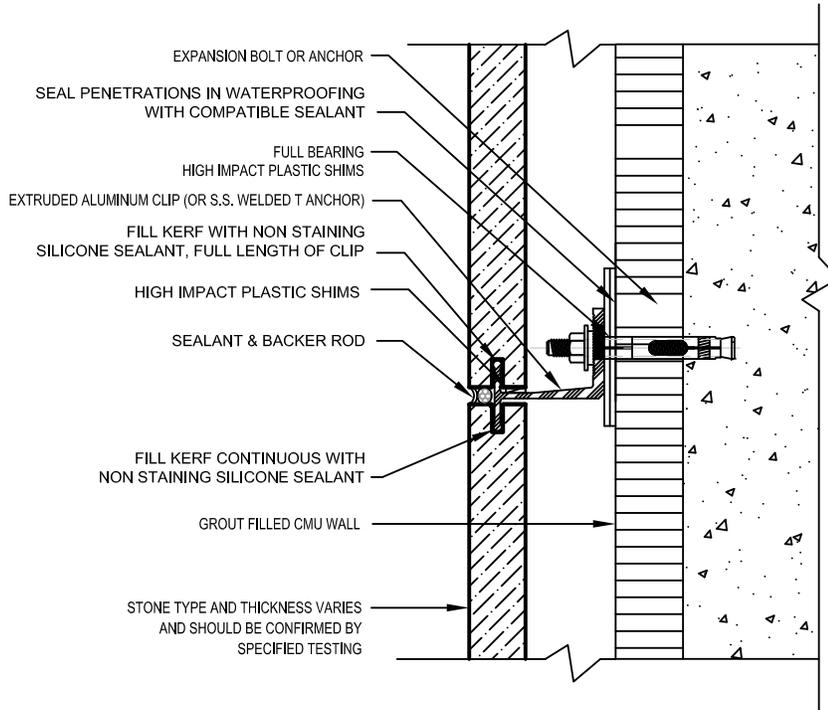
6.01 A knowledgeable and experienced Installer must provide an engineered and fabricated system that will satisfy functional and aesthetic requirements. However, determining which performance requirements and the criteria under each must be made by the Specifying Authority in consultation with the Structural Engineer.

SECTION 7. GENERAL PRECAUTION:

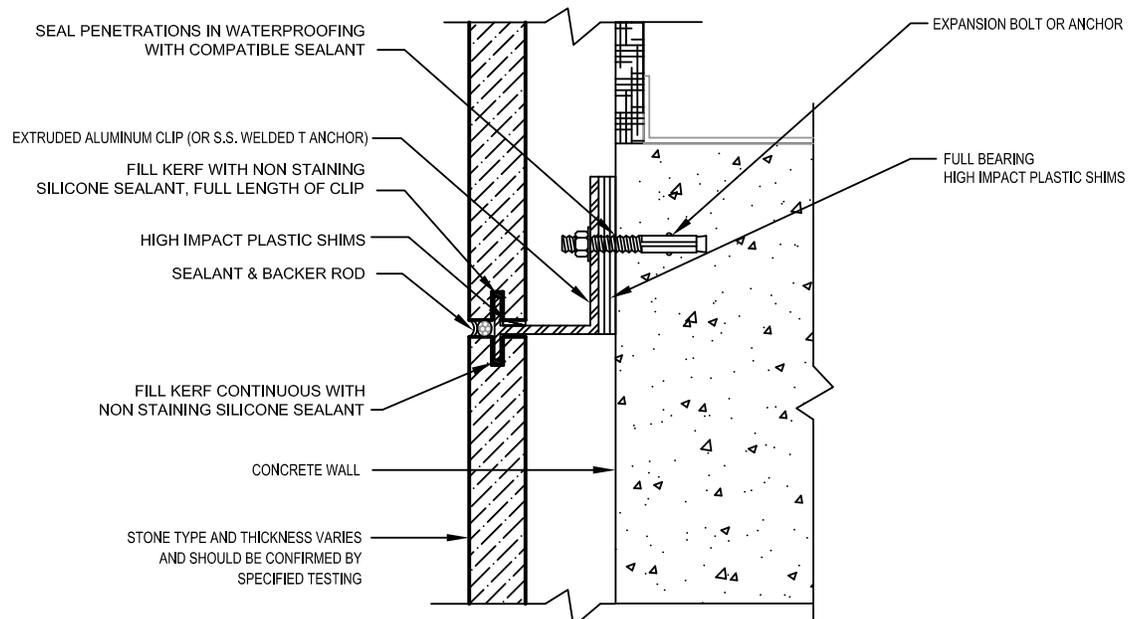
7.01 During construction, the General Contractor shall protect all stone from staining and damage.

7.02 Caution is advised when using historical test data for natural stones. It is preferable to use data obtained from test specimens from current quarry production that is representative of the actual product being supplied. Test data should be obtained from certified testing agencies specializing in natural stone testing.

SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER



1 EXTRUDED ALUMINUM OR WELDED STAINLESS STEEL "T" ON CMU BACKUP



2 EXTRUDED ALUMINUM OR WELDED ST. STEEL "T" ON CONCRETE BACKUP



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0	Aug 2006
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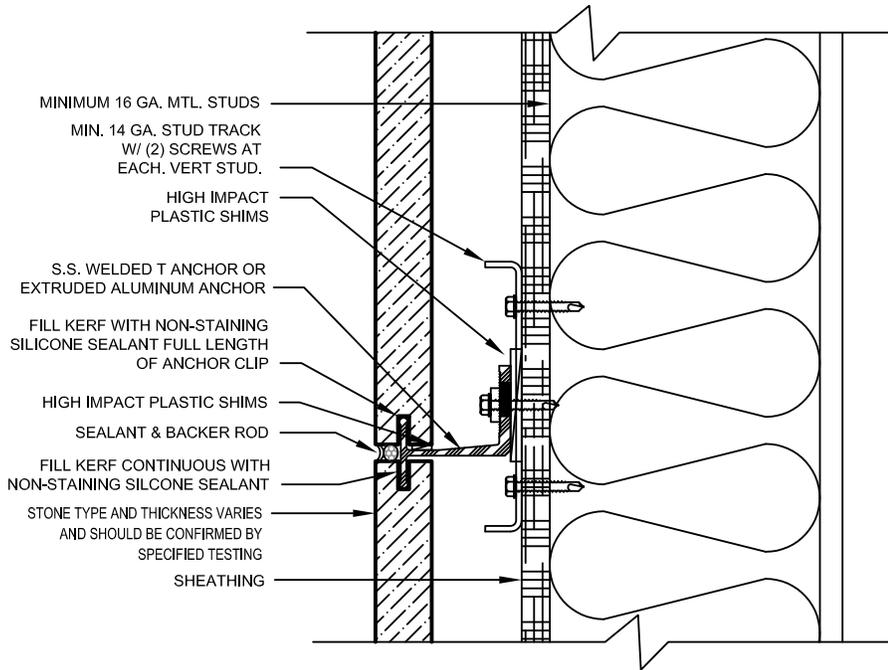
EXTERIOR STONE ATTACHMENT DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

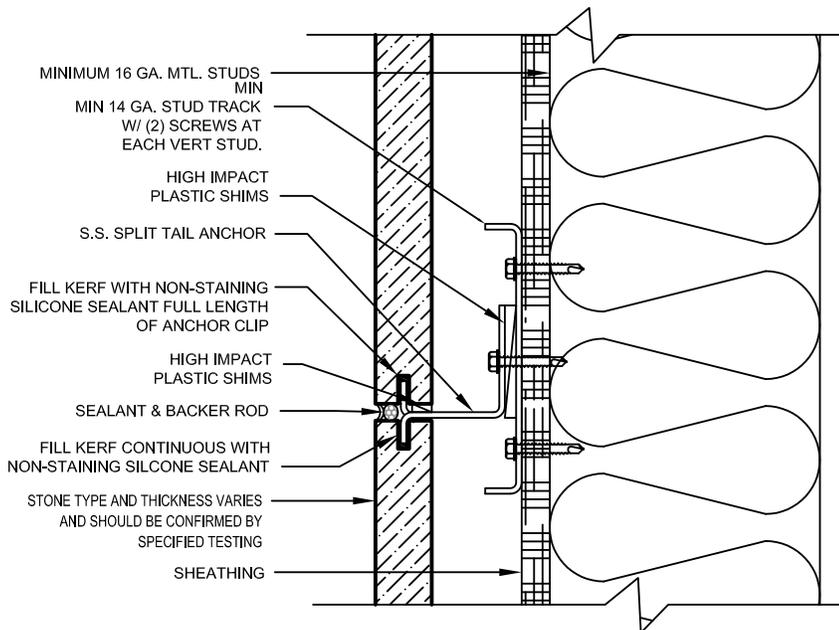
DRWG NO: 15-D-1

SCALE:
3" = 1'-0"

SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER



1 EXTRUDED ALUMINUM OR WELDED ST. STEEL "T" ON METAL STUD BACKUP



2 STAINLESS STEEL SPLIT-TAIL ANCHOR ON METAL STUD BACKUP



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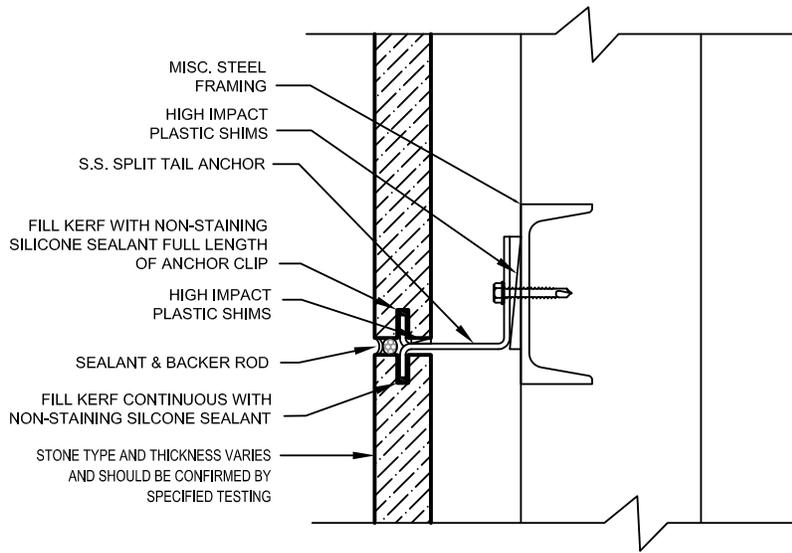
EXTERIOR STONE ATTACHMENT DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

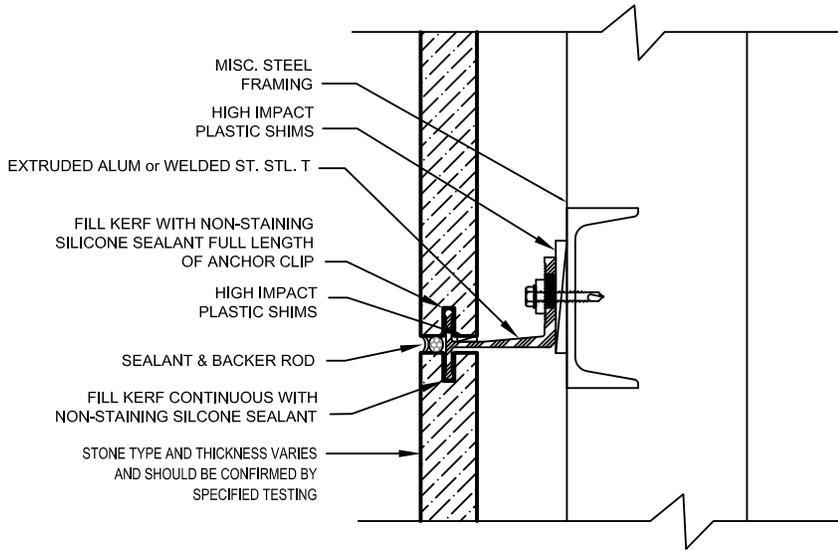
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SCALE:
3" = 1'-0"

SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER



1 STAINLESS STEEL SPLIT-TAIL ANCHOR ON MISC. METAL BACKUP



2 EXTRUDED ALUMINUM OR WELDED ST. STEEL "T" ON MISC. METAL BACKUP



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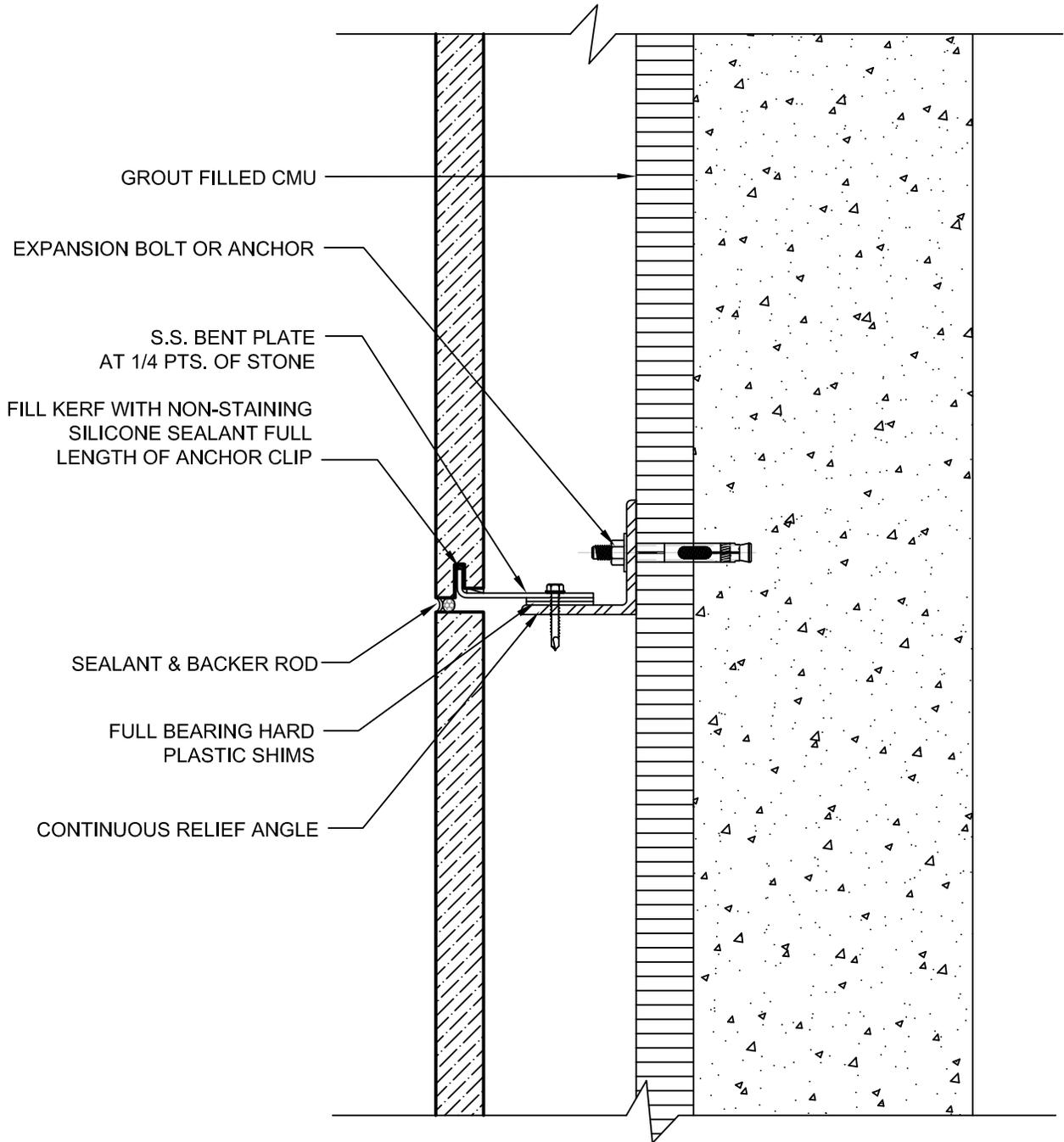
EXTERIOR STONE ATTACHMENT DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-3

SCALE:
3" = 1'-0"

SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER



1 RELIEF ANGLE CONNECTION ON CMU/CONCRETE BACKUP



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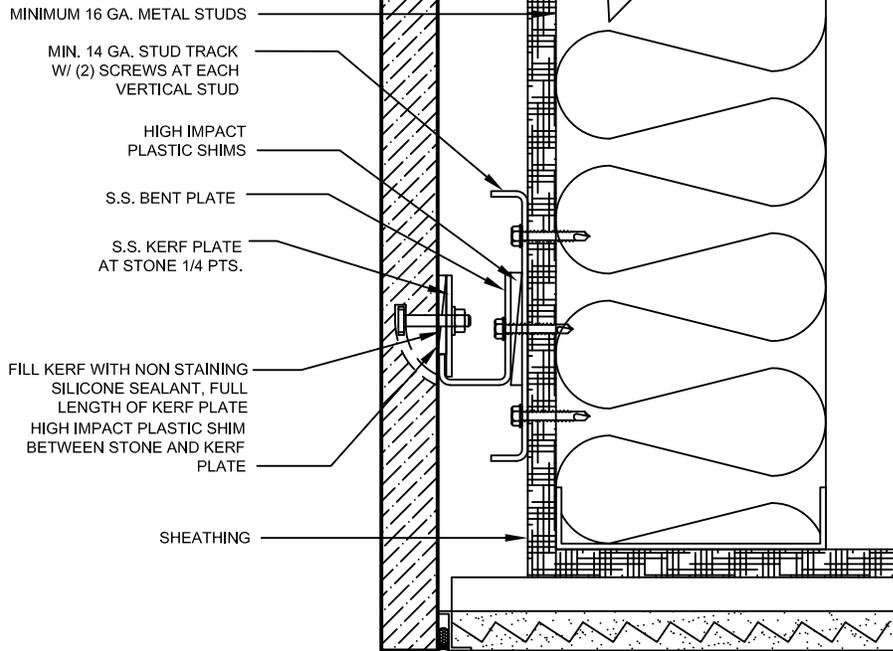
EXTERIOR STONE ATTACHMENT DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

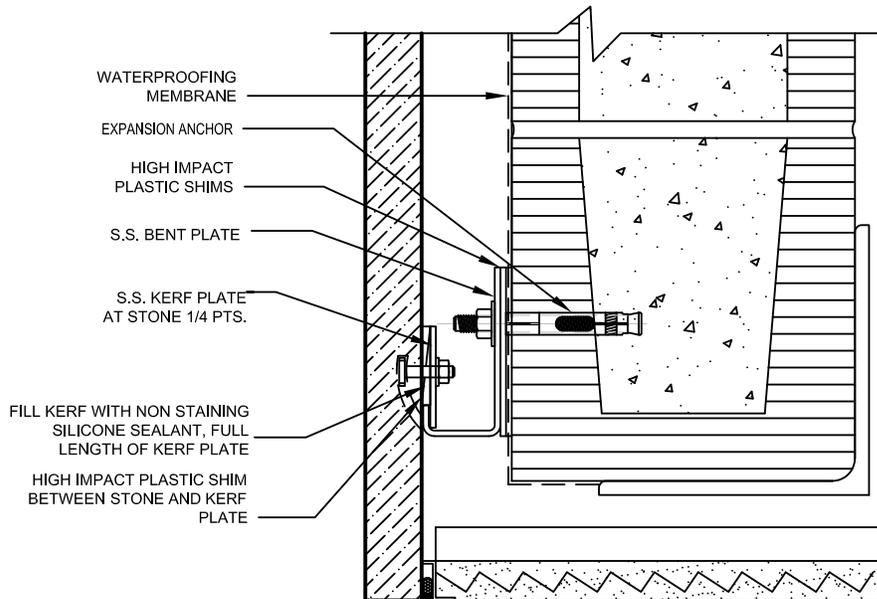
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SCALE:
3" = 1'-0"

SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER



1 BACK ANCHOR & ST. STL. CLIP FOR "BLIND" CONNECTION ON METAL STUDS



2 BACK ANCHOR & ST. STL. CLIP FOR "BLIND" CONNECTION ON CMU/COMCRETE



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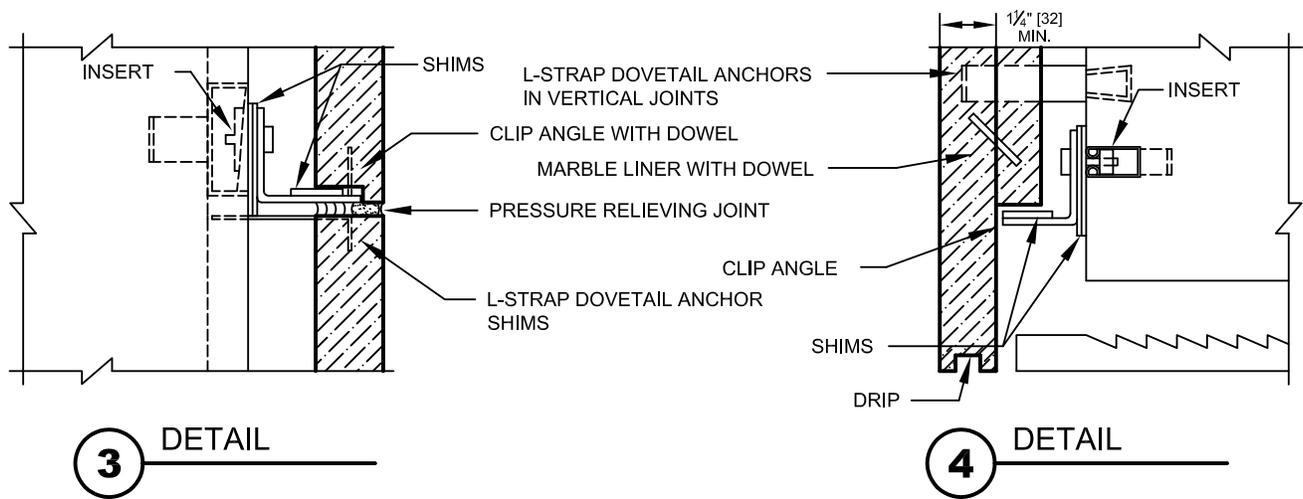
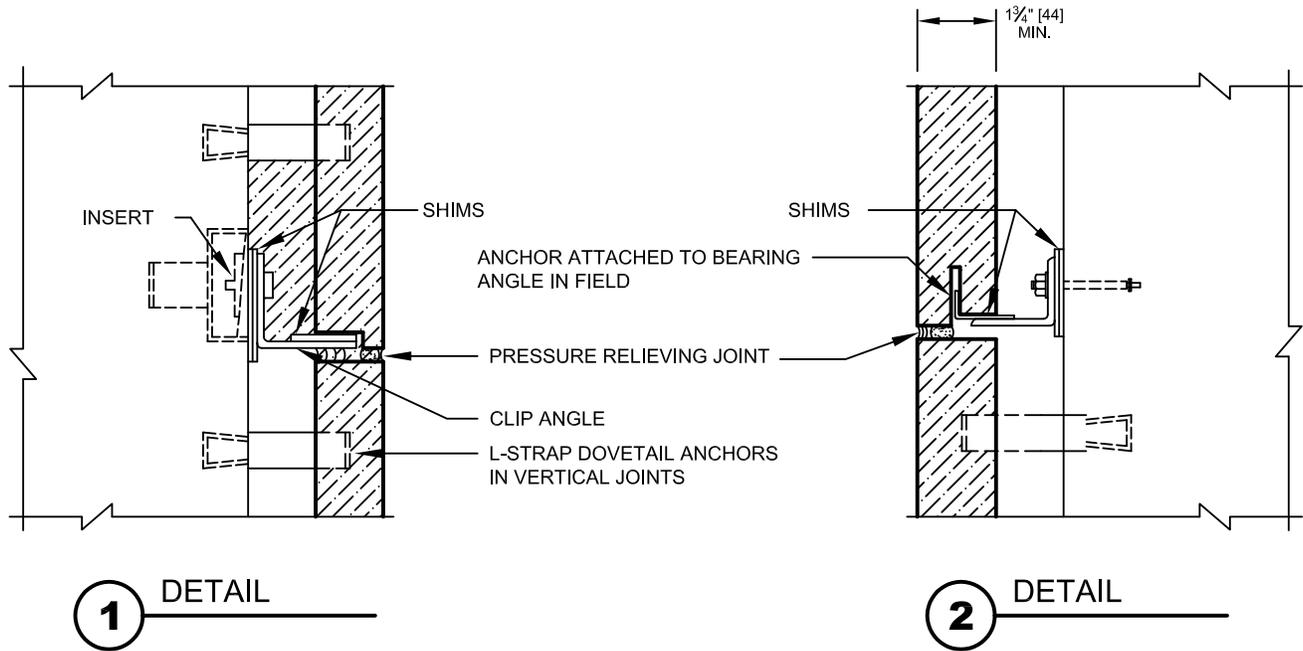
EXTERIOR STONE ATTACHMENT DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-5

SCALE:
3" = 1'-0"

SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER



NOTE: 1. ALLOW ADEQUATE SPACE FOR ANCHOR BOLT HEADS.
 2. NEVER ANCHOR THROUGH A PRESSURE RELIEVING JOINT.
 3. ALL METALS IN DIRECT CONTACT WITH THE STONE MUST BE STAINLESS STEEL.



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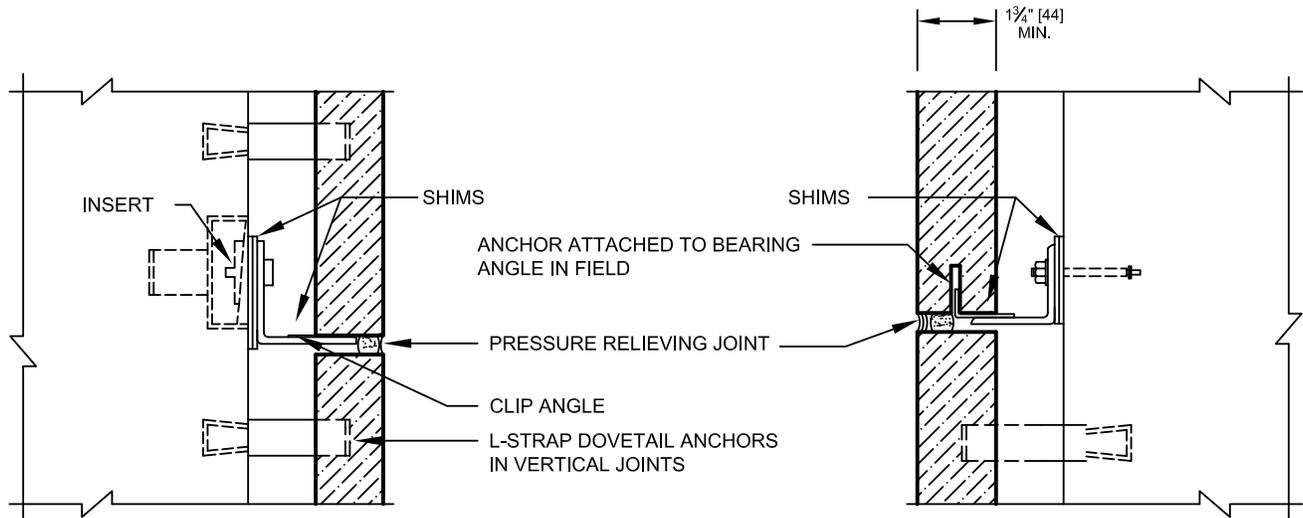
EXTERIOR STONE RELIEF DETAILS WITH REBATED BEARING

MIA DIMENSION STONE DESIGN MANUAL VII

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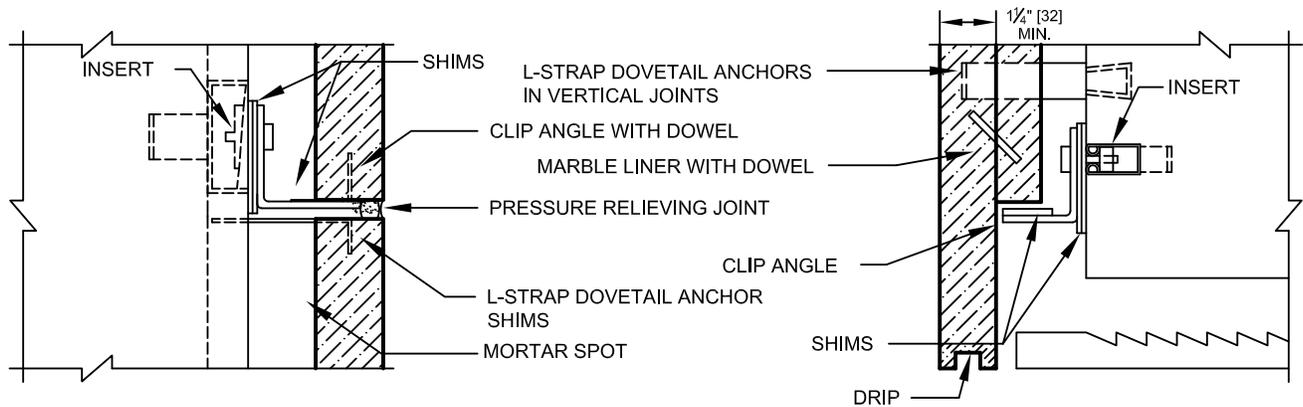
SCALE:
3" = 1'-0"

SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER



1 DETAIL

2 DETAIL



3 DETAIL

4 DETAIL

NOTE: 1. ALLOW ADEQUATE SPACE FOR ANCHOR BOLT HEADS.
 2. NEVER ANCHOR THROUGH A PRESSURE RELIEVING JOINT.
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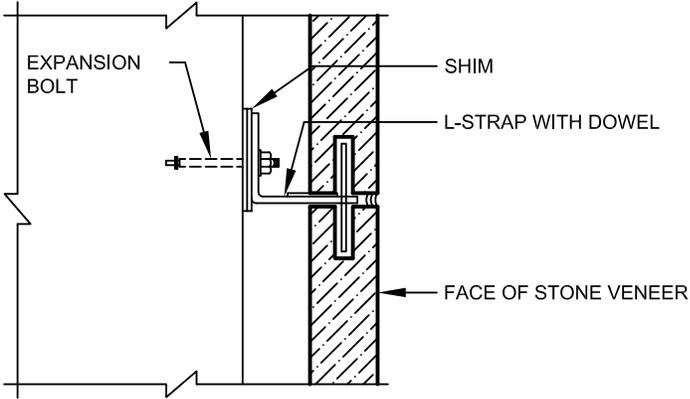
EXTERIOR STONE RELIEF DETAILS WITH NON- REBATED BEARING

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-7

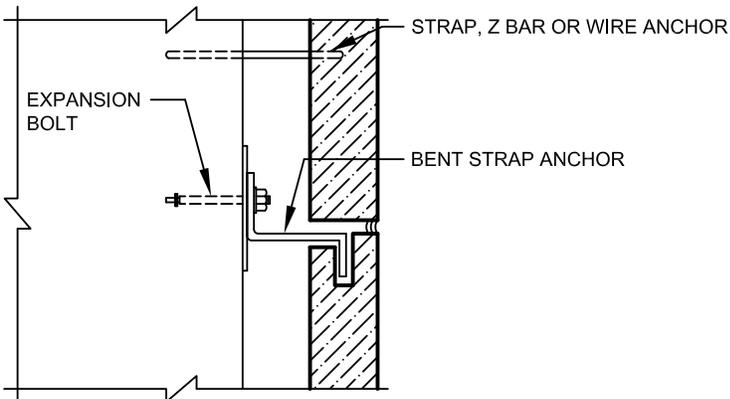
SCALE:
3" = 1'-0"

SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER

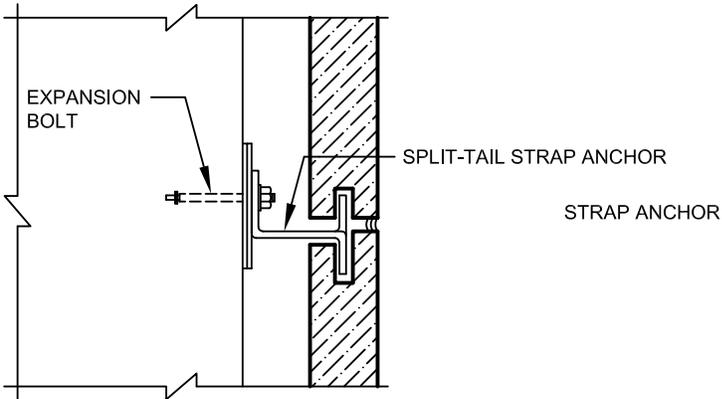


1 DETAIL

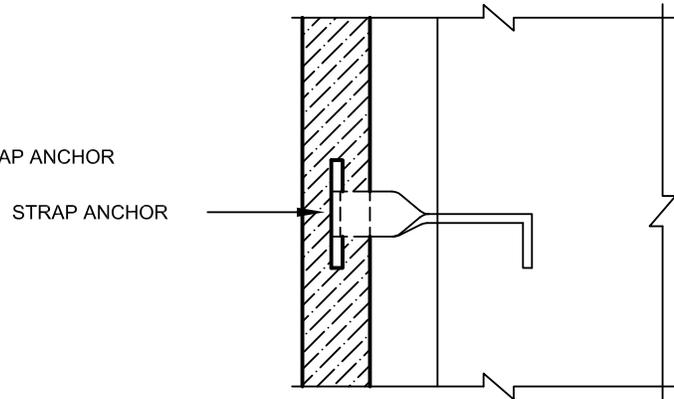
- NOTES:**
1. ALL METALS IN DIRECT CONTACT WITH STONE MUST BE STAINLESS STEEL.
 3. RECOMMENDED MINIMUM THICKNESS OF STONE VENEER FOR ANCHORAGE SHOWN IN DETAILS 7,8,9 & 12 VARIES.



2 DETAIL



3 DETAIL



4 DETAIL



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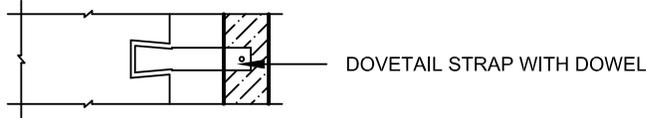
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EXTERIOR STONE VENEER RESTRAINT ANCHORAGE DETAILS

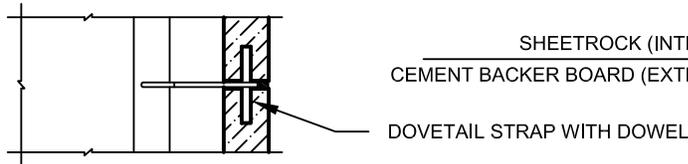
MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-8 SCALE:
3" = 1'-0"

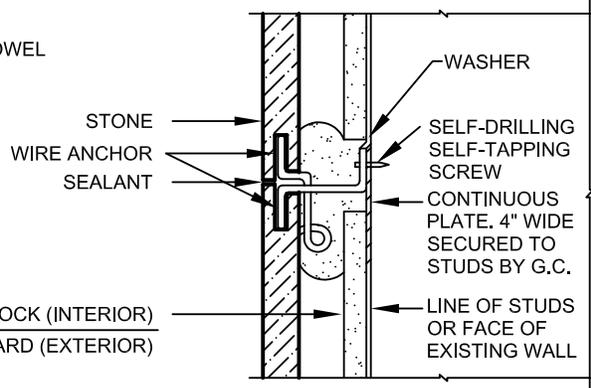
SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER



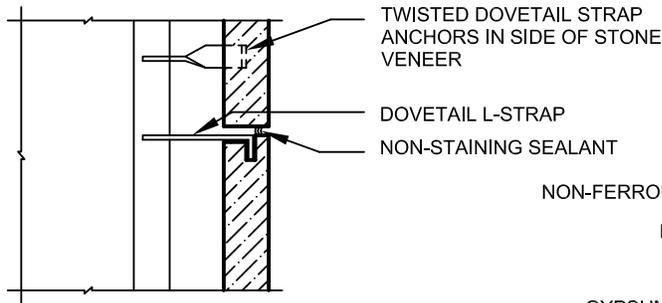
PLAN OF DETAIL 12



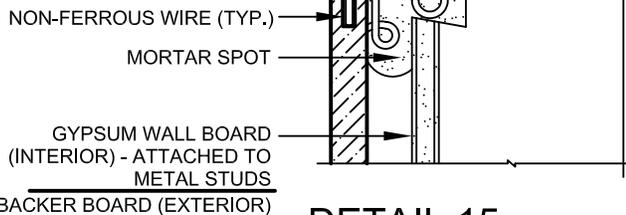
DETAIL 12



DETAIL 14



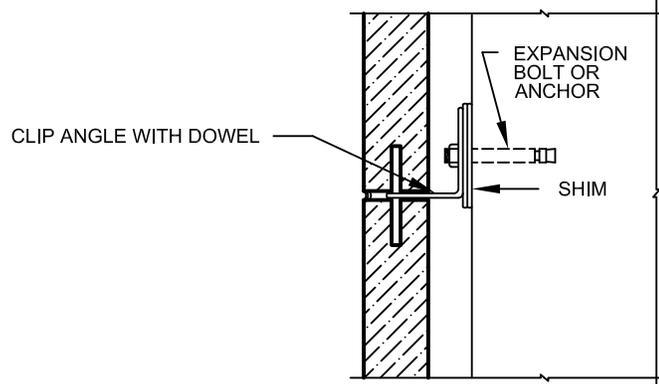
DETAIL 13



DETAIL 15

NOTES:

1. EXPANSION BOLTS SHOULD ONLY BE USED IN BRICK, CONCRETE, OR FILLED CORE CMU BACK-UP.
2. ALL METALS IN DIRECT CONTACT WITH STONE MUST BE STAINLESS STEEL.
3. ALLOW ADEQUATE SPACE FOR ANCHOR BOLT HEADS.



DETAIL 16



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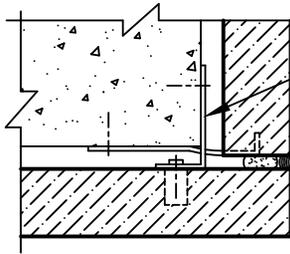
EXTERIOR STONE VENEER RESTRAINT ANCHORAGE DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-9

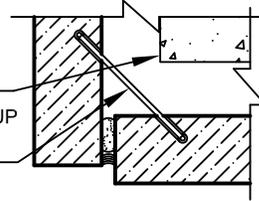
SCALE:
3" = 1'-0"

SUPPLEMENTAL INFORMATION VERTICAL SURFACES / EXTERIOR STONE VENEER



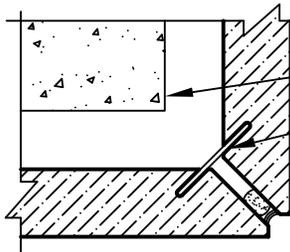
1 BUTT JOINT

BENT STRAP ANCHORED TO STONE VENEER WITH EXPANSION SHIELD & BOLT



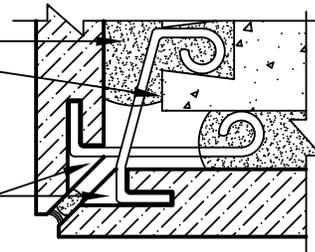
2 OFFSET BUTT JOINT

MASONRY OR CONCRETE BACK-UP
U BAR CRAMP IN HORIZONTAL JOINT



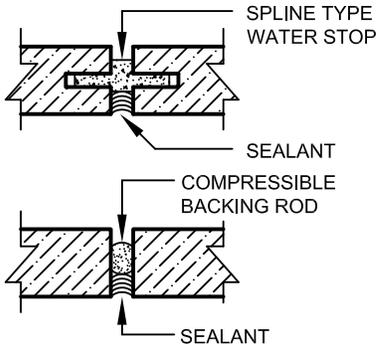
3 QUIRK MITER JOINT

MORTAR SPOTS
CONCRETE OR MASONRY BACK-UP
U BAR CRAMP IN HORIZONTAL JOINT



4 QUIRK MITER JOINT

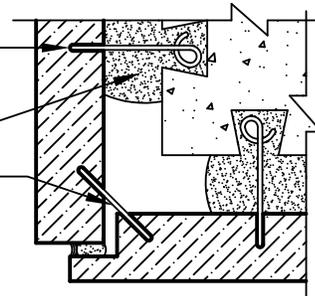
NON-FERROUS WIRE ANCHORS(TYP.)



5 TYPICAL EXPANSION JOINTS

NON-FERROUS WIRE (TYP.)

MORTAR SPOTS
U BAR CRAMP IN HORIZONTAL JOINT



6 RABBETED JOINT

NOTE: ALL METAL IN DIRECT CONTACT WITH THE STONE MUST BE STAINLESS STEEL.



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EXTERIOR STONE VENEER /TYPICAL CORNERS, EXPANSION JOINTS,REGLETS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-10

SCALE:
6" = 1'-0"