

Vertical Surfaces

An excerpt from the *Dimension Stone Design Manual*,
Version 7.2 (July 2011)



Setting the Standards for Natural Stone

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VERTICAL SURFACES - INSTALLATION NOTES

1.0 VERTICAL SURFACES INSTALLATION SYSTEMS

Vertical Stone Surfaces are installed with a variety of conventional and proprietary systems. A brief discussion of the more common types is below:

1.1 Independently Supported Veneer

1.1.1 Each stone panel is independently supported (relieved and restrained) by mechanical anchorage attached to the back up wall substrate (building structure, masonry backup, stud framing assembly, miscellaneous steel and etc.).

1.1.2 The stone panels and associated anchorage are designed to accommodate vertical loads (stone unit self weight) and lateral loads (wind and seismic forces) as required by governing codes and/or project specifications. Each of these loads is transferred directly to the back up wall substrate through the stone anchorage. Joints between each stone are designed to accommodate thermal expansion and differential movement between stone units, and therefore, must remain free of shims, mortar, or any other rigid material that would transfer load from one stone to another. The joints are typically filled with a non-staining sealant that possesses compressive and tensile capacities adequate to meet the performance requirements for the project. A minimum joint width of 3/8" is recommended for exterior stone veneer. Larger joints may be required to accommodate specific project demands. Note: This system can also be installed as a rainscreen or open-joint façade omitting joint sealant between stone veneer units.

1.2 "Stacked" Veneer With Relieving Supports

1.2.1 Restraint and relief are achieved by using a combination of lateral ties (straps, split-tail anchors, welded tees, or other positively engaged mechanical anchorage approved by a qualified design professional) and gravity relief supports.

1.2.2 Each stone panel is restrained by mechanical anchorage attached to the back up wall substrate (building structure, masonry backup, stud framing assembly, miscellaneous steel, and etc.). The stone panels and associated anchorage are designed to accommodate lateral loads only (wind and seismic forces) as required by governing codes and/or project specifications. These loads are transferred directly to the back up wall substrate through the stone anchorage. Relieving supports (i.e., continuous angles or clips) are designed to accommodate the cumulative vertical load of the stone veneer units "stacked" between the relief support and expansion or control joint above, typically a live load joint at a floor/slab line. Relief supports are typically provided over all openings and at each story height (or maximum vertical spacing of 20'). Within a "stack", vertical loads are typically transferred from one stone to another using load-bearing shims or mortar. The joints are typically filled with a non-staining sealant or mortar adequate to meet the performance requirements for the project.

1.2.3 Consideration of weeps and flashing is recommended when continuous relief angles are utilized.

1.3 Adhered Installation

1.3.1 Thin Stone. Adhered installation is to be used for thin stone only (1/4" to 1/2" thickness) of heights not exceeding 15'-0" (4.5 m).

1.3.2 Units shall not exceed 36 inches (914 mm) in the greatest dimension nor more than 720 square inches (0.46 m²) in total area and shall not weigh more than 15 pounds per

square foot (73 kg/m²) unless approved by the local governing officials and the engineer of record.

1.3.3 Thin-Set Mortar [Thin Bed (ANSI A118.1)]. See Chapter 13, section 3.1.2.

1.3.4 Latex-Portland Cement Mortar [Thin Bed (ANSI A118.4)]. See Chapter 13, section 3.1.3.

1.3.5 Epoxy Mortar (ANSI A118.3). See Chapter 13, section 3.1.4.

1.3.6 Limestone Setting Mortar. See Chapter 13, section 3.1.5.

1.3.7 Setting Bed. White portland cement with low alkali content is required for all light colored stone varieties.

1.3.8 Petroleum-based organic adhesives should be avoided because they may stain the stone.

1.3.9 Recommended substrate materials are masonry and cementitious backer board.

1.3.10 Exterior Vertical Surfaces. When adhesive installation methods are used for exterior vertical surfaces, the stone shall be back buttered to achieve, as close as practical, 100% adhesive contact between the stone and the backup. Remove freshly installed tiles periodically during installation to verify adhesion level.

1.3.11 When thin stone tiles are installed on exterior vertical surfaces, they are fully reliant upon the backup and substrate for performance. Use of unstable backup materials should be avoided.

1.3.12 Substrates to receive adhered veneer using thin-set adhesive methods shall be held to a tolerance of 1/8" variation in 10'-0".

1.4 Other systems include a variety of prefabricated and proprietary systems commonly known as:

1.4.1 "Grid" systems, commonly composed of vertical and horizontal support framing of varying corrosion-resistant materials, such as aluminum, mild steel, cold-formed steel, or stainless steel. The framing is typically pre-installed in the stone setting cavity to the substrate or support wall. Stone supports are typically integrated in the system design.

1.4.2 "Strut" systems are commonly composed of vertical support framing of varying corrosion-resistant materials such as aluminum, mild steel, cold-formed steel or stainless steel. The framing is typically pre-installed in the stone setting cavity to the substrate or support wall. Non-integrated stone supports are typically attached in a method similar to Independently Supported Veneer or "Stacked" Veneer with Relieving Supports.

1.4.3 Integrated Stone Curtain Wall. Stone veneer installed in glazing channels of glazed curtain wall members, in similar manner to metal spandrel panels or stone veneer installed in structurally glazed curtain walls, in a similar manner to glass.

1.4.4 Panelized dimension stone cladding, which may include independently supported veneer, "stacked" veneer with relieving supports, adhered veneer, or a combination of these methods. This is also known as a truss system.

1.5 Consideration should be given to the various features of each system in making a selection for a specific installation. See detailed illustrations of examples at the close of this section.

1.6 Venting of Exterior Stone Veneers

1.6.1 Existing Methods. The existing methods of installing exterior thin stone veneer have evolved through the years. For the most part, the standards were developed when the joints were filled with portland cement mortar and the building interiors were not temperature- and humidity-controlled.

1.6.2 Additional Techniques. With today's improved construction techniques, it is possible to produce structures that are highly resistant to natural weather conditions. Joints can be sealed with resilient sealants and the building interior can be temperature- and humidity-controlled. Venting of the cavity is recommended to prevent moisture problems. It is recommended that a vapor barrier be installed at the exterior face of the backup wall. The back face of the stone should not be sealed.

1.6.3 Veneer Cavities. Solid grouting of stone veneer cavities that would permit passage of moisture through the wall from exterior to interior, and interior to exterior, is inadvisable. Windblown rain would be forced through the wall, and water vapor would move from exterior to interior and reverse, forced by the temperature and humidity differentials from outside to inside.

1.7 Relieving Supports

1.7.1.1 Relieving angles should be provided over all openings and at each story height (or maximum vertical spacing of 20'). Angles should have ¼" weep holes every 2'. When stone liners are used, they are fastened by stainless steel dowels and epoxy to the back of the finished stone facing and are supported on these angles. Refer to local codes for variance

2.0 RELATED COMPONENTS

2.1 Mechanical Anchors, Exterior and Interior

2.1.1 Anchor Size. Anchor sizing is dependent upon materials, codes, and physical conditions of the structure. Anchors should be engineered separately for each.

2.1.2 Anchor Placement. Under typical conditions, standard practice provides for a minimum of 4 anchors per piece of stone up to 12 sq ft of surface area, and 2 anchors for each additional 8 sq ft. Weight, size, shape, and type of stone may dictate deviations from the foregoing. IBC currently prescribes minimum anchorage quantities for non-engineered "stone veneer" and "slab type veneer" based on the surface area of the stone panels. Due to varying loads, stone properties, and anchor capacities, this may not necessarily be adequate, particularly when public or occupant safety may be compromised. It is recommended that exterior stone cladding systems be reviewed by an experienced stone cladding engineer to verify anchor and panel capacities. In all cases, anchorage shall be compliant with the project specifications, requirements of the engineer of record, and/or applicable codes.

2.1.3 Anchor Types. Anchors shall be of non-staining, corrosion resistant metals. Stainless steel, aluminum, bronze, and brass wire and straps, and copper wire are preferred for their corrosion resistance. (See illustrations of typical anchors and accessories at the close of this chapter). In exterior cladding systems, stainless steel (series 304) is the most common. Copper is commonly limited to interior applications.

2.1.3.1 Copper Wire Tie Anchorage is a historically effective method of anchoring stone panels, but is to be used within the following limitations:

2.1.3.1.1 Wire anchors are not generally recommended for installations exceeding 15'-0" vertically.

2.1.3.1.2 Stainless steel wire is recommended in lieu of copper wire for exterior or wet area

interior applications. “Spot” material used in conjunction with wire anchors in exterior or wet areas shall be of a portland cement based compound. Setting plaster, moulding plaster, or other gypsum based products are not adequate products for this purpose.

2.1.3.1.3 When copper wire is used, it is common in some geographical regions to twist the wire to stiffen the wire via metallurgical work hardening. Excessive work hardening of the wire can lead to embitterment of the metal. Care must be taken to ensure that the physical properties of the wire have been improved and not degraded by this process.

2.1.4 Thin Stone. Natural stone in thicknesses of less than $\frac{3}{4}$ " (20 mm) are not usually capable of receiving mechanical anchors and can only be used with adhesive attachment.

2.1.5 Technical Information. Every construction condition requires engineering based on specific factors for each project—panel weight, wind and seismic loads, backup material, stone compressive and flexural properties, etc. The most stringent building code always takes precedence. Contact the engineer or manufacturer of each anchoring system for its particular technical information and engineering formulas.

2.1.5.1 Grout. When using adhesion installation methods, grout joints shall be a minimum of $\frac{1}{4}$ " wide. Apply grout to full depth of stone. Avoid use of “designer grouts” on exterior or in wet areas, as these grouts tend to be soft and very absorbent.

2.1.5.1.1 Limestone and Light-Colored Stones. Wherever limestone, or white and light-colored marble or granite are to be installed, it is important to use only white portland cement, white thin-set mortar, or white-colored adhesive to adhere the stone to the backup, or for setting anchors. It is normal for the setting spots to darken the

stone at the face. The dark coloring should disappear as the setting material cures and excess moisture is ventilated from the cavity. (This process has been known to take up to 8 months). Prior to installing any stone the Setter is not experienced with, the setting material should always be applied to a test scrap stone and allowed to cure thoroughly to make sure that the stone will not be permanently stained.

2.2 Shims. 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.

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

2.2.2 Shims used in joints of “stacked” veneer systems remain in the joint permanently to transfer load from course to course. Shims may be used to temporarily maintain joint width in other joint conditions but are to be removed prior to application of joint filler material.

2.3 Sealant: 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.

2.4 Metal Studs. Metal studs placed behind stone wall installations to hold the wall should be 16 gauge or heavier.

2.4.1 Lateral channels are frequently required to facilitate attachment locations and also to distribute loads over multiple studs.

2.4.2 Where studs exceed 8'-0" in height, it may be necessary to relieve the weight at a maximum of 8'-0" intervals.

2.4.3 Walls and partitions constructed of metal studs should be designed to maximum deflection of L/720 for conditions utilizing thick-set or thin-set mortar installation methods.

2.5 Joint Size. Typical joint widths are:

2.5.1 Exterior Stone Cladding: Minimum ¼", preferably 3/8". Joints of ½" or larger are frequently required for large unit size installation.

2.5.2 Interior Stone Cladding: Minimum 1/16", preferably 1/8". Joints of ¼" or larger are frequently required for large unit size installation.

2.5.3 IN NO CASE SHALL TIGHT or "HAND-BUTTED" JOINTERY BE USED.

2.6 Lippage. On smooth surface stones, lippage should be limited to ±1/16".

2.6.1 Allowable lippage is an installation tolerance, and is additive to the inherent warpage of the stone unit.

2.6.2 This lippage may not be attainable in flamed, cleft, or otherwise textured finishes. In those installations, joint width should be increased to limit perceived lippage, and in some cases joints as wide as ¾" may be required.

2.6.3 This lippage may not be achievable in extremely large format stone pavers, in which case larger than typical joint widths are recommended to minimize perceived lippage.

2.7 Exposed stone edges must be gauged to the precise thickness specified.

2.8 Physical Property Values. Final design should always be based on specific physical property values obtained by ASTM test methods for the stone and attachment method systems to be used.

NOTES:

EXTERIOR STONE VENEER

1.0 INTRODUCTION

1.1 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.

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

1.3 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.

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

2.0 RELATED COMPONENTS

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

2.2 Joint Fillers. When using adhesion installation methods, grout joints shall be a minimum of ¼" 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.

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

2.4 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.

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

2.5 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.

2.6 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.

3.0 HYSTERESIS

3.1 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.

DATA SHEET

4.0 EXTERIOR STONE VENEER - PRODUCT DESCRIPTION

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

4.1.1 Thickness Limitations for Mechanically Attached Systems. As a general rule, stone panel thickness should be a minimum of 1¼". 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.

4.1.2 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.

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

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

4.1.5 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 quarrier of the material prior to finalizing the design.

5.0 TECHNICAL DATA

5.1 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:

5.1.1 Granite: ASTM C615 Standard Specification for Granite Dimension Stone

5.1.2 Limestone: ASTM C568 Standard Specification for Limestone Dimension Stone

5.1.3 Marble: ASTM C503 Standard Specification for Marble Dimension Stone (Soundness Classifications A and B only)

5.1.4 Quartz-based Stone: ASTM C616 Standard Specification for Quartz-based Dimension Stone

5.1.5 Serpentine: ASTM C1526 Standard Specification for Serpentine Dimension Stone

5.1.6 Slate: ASTM C629 Standard Specification for Slate Dimension Stone

5.1.7 Soapstone: No ASTM Standard exists at this time.

5.1.8 Travertine: ASTM C1527 Standard Specification for Travertine Dimension Stone

6.0 ENGINEERING

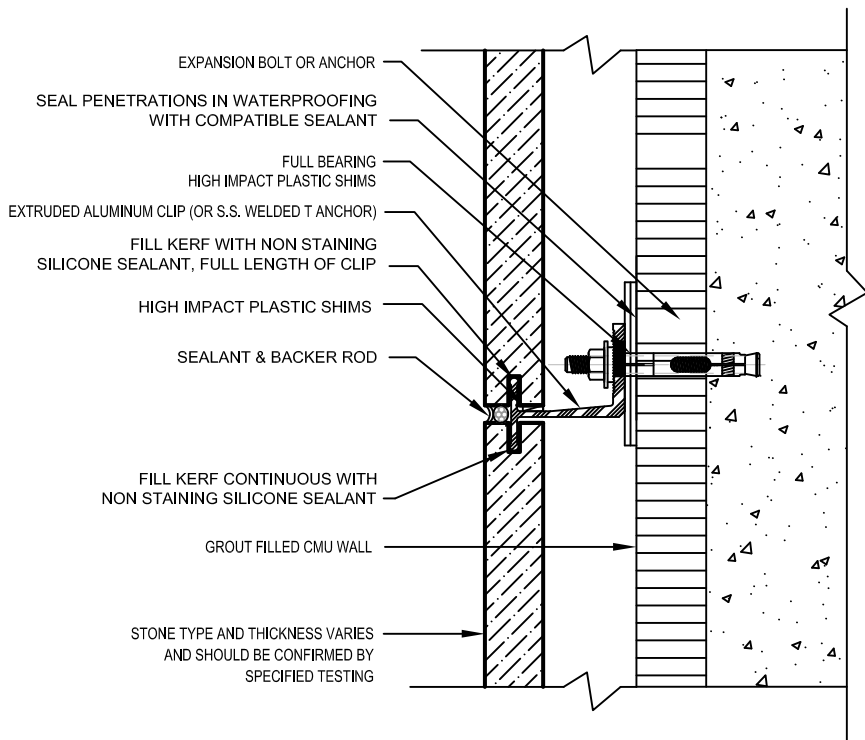
6.1 A knowledgeable and experienced Installer must provide an engineered and fabricated system that will satisfy functional and aesthetic requirements. However, determining which performance requirements and the criteria under each must be made by the Specifying Authority in consultation with the Structural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

7.0 GENERAL PRECAUTION:

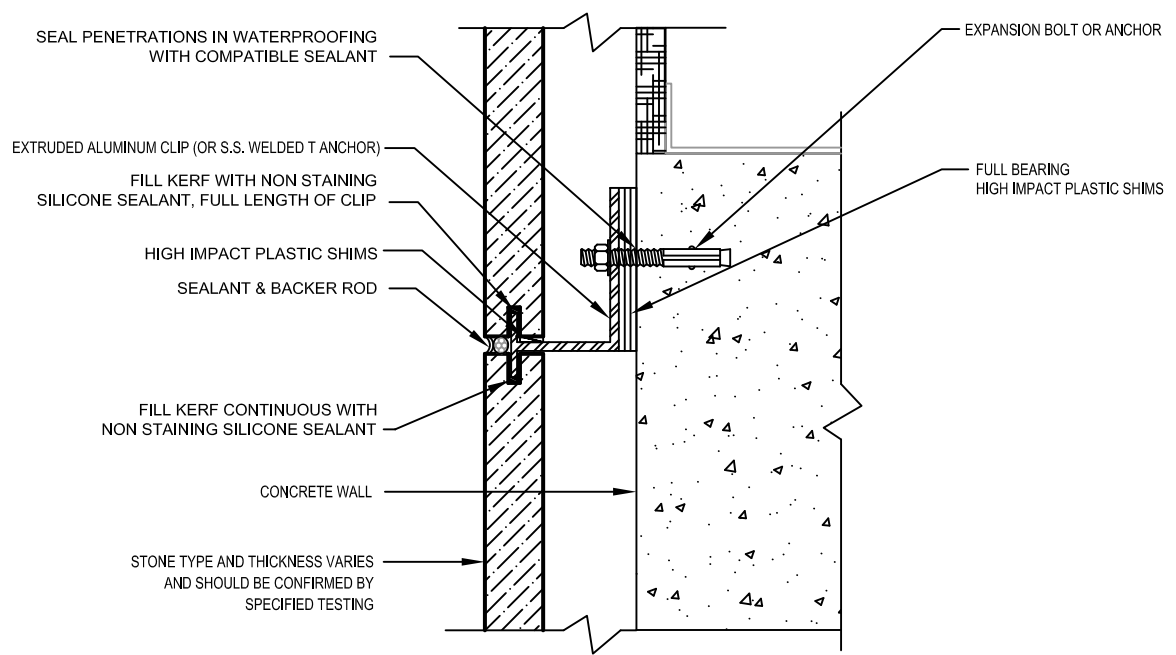
7.1 During construction, the General Contractor shall protect all stone from staining and damage.

7.2 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.


NOTES:



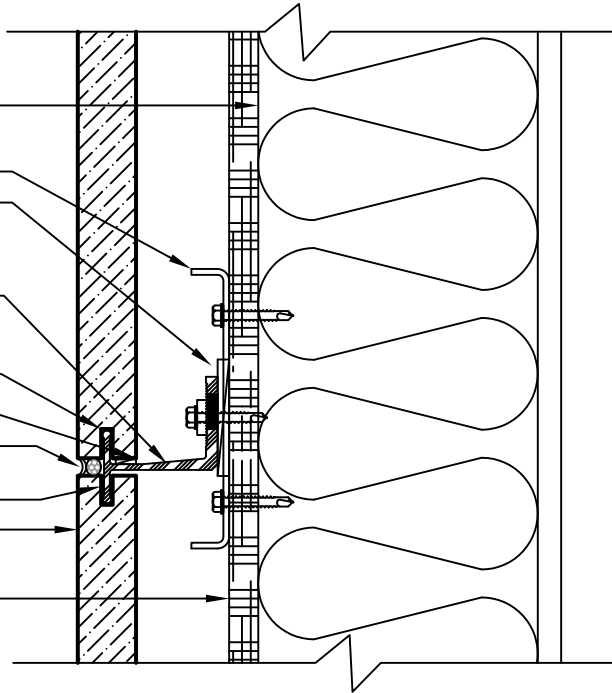
1 EXTRUDED ALUMINUM OR WELDED STAINLESS STEEL "T" ON CMU BACKUP



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

 <p>MARBLE INSTITUTE of America</p>	MARBLE INSTITUTE of AMERICA 28901 Clemens Road - Suite 100 Cleveland, OH 44145 Tel: (440) 250-9222 Fax: (440) 250-9223 www.marble-institute.com		REV DATE 0 Aug 2006 1 Oct 2006	EXTERIOR STONE ATTACHMENT DETAILS MIA DIMENSION STONE DESIGN MANUAL VII	DRWG NO: 15-D-1 SCALE: 3" = 1'-0"

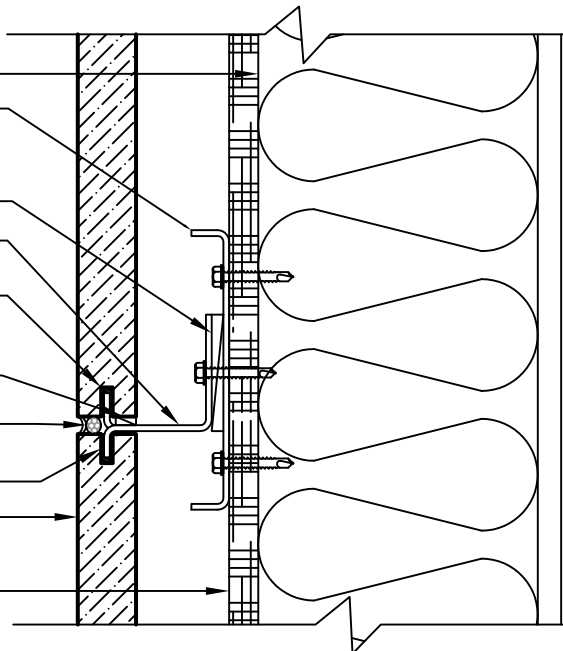
MINIMUM 16 GA. MTL. STUDS
 MIN. 14 GA. STUD TRACK
 W/ (2) SCREWS AT
 EACH. VERT. STUD.
 HIGH IMPACT
 PLASTIC SHIMS
 S.S. WELDED T ANCHOR OR
 EXTRUDED ALUMINUM ANCHOR
 FILL KERF WITH NON-STAINING
 SILICONE SEALANT FULL LENGTH
 OF ANCHOR CLIP
 HIGH IMPACT PLASTIC SHIMS
 SEALANT & BACKER ROD
 FILL KERF CONTINUOUS WITH
 NON-STAINING SILICONE SEALANT
 STONE TYPE AND THICKNESS VARIES
 AND SHOULD BE CONFIRMED BY
 SPECIFIED TESTING
 SHEATHING



1

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

MINIMUM 16 GA. MTL. STUDS
 MIN
 MIN 14 GA. STUD TRACK
 W/ (2) SCREWS AT
 EACH VERT. STUD.
 HIGH IMPACT
 PLASTIC SHIMS
 S.S. SPLIT TAIL ANCHOR
 FILL KERF WITH NON-STAINING
 SILICONE SEALANT FULL LENGTH
 OF ANCHOR CLIP
 HIGH IMPACT
 PLASTIC SHIMS
 SEALANT & BACKER ROD
 FILL KERF CONTINUOUS WITH
 NON-STAINING SILICONE SEALANT
 STONE TYPE AND THICKNESS VARIES
 AND SHOULD BE CONFIRMED BY
 SPECIFIED TESTING
 SHEATHING



2

STAINLESS STEEL SPLIT-TAIL ANCHOR ON METAL STUD BACKUP



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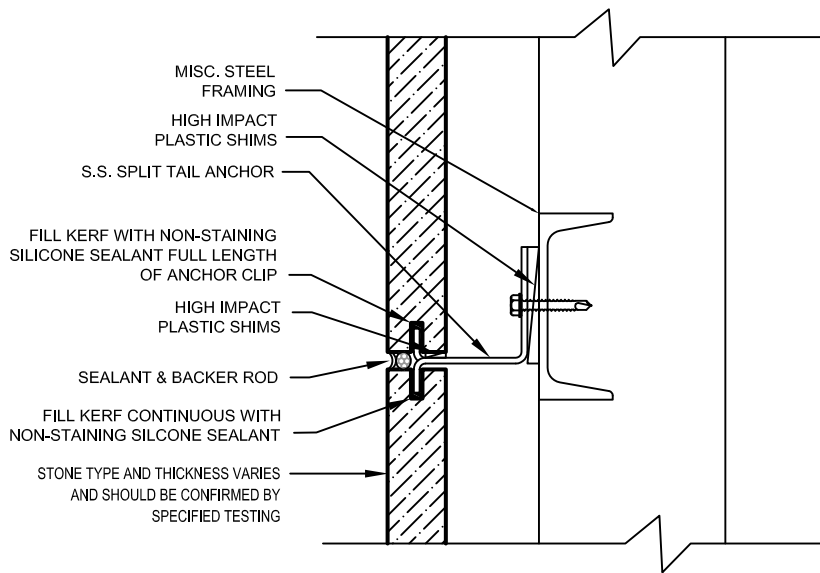
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**EXTERIOR STONE ATTACHMENT
DETAILS**

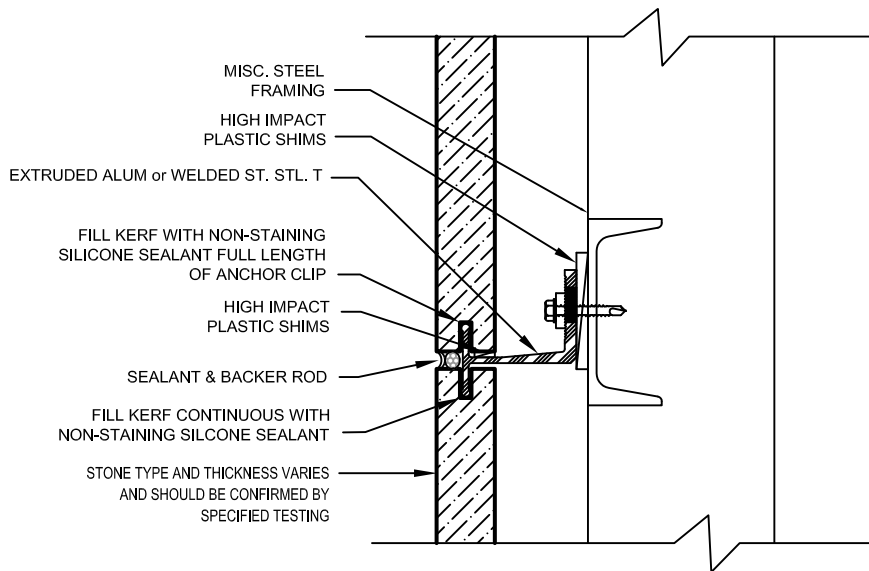
MIA DIMENSION STONE DESIGN MANUAL VII

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SCALE:
3" = 1'-0"



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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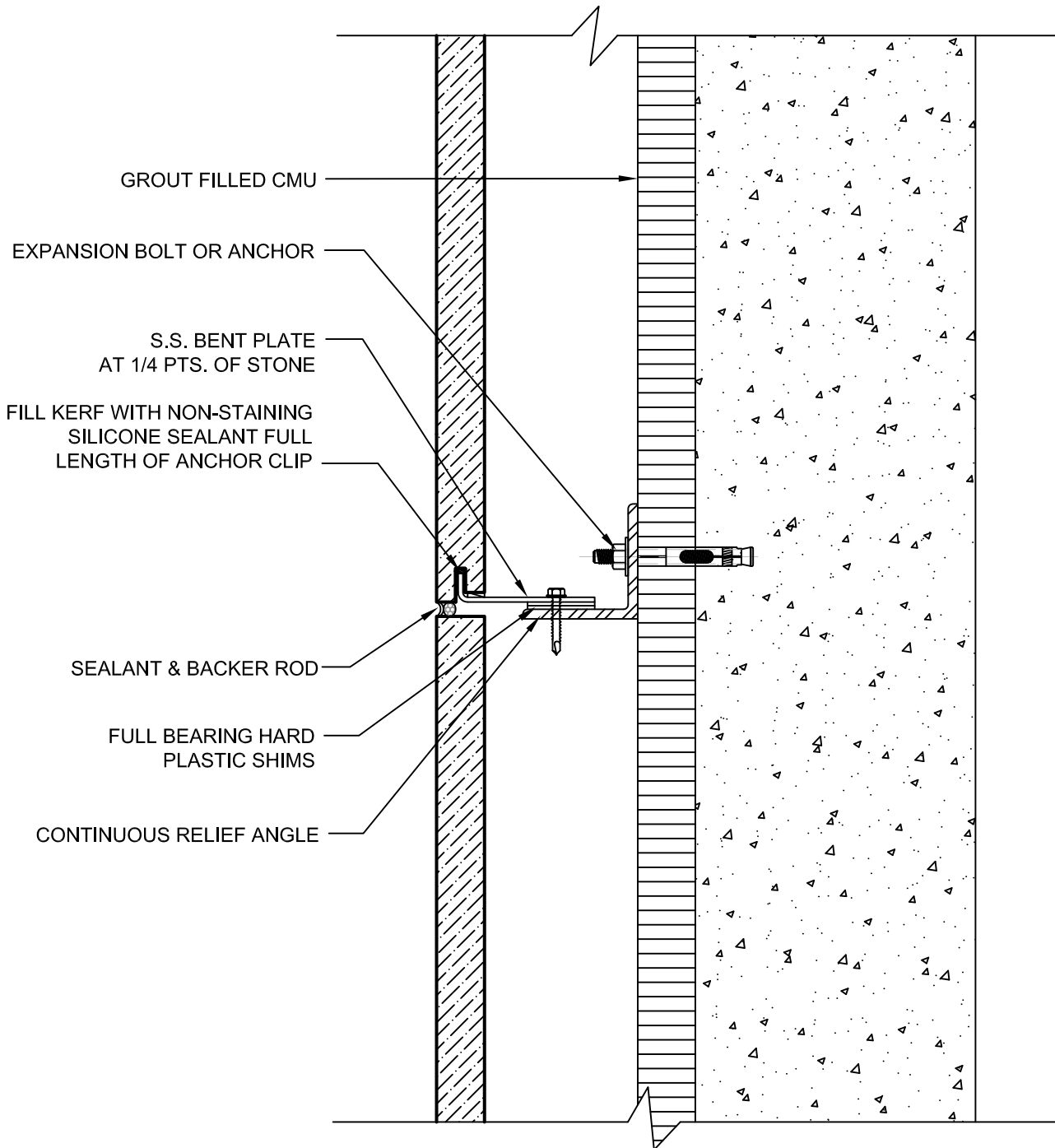
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EXTERIOR STONE ATTACHMENT
 DETAILS

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SCALE:
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1 RELIEF ANGLE CONNECTION ON CMU/CONCRETE BACKUP



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EXTERIOR STONE ATTACHMENT DETAILS

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DRWG NO: 15-D-4

SCALE:
 3" = 1'-0"

MINIMUM 16 GA. METAL STUDS

MIN. 14 GA. STUD TRACK
W/ (2) SCREWS AT EACH
VERTICAL STUD

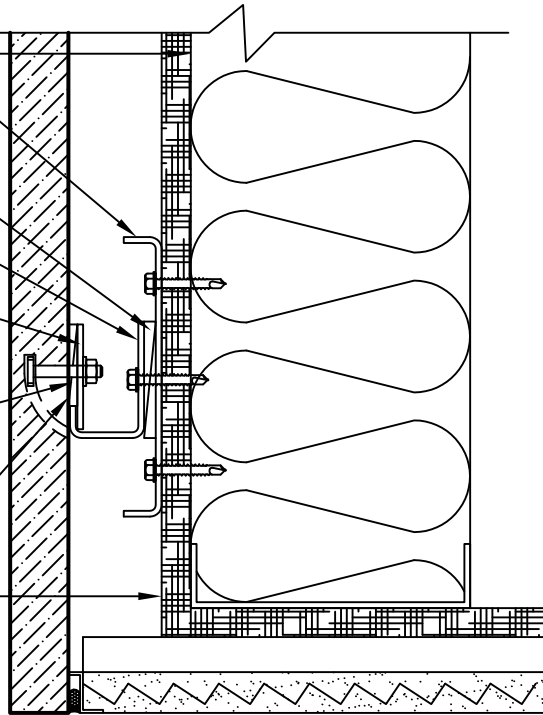
HIGH IMPACT
PLASTIC SHIMS

S.S. BENT PLATE

S.S. KERF PLATE
AT STONE 1/4 PTS.

FILL KERF WITH NON STAINING
SILICONE SEALANT, FULL
LENGTH OF KERF PLATE
HIGH IMPACT PLASTIC SHIM
BETWEEN STONE AND KERF
PLATE

SHEATHING



1

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

WATERPROOFING
MEMBRANE

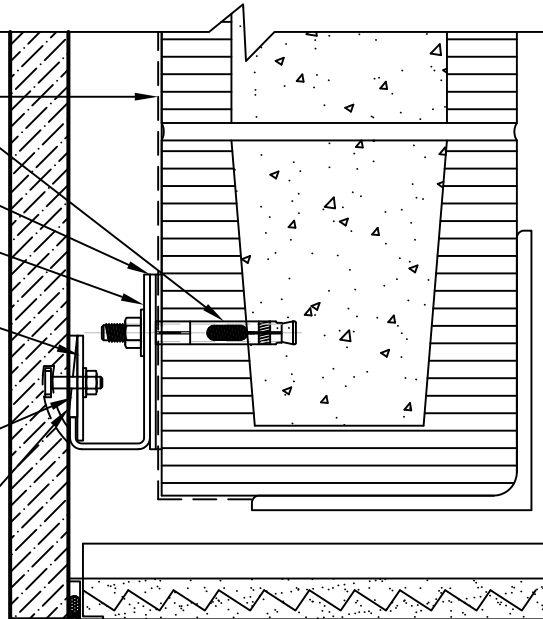
EXPANSION ANCHOR

HIGH IMPACT
PLASTIC SHIMS

S.S. BENT PLATE

S.S. KERF PLATE
AT STONE 1/4 PTS.

FILL KERF WITH NON STAINING
SILICONE SEALANT, FULL
LENGTH OF KERF PLATE
HIGH IMPACT PLASTIC SHIM
BETWEEN STONE AND KERF
PLATE



2

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



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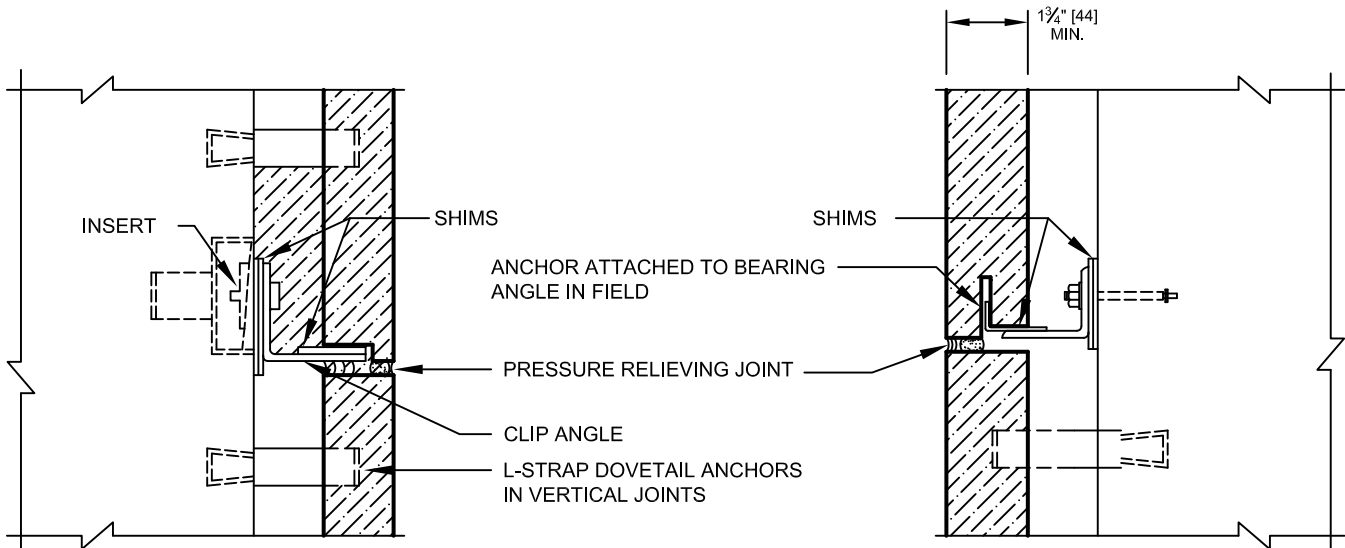
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EXTERIOR STONE ATTACHMENT
DETAILS

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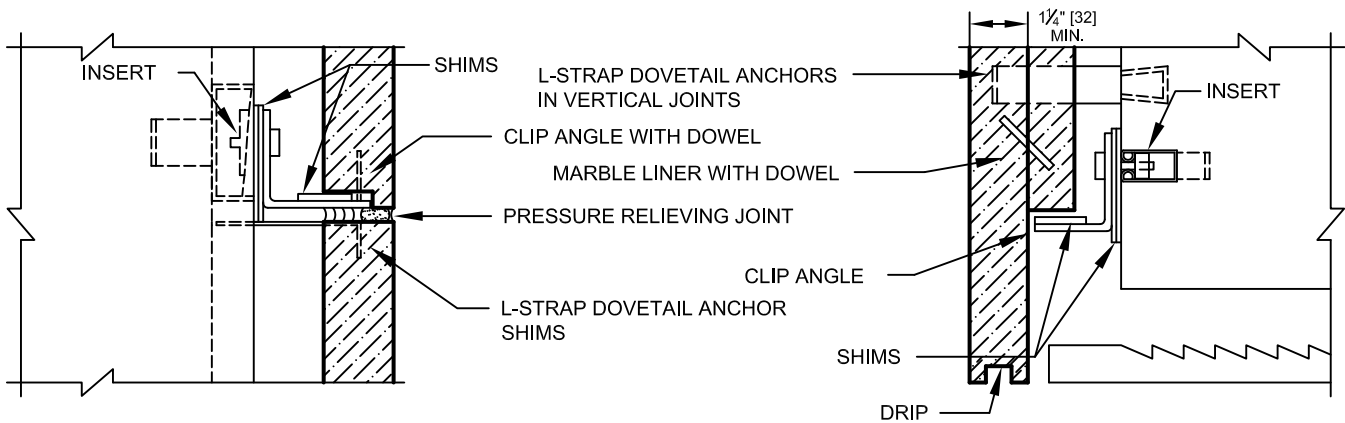
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SCALE:
3" = 1'-0"



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.
 3. ALL METALS IN DIRECT CONTACT WITH THE STONE MUST BE STAINLESS STEEL.



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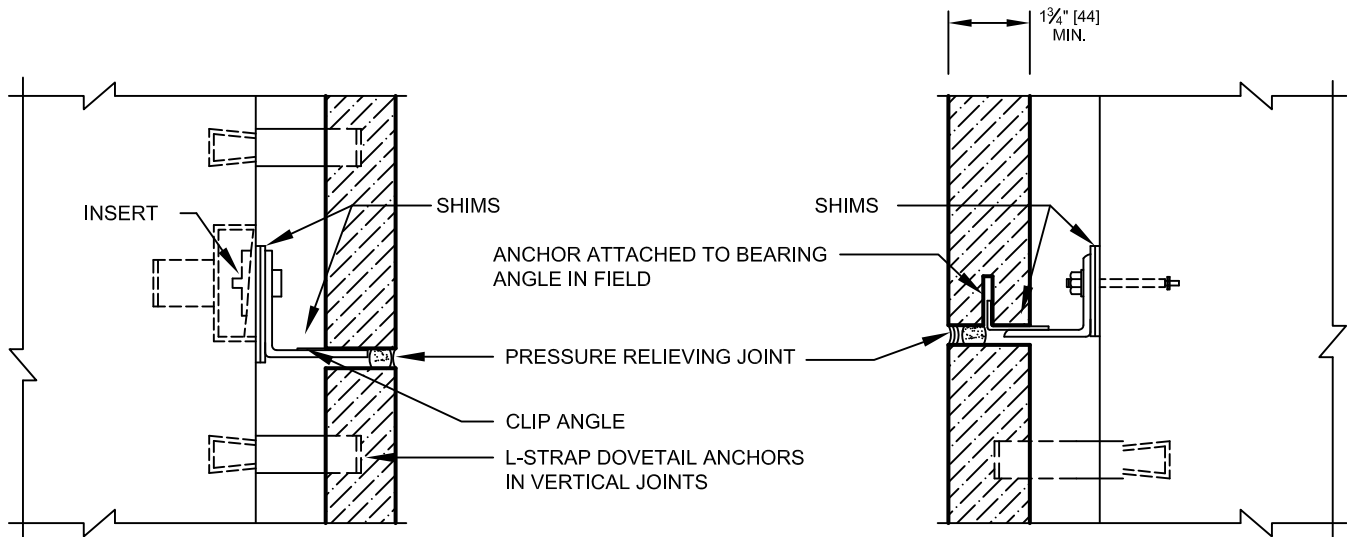
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EXTERIOR STONE RELIEF DETAILS
 WITH REBATED BEARING

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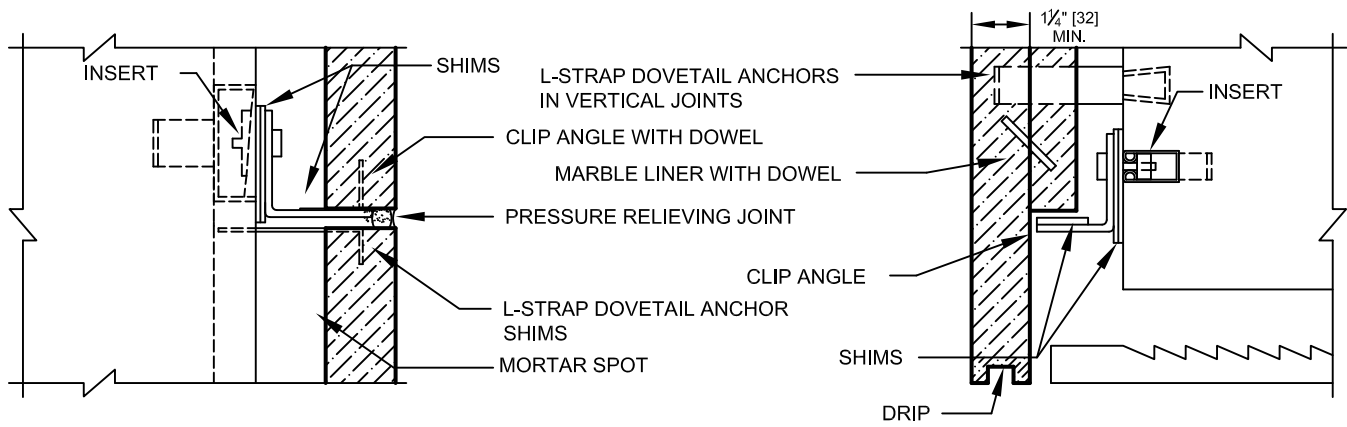
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SCALE:
 3" = 1'-0"



1 DETAIL

2 DETAIL



3 DETAIL

4 DETAIL

NOTE: 1. ALLOW ADEQUATE SPACE FOR ANCHOR BOLT HEADS.
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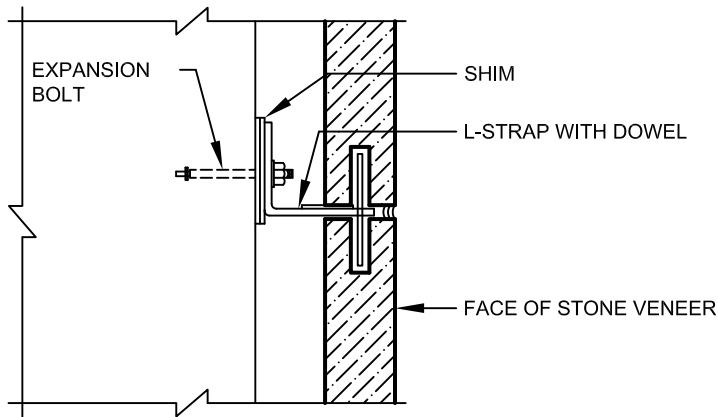
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EXTERIOR STONE RELIEF DETAILS
 WITH NON- REBATED BEARING

MIA DIMENSION STONE DESIGN MANUAL VII

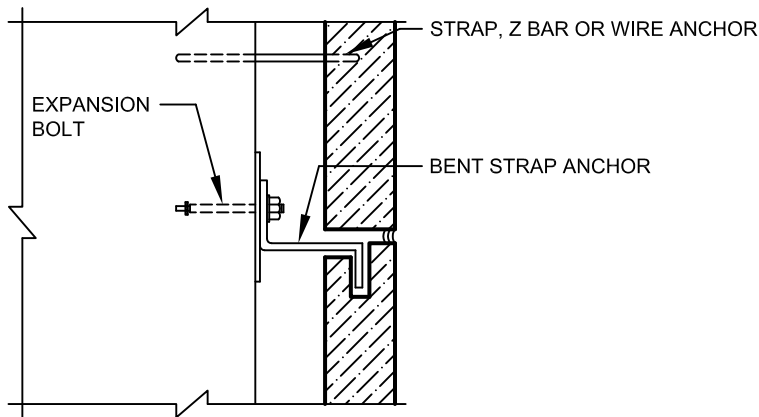
DRWG NO: 15-D-7

SCALE:
 3" = 1'-0"

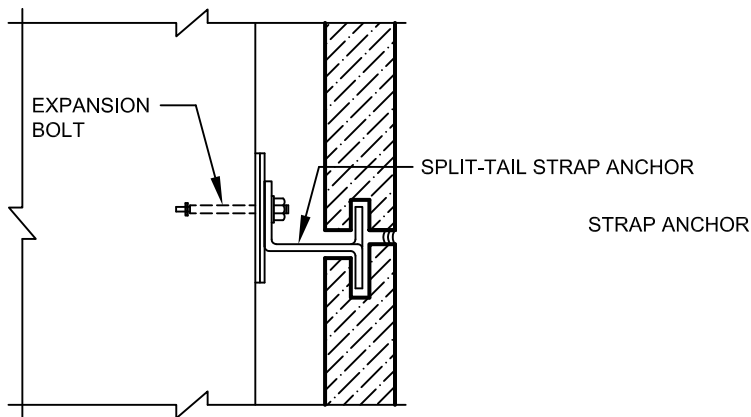


1 DETAIL

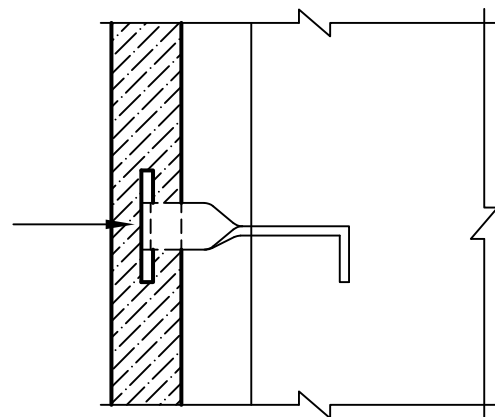
- NOTES:
1. ALL METALS IN DIRECT CONTACT WITH STONE MUST BE STAINLESS STEEL.
 3. RECOMMENDED MINIMUM THICKNESS OF STONE VENEER FOR ANCHORAGE SHOWN IN DETAILS 7,8,9 & 12 VARIES.



2 DETAIL



3 DETAIL



4 DETAIL



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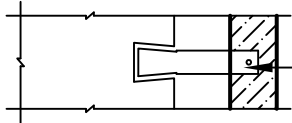
REV	DATE
0	Aug 2006
1	Oct 2006

EXTERIOR STONE VENEER
 RESTRAINT ANCHORAGE DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

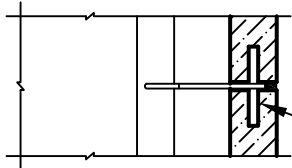
DRWG NO: 15-D-8

SCALE:
 3" = 1'-0"



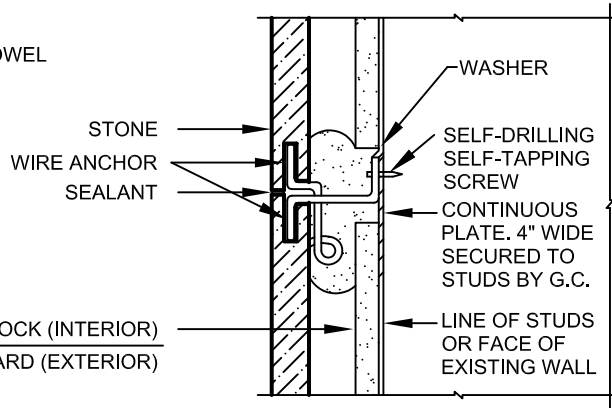
DOVETAIL STRAP WITH DOWEL

PLAN OF DETAIL 12

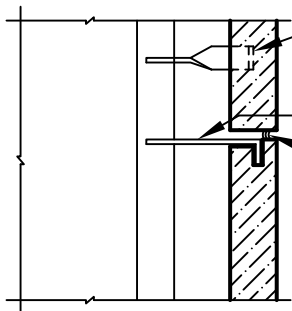


SHEETROCK (INTERIOR)
CEMENT BACKER BOARD (EXTERIOR)
DOVETAIL STRAP WITH DOWEL

DETAIL 12



DETAIL 14



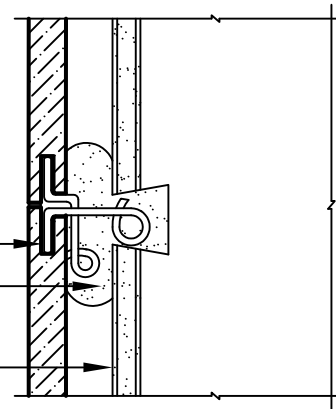
TWISTED DOVETAIL STRAP
ANCHORS IN SIDE OF STONE
VENEER
DOVETAIL L-STRAP
NON-STAINING SEALANT

DETAIL 13

NON-FERROUS WIRE (TYP.)
MORTAR SPOT

GYPSUM WALL BOARD
(INTERIOR) - ATTACHED TO
METAL STUDS

CEMENT BACKER BOARD (EXTERIOR)

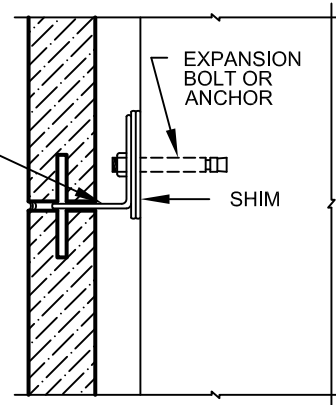


DETAIL 15

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.

CLIP ANGLE WITH DOWEL



DETAIL 16



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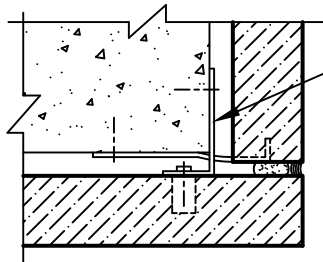
REV	DATE
0	Aug 2006
1	Oct 2006

EXTERIOR STONE VENEER RESTRAINT ANCHORAGE DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

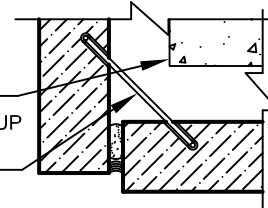
DRWG NO: 15-D-9

SCALE:
3" = 1'-0"



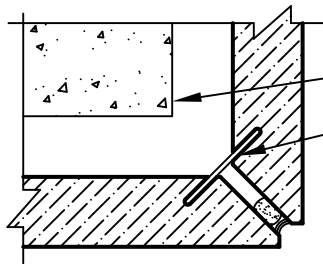
BENT STRAP ANCHORED TO STONE VENEER WITH EXPANSION SHIELD & BOLT

1 BUTT JOINT



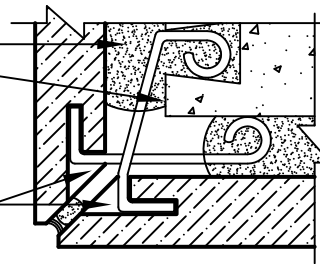
MASONRY OR CONCRETE BACK-UP
U BAR CRAMP IN HORIZONTAL JOINT

2 OFFSET BUTT JOINT



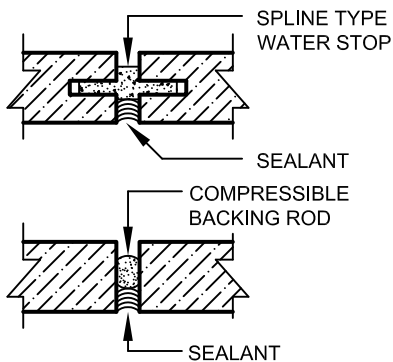
MORTAR SPOTS
CONCRETE OR MASONRY BACK-UP
U BAR CRAMP IN HORIZONTAL JOINT

3 QUIRK MITER JOINT



NON-FERROUS WIRE ANCHORS(TYP.)

4 QUIRK MITER JOINT



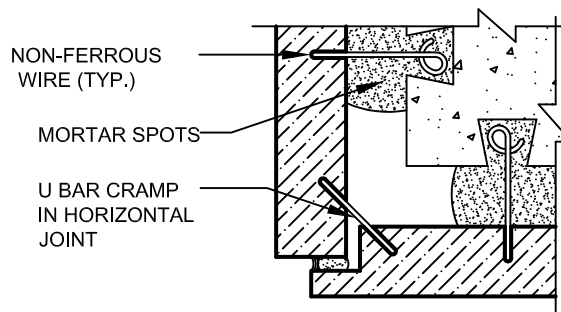
SPLINE TYPE WATER STOP

SEALANT

COMPRESSIBLE BACKING ROD

SEALANT

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"

INTERIOR STONE WALL CLADDING

1.0 INTRODUCTION

1.1 Installation Methods. There are several methods by which interior 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.

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

1.3 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.

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

2.0 DESIGN CRITERIA

2.1 Stone Size and Thickness. Most dimension stones, as defined by ASTM C119, are suitable for interior cladding. Stone panel size and thickness are closely interrelated with the type of stone being installed and its particular engineering qualities. Generally, consideration for greater stone thickness should be made for larger-sized stones (over 12 sq ft) set at higher elevations, and more fragile stones, with the exception of natural stone veneer panels with integrated reinforced backers, which have a limited availability of up to 5' x 10'.

2.2 Installation. Stone wall facing panels may be installed either by conventionally set method using nonstaining anchors, dowels, pins, cramps, wire, and mortar spots; nonstaining adhesive in securing thin tile units to interior vertical surfaces; or by one of the several mechanical methods.

2.3 Physical Property Values. Final design should always be based on specific physical property values of the stone. These values are available from the Stone Supplier.

3.0 MECHANICAL SYSTEMS

3.1 Performance Criteria. The Specifying Authority must determine the performance criteria of the mechanical system to be employed.

3.2 Engineering. A knowledgeable and experienced Installer must be engaged to engineer and fabricate a system that will satisfy the functional and aesthetic requirements of the project.

3.3 Anchorage systems must be securely attached and located as shown on the approved shop drawings and shall be plumb and in true plane.

3.4 Assembly/Installation Systems. A number of proprietary assembly and installation systems are available.

3.5 Panel Installation. Stone panels must be installed to the mechanical system in the prescribed manner, with vertical lines plumb and horizontal lines level.

3.6 Conditions. In all conditions, the substrate must be installed sufficiently true and level so that the stone panels or tiles may be installed true and level and sufficiently rigid to ensure a satisfactory backup surface to the stone installation. (Industry standard: 1/8" in 10'-0" with no more than 1/32" between individual stones.)

3.7 Masonry Backup. May be poured-in-place concrete, hollow concrete block, brick, or other solid masonry surface. Normally, stone installation with this substrate will be set with a cavity.

3.8 Metal Studs. Must be 16 gauge or thicker. Stone anchors may attach directly to the studs, or a horizontal track component may be used to carry the load of the anchor to several studs. May use plywood, cementitious backer board, or gypsum board as a non-loadbearing sheathing.

3.9 Wood Studs. Stone anchors may attach directly to the studs, or a horizontal track component may be used to carry the load of the anchor to several studs. May use plywood, cementitious backer board, or gypsum board as a non-loadbearing sheathing.

3.10 Mechanical Systems. Each mechanical system is different. Follow Manufacturer's recommendations.

3.11 Wet Areas. Avoid the use of plywood or gypsum board as substrate materials. Provide a moisture barrier. Suitable substrates are masonry backup and cementitious backer board on metal or wood studs. Apply appropriate water proofing membranes to all substrates.

4.0 STONE PANELS

4.1 General. Stone panels that cover a wall (wall die) or a lower portion of a wall (wainscot) are supplied in several standard as well as custom thicknesses depending on the stone, its location on the wall, and its use in the project. Normally, stone thickness of ¾" is sufficient. In some instances of very large or fragile stones, thickness of 1¼" or greater may be necessary.

4.2 Base. The base may be in coplanar position with the wainscot or die or be offset so that a portion or all of the top edge of the

base stone remains prominent. It may be profiled or otherwise decorated to achieve architectural effect. The base must be separated from the floor with a "soft" joint appropriately sized to accommodate anticipated building movements and prevent damage to either the horizontal or vertical surface.

4.3 Installation. Stone panels may be solid set or standard set (with a cavity) to the substrate. Normally, standard set is the more economical method, and is most commonly employed. The solid-set method is seldom used, except for installing wainscot or in certain wet or special circumstance area conditions. In the standard-set method, space allowed between the substrate and the back face of the stone may be as little as 1". Wider spaces over 2" should have strap anchors instead of twisted-wire anchors.

4.4 Weight Relief. Stone panels should have their weight relieved when spanning openings over windows or doors, at all floor lines, at any expansion joints in the substrate, or at 12' to 15' intervals in height.

5.0 STONE TILE

5.1 Color Differential. Stone tiles are subject to manufacturing processes different than other dimension stones and natural stone veneer panels. There is greater latitude in the acceptability of shaded stones, and Installers should obtain approval of the stone layout prior to installation.

5.2 Installation. Stone tile may be installed in almost any location for which stone panels are considered. The exception is for elevations higher than 15'-0", which require anchors. Thin stone tiles are not suitable for use with anchors. Stone tile may be installed in a full mortar bed, in a thin-set mortar bed, or with an approved adhesive.

5.3 Back Buttering. For all applications, the stone tile shall be back buttered to achieve, as close as practical, 100% adhesive contact between the stone and the backup.

5.4 Size. Tile patterns shall be laid out so that no perimeter tile is less than ½ the width of the typical stone tile, except at the front of cutouts.

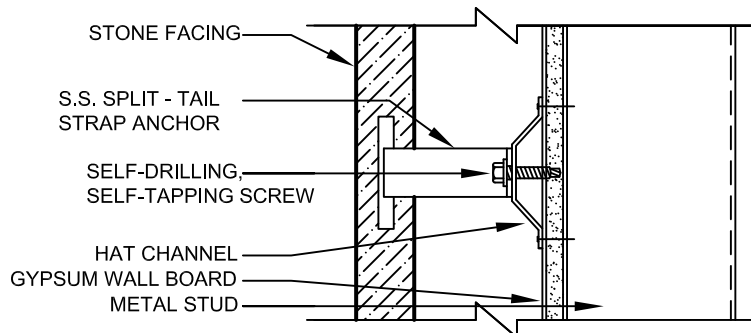
5.5 Substrates. Suitable substrates for stone tile are masonry, cementitious backer board, and gypsum board. Do not use gypsum-based products in wet areas.

5.6 Fire Rating. Two (2) layers of gypsum board are required in elevator shaft walls and where a fire rating is required.

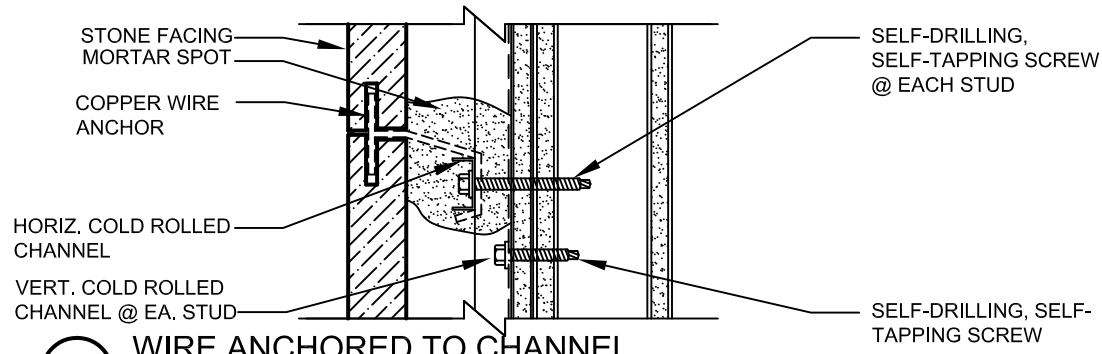
6.0 LIGHTWEIGHT NATURAL STONE VENEER PANELS

6.1 Definition. This product is a bi-material panel using a thin (± 5 mm) stone face adhesively bonded to a lightweight aluminum backer. Most stone varieties and finishes are available, although each manufacturer has several preferred stones available in their offerings.

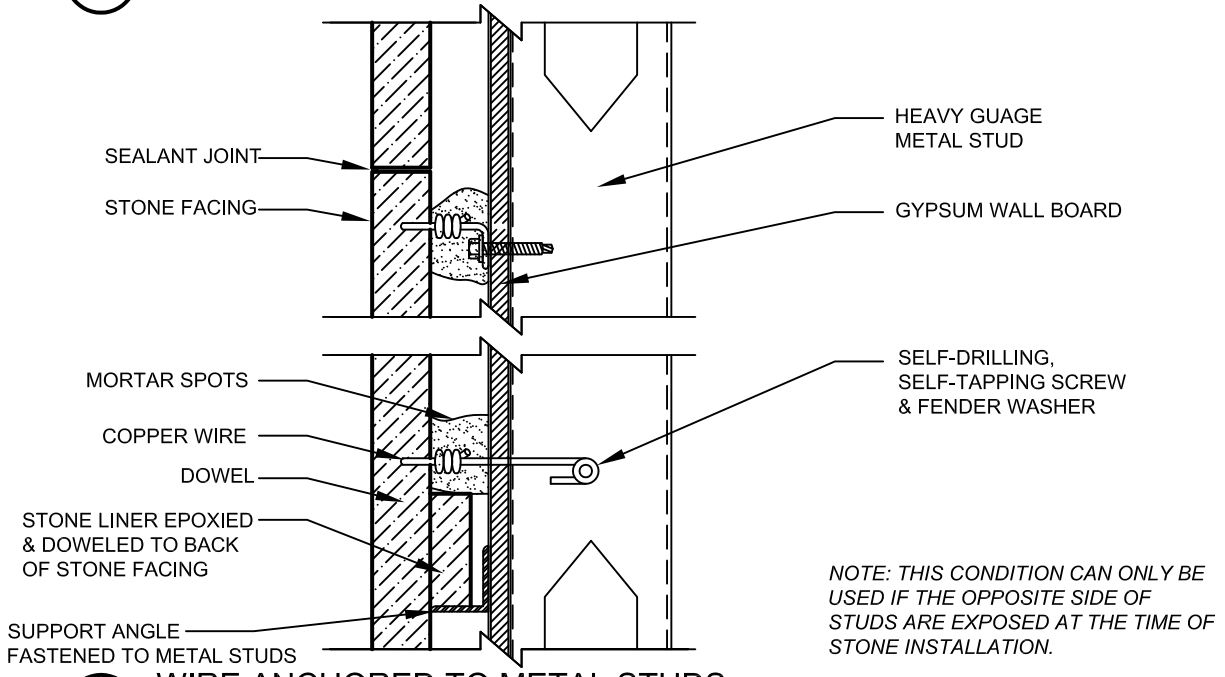
NOTES:



1 STRAP ANCHORED TO METAL STUDS




2 WIRE ANCHORED TO CHANNEL



3 WIRE ANCHORED TO METAL STUDS

NOTE: THIS CONDITION CAN ONLY BE USED IF THE OPPOSITE SIDE OF STUDS ARE EXPOSED AT THE TIME OF STONE INSTALLATION.



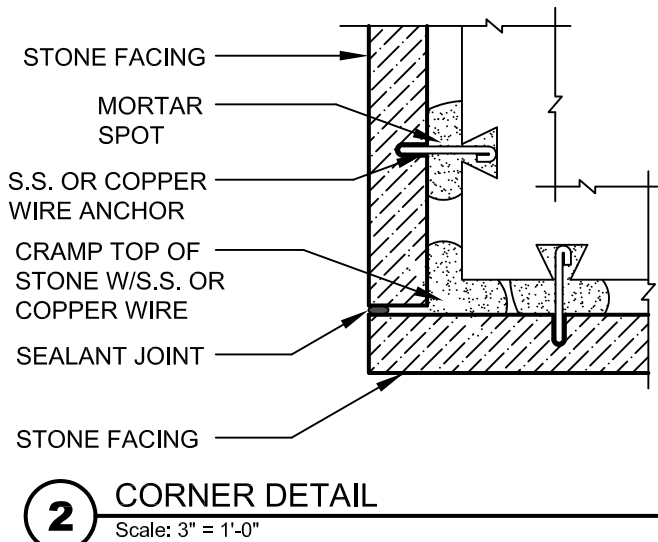
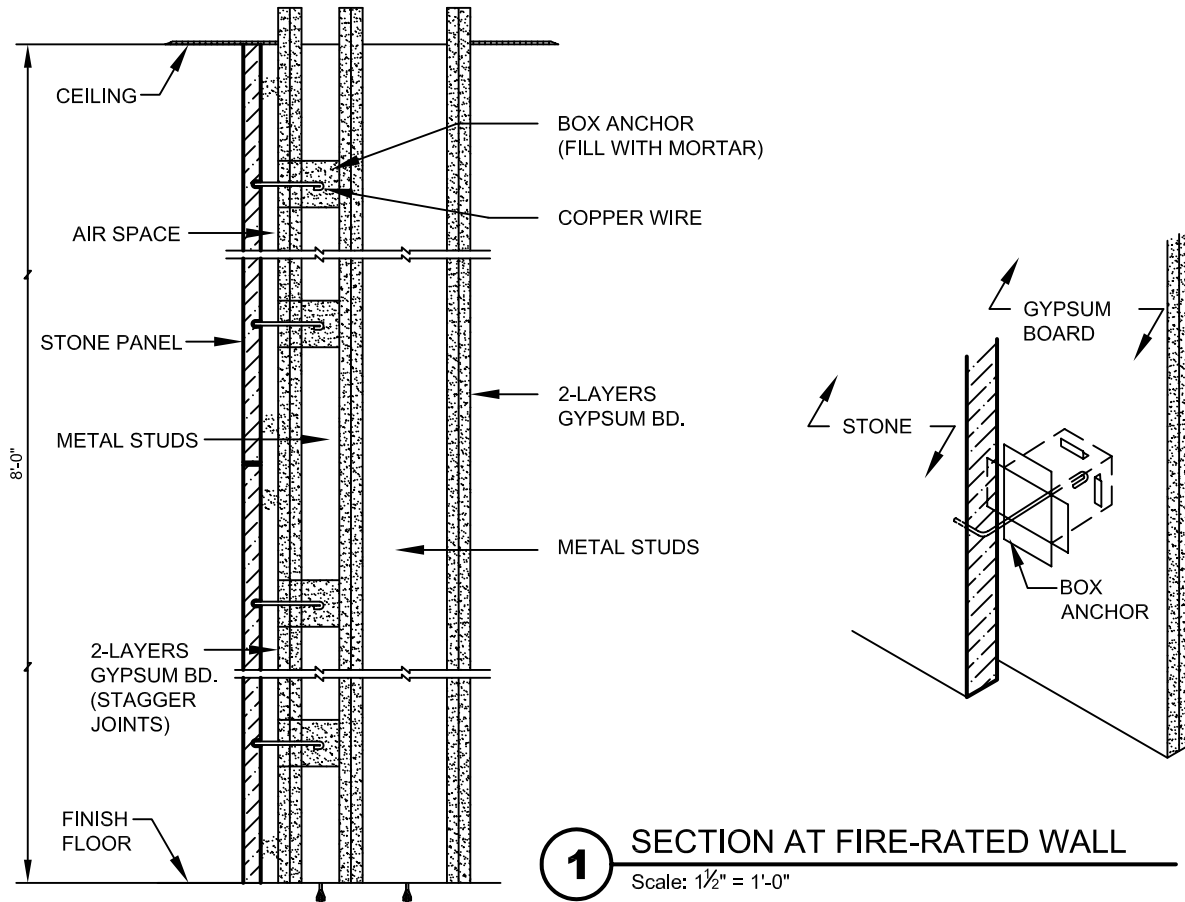
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INTERIOR STONE WALL CLADDING
 WALL FACING DETAILS
 MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-11

SCALE:
 3" = 1'-0"



NOTE: 1/2" SETTING SPACE REQUIRED WHEN MARBLE LINERS ARE NOT EMPLOYED.



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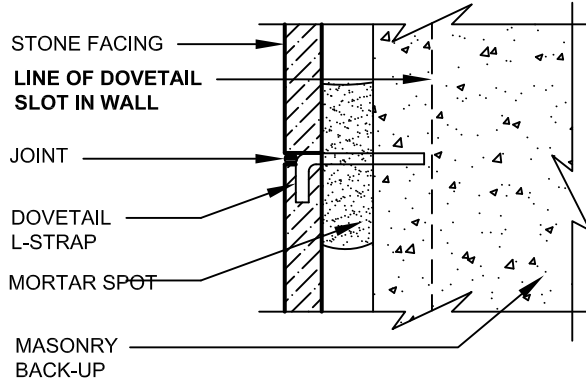
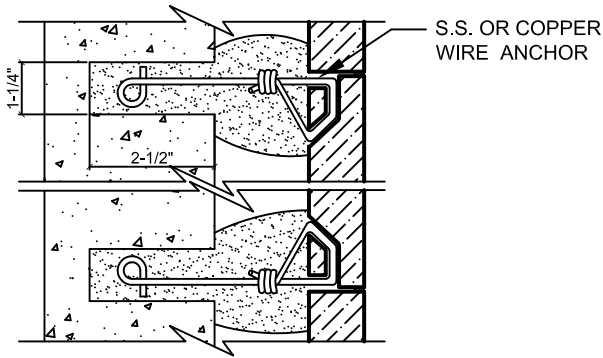
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1	Oct 2006

INTERIOR STONE WALL CLADDING WALL FACING DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

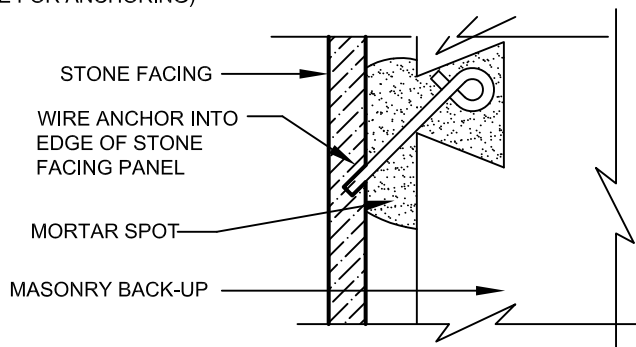
DRWG NO: 15-D-12

SCALE:
 AS NOTED

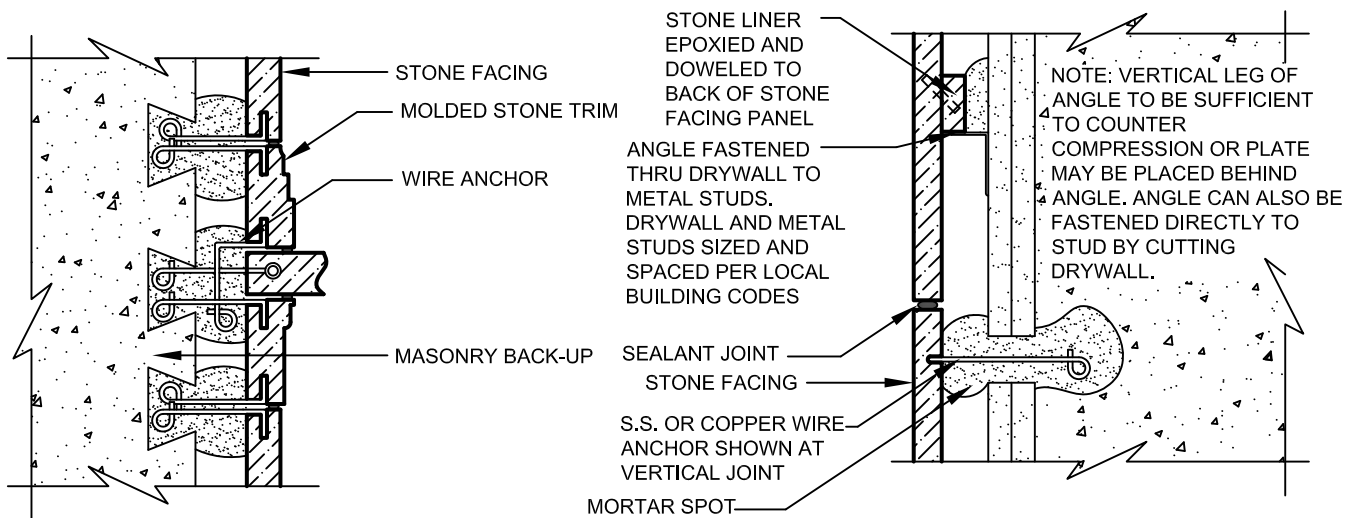


1 WIRE LACE ANCHOR
(TO BE USED ONLY WHERE EDGE CONDITION IS NOT AVAILABLE FOR ANCHORING)

2 DOVETAIL ANCHOR IN MASONRY



3 WIRE ANCHOR IN MASONRY



4 WIRE ANCHORED MOULDED TRIM

5 WIRE ANCHORED TO METAL STUDS

NOTE: 1-1/2 INCH SETTING SPACE REQUIRED WHEN MARBLE LINERS ARE NOT EMPLOYED.



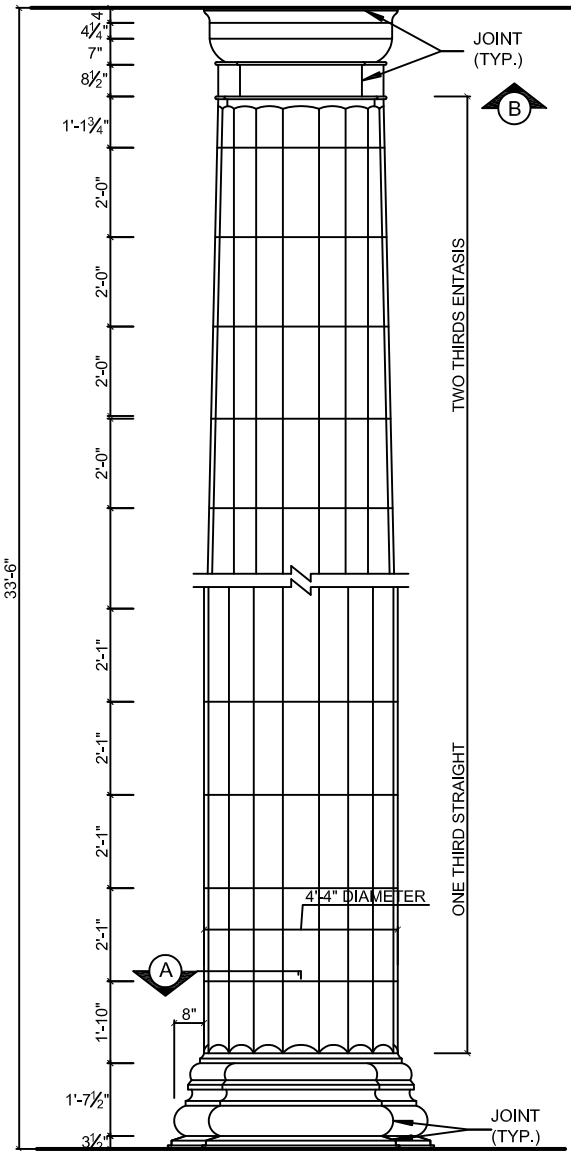
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INTERIOR STONE WALL CLADDING
WALL FACING DETAILS
MIA DIMENSION STONE DESIGN MANUAL VII

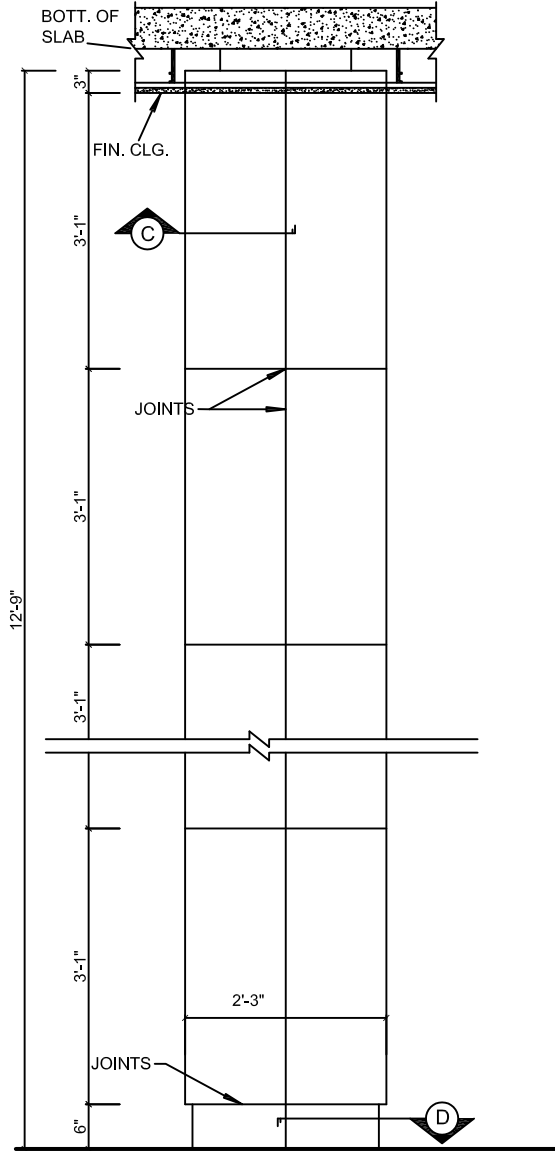
DRWG NO: 15-D-13

SCALE:
3" = 1'-0"



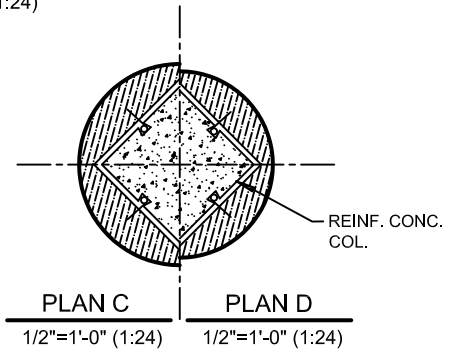
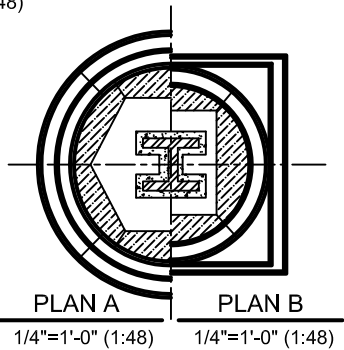
ELEVATION

1/4"=1'-0" (1:48)



ELEVATION

1/2"=1'-0" (1:24)



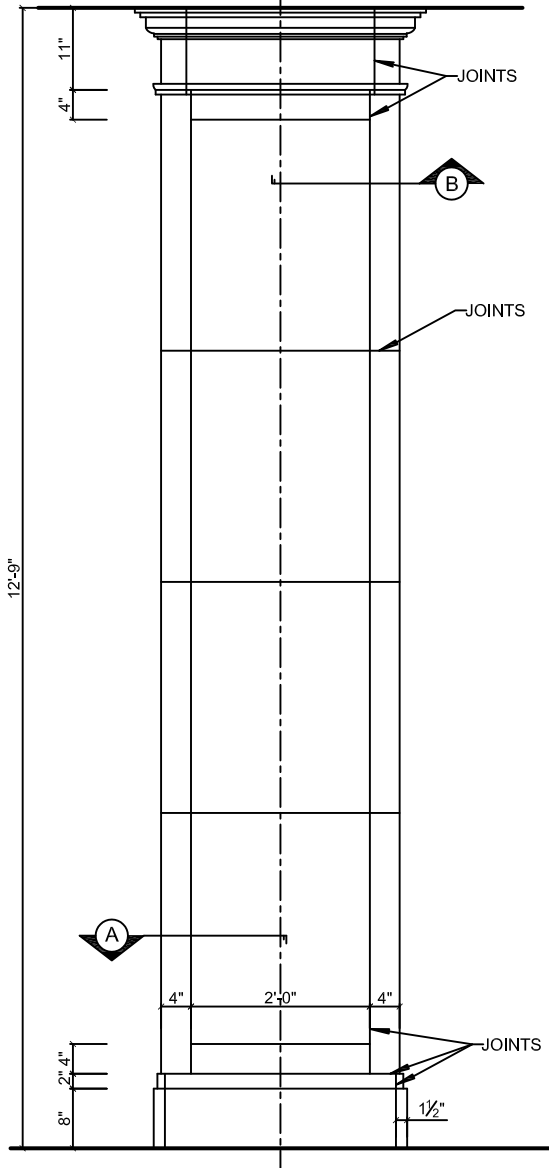
KEY TO MATERIALS: STONE [diagonal hatching] CONCRETE [stippled] STEEL [cross-hatching]



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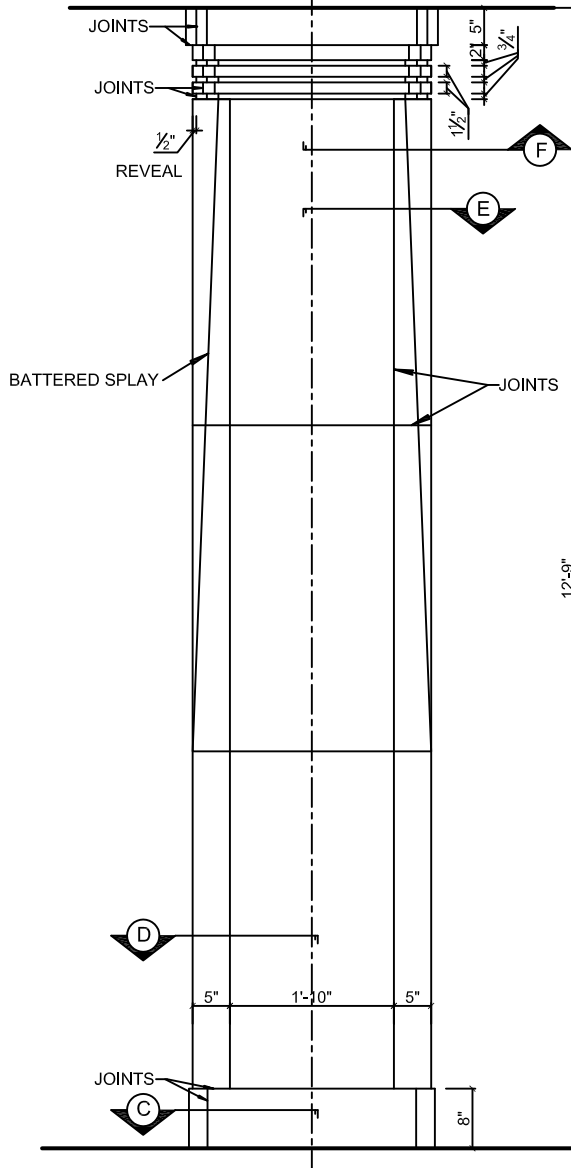
REV	DATE
0	Aug 2006
1	Oct 2006

INTERIOR STONE WALL CLADDING
 FREE-STANDING COLUMN DETAILS
 MIA DIMENSION STONE DESIGN MANUAL VII
 DRWG NO: 15-D-14
 SCALE: As Noted



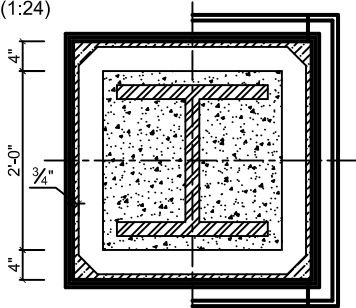
ELEVATION

1/2"=1'-0" (1:24)



ELEVATION

1/2"=1'-0" (1:24)

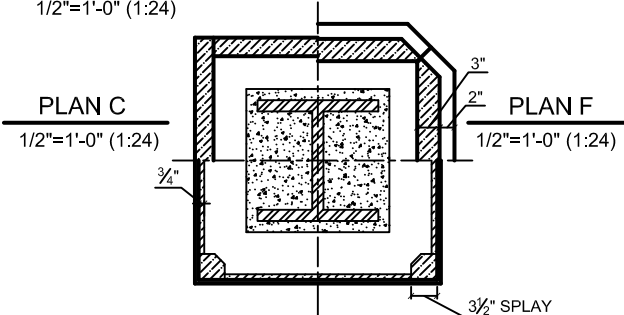


PLAN A

1/2"=1'-0" (1:24)

PLAN B

1/2"=1'-0" (1:24)



PLAN C

1/2"=1'-0" (1:24)

PLAN F

1/2"=1'-0" (1:24)

PLAN D

1/2"=1'-0" (1:24)

PLAN E

1/2"=1'-0" (1:24)

KEY TO MATERIALS:

STONE

CONCRETE

STEEL



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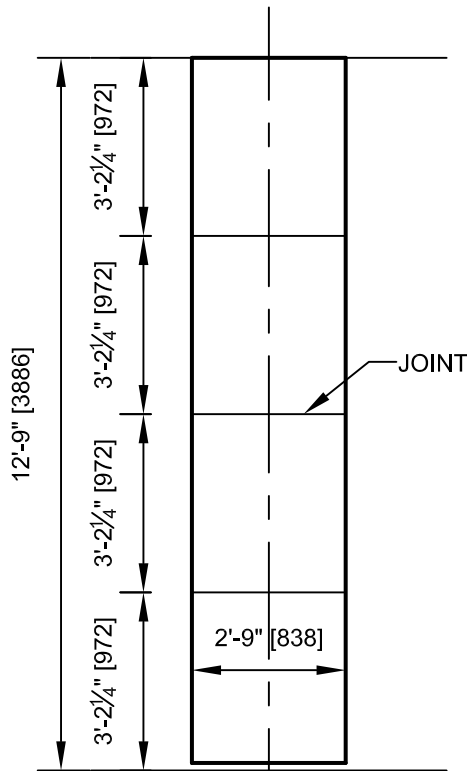
REV	DATE
0	Aug 2006
1	Oct 2006

INTERIOR STONE WALL CLADDING FREE-STANDING COLUMN DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-15

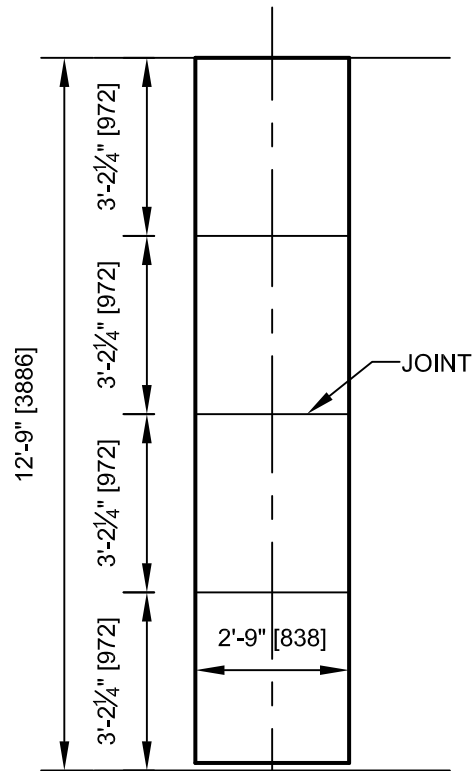
SCALE:
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SQUARE COLUMN

ELEVATION

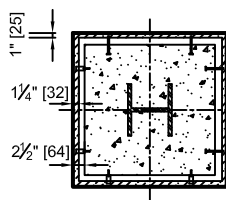
1/2"=1'-0" (1:24)



ROUND COLUMN-FOUR SECTIONS

ELEVATION

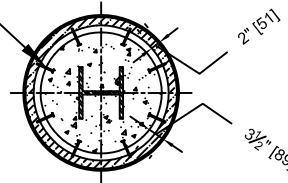
1/2"=1'-0" (1:24)



PLAN

1/2"=1'-0" (1:24)

STRAP ANCHORS, OR, SEE TYPICAL STANDARD ANCHOR SECTION FOR OTHER ANCHOR TYPES



PLAN

1/2"=1'-0" (1:24)

KEY TO MATERIALS:

STONE

CONCRETE

STEEL



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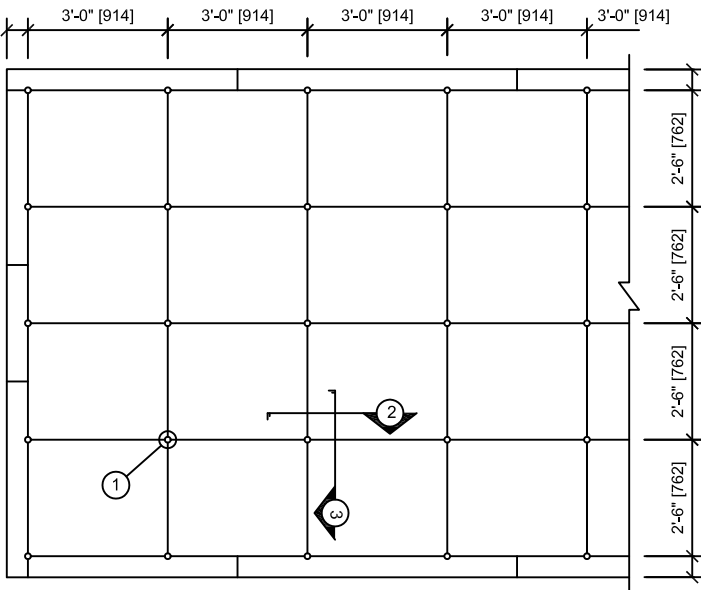
REV	DATE
0	Aug 2006
1	Oct 2006

INTERIOR STONE WALL CLADDING
 FREE-STANDING COLUMN DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-16

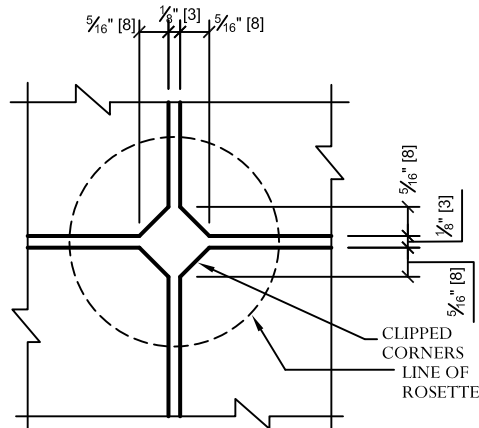
SCALE:
 1/2" = 1'-0"



NOTE: DIMENSIONS ARE TO CENTER OF 1/8" JOINTS. TOP, BOTTOM AND SIDE TRIM PIECE WIDTH VARIES.

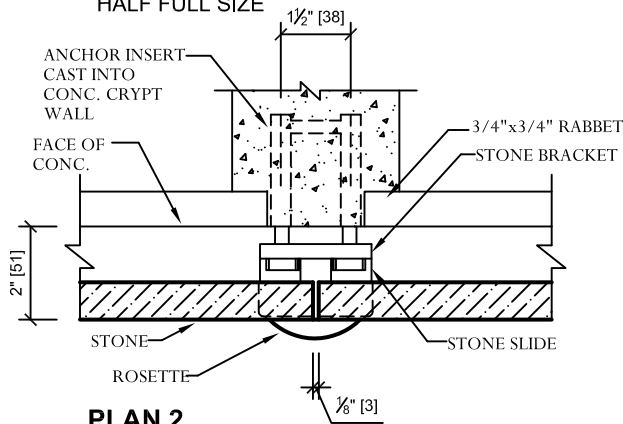
ELEVATION

1/4"=1'-0"(1:48)



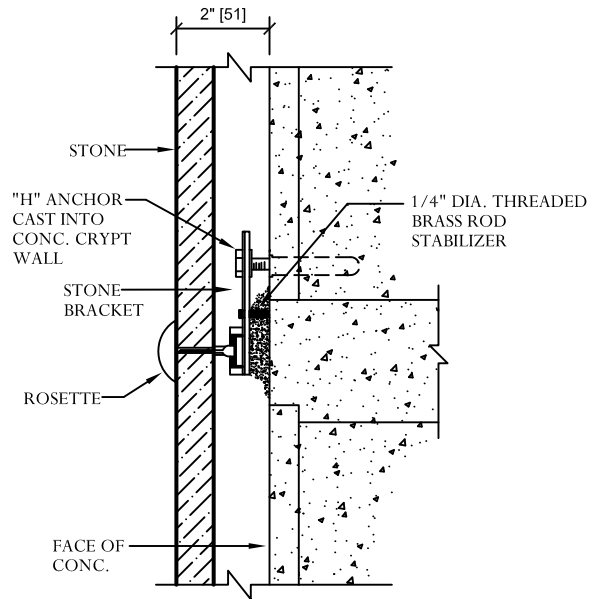
DETAIL 1

HALF FULL SIZE



PLAN 2

3"=1'-0"(1:4)



SECTION 3

3"=1'-0"(1:4)



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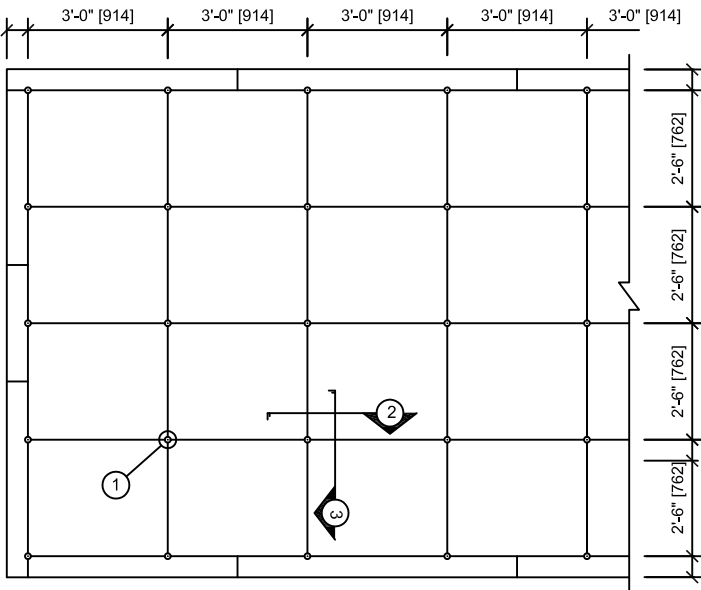
REV	DATE
0	Aug 2006
1	Oct 2006

Interior Stone Wall Cladding
 Crypt with Bracket and Rosette Detail

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-17

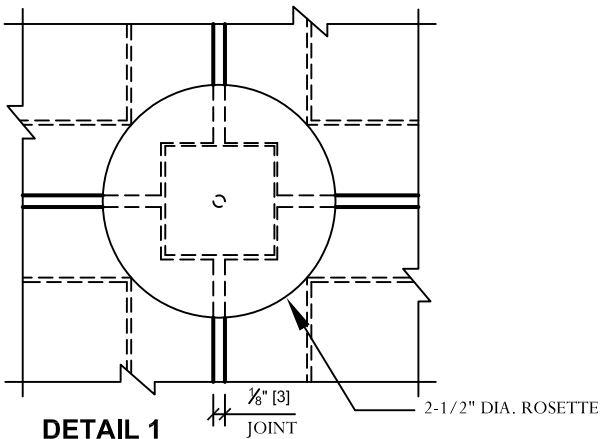
SCALE:
 As Noted



NOTE: DIMENSIONS ARE TO CENTER OF 1/8" JOINTS. TOP, BOTTOM AND SIDE TRIM PIECE WIDTH VARIES.

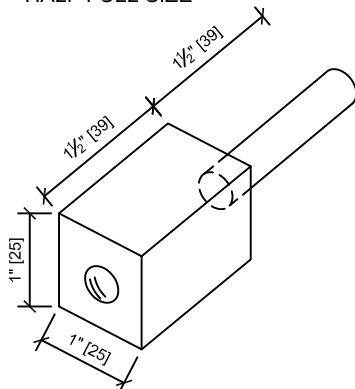
ELEVATION

1/4"=1'-0"(1:48)



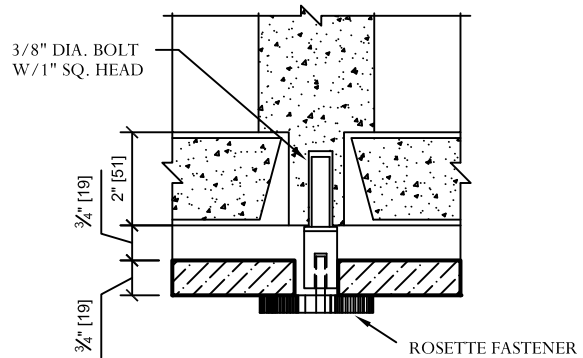
DETAIL 1

HALF FULL SIZE



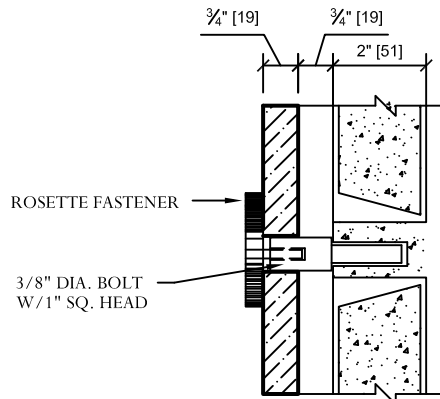
3/8" DIA. BOLT W/1" SQ. HEAD

HALF FULL SIZE



PLAN 2

3"=1'-0"(1:4)



SECTION 3

3"=1'-0"(1:4)



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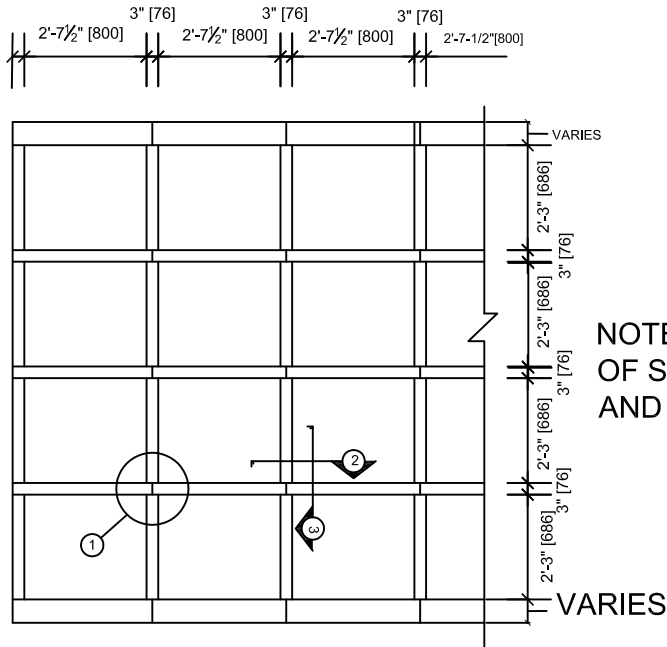
REV	DATE
0	Aug 2006
1	Oct 2006

Interior Stone Wall Cladding
 Crypt with Bolt and Rosette Fasteners

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-18

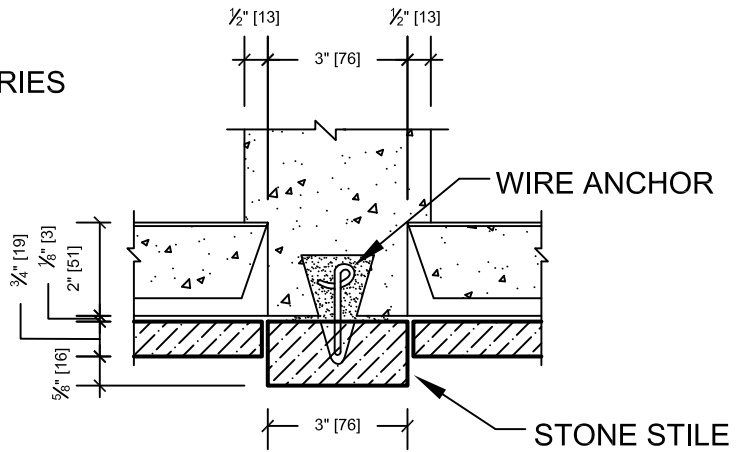
SCALE:
 As Noted



NOTE: DIMENSIONS ARE TO EDGE OF STILE OR RAIL. TOP, BOTTOM AND SIDE TRIM PIECE WIDTH VARIES.

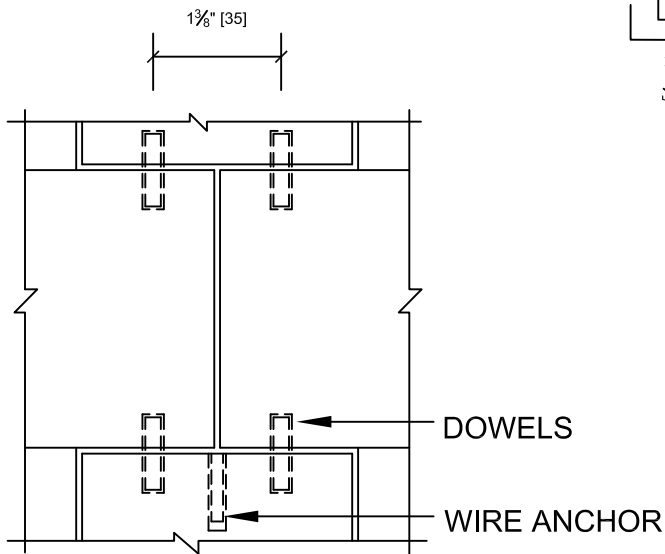
ELEVATION

1/4"=1'-0" (1:48)



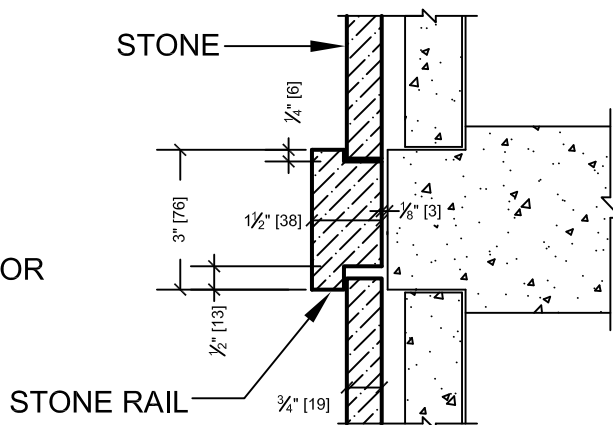
PLAN 2

3"=1'-0" (1:4)



DETAIL 1

HALF FULL SIZE



SECTION 3

3"=1'-0" (1:4)



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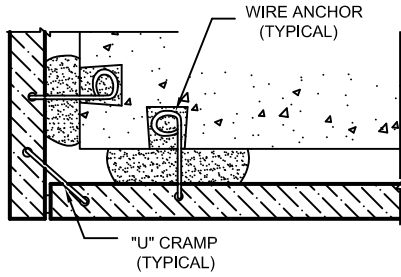
REV	DATE
0	Aug 2006
1	Oct 2006

Interior Stone Wall Cladding
 Crypt with Stile and Rail Detail

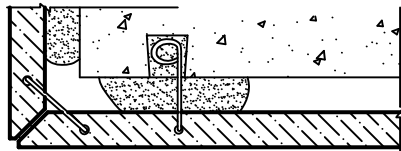
MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-19

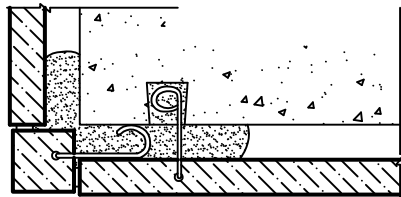
SCALE:
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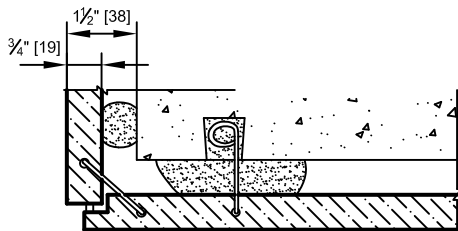
1 BUTT JOINT
EXTERNAL CORNER



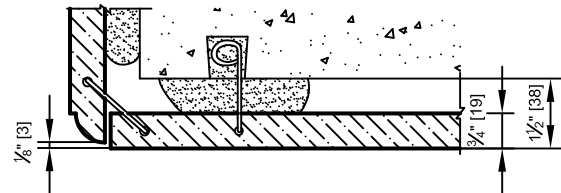
2 QUIRK MITER JOINT
EXTERNAL CORNER



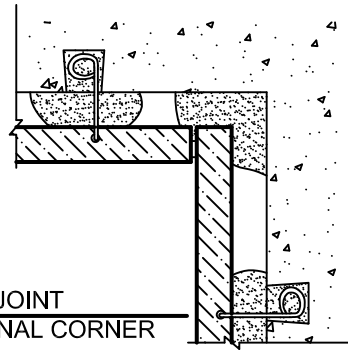
3 CORNER BLOCK JOINT
EXTERNAL CORNER



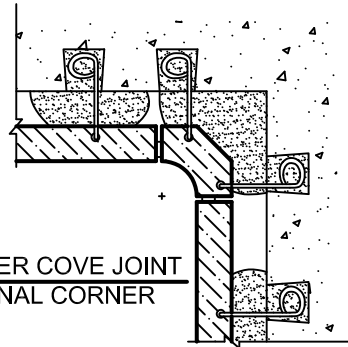
5 RABBETTED JOINT
EXTERNAL CORNER



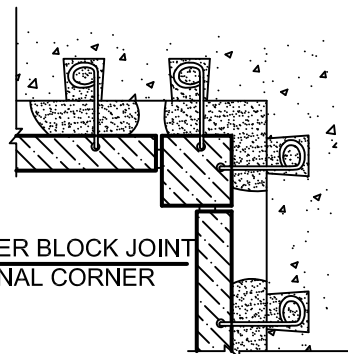
6 MOLDED JOINT
EXTERNAL CORNER



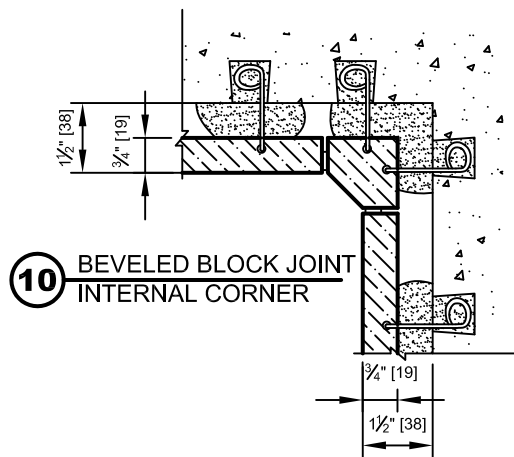
7 BUTT JOINT
INTERNAL CORNER



8 CORNER COVE JOINT
INTERNAL CORNER



9 CORNER BLOCK JOINT
INTERNAL CORNER



10 BEVELED BLOCK JOINT
INTERNAL CORNER



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INTERIOR STONE WALL CLADDING
CORNER DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-20

SCALE:
3" = 1'-0"

VERTICAL SURFACES – INTERIOR STONE BASE

1.0 INTRODUCTION

1.1 Installation Methods. There are several methods by which interior stone base can be installed. Consideration should be given to the various features of each method in making a selection for a specific installation. See information about installation methods on the following page, and illustrations of examples at the close of this section.

1.2 Delivered ready to install. Generally, stone base is cut to required lengths by the fabricator, based on job-site measurements furnished by the stone contractor, and delivered to the job site ready to install.

1.3 Exposed stone edges must be gauged to the precise thickness specified. Gauging tolerance cannot be over $\pm 1/32$ ".

1.4 White portland cement is recommended for light-colored granite and marble. White portland cement with a low alkali content is recommended for limestone.

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

1.6 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.

2.0 PRODUCT DESCRIPTION

2.1 Basic Use. Lowest or bottom part of structural elements such as columns, piers, and walls.

2.2 Fabrication. Stone base units are fabricated to dimensions specified on shop drawings, prefinished, and delivered to the job site ready to be cut into required lengths for installation.

2.3 Finishes. Exposed surfaces and edges are to be finished with any typical stone finish, usually polished.

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

2.5 Sizes. Thicknesses of 3/8", 1/2", 3/4", 7/8", 1 1/4", or as specified.

3.0 TECHNICAL DATA

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

3.1.1 Granite: ASTM C615 Standard Specification for Granite Dimension Stone

3.1.2 Limestone: ASTM C568 Standard Specification for Limestone Dimension Stone

3.1.3 Marble: ASTM C503 Standard Specification for Marble Dimension Stone

3.1.4 Quartz-based Stone: ASTM C616 Standard Specification for Quartz-based Dimension Stone

3.1.5 Serpentine: ASTM C1526 Standard Specification for Serpentine Dimension Stone

3.1.6 Slate: ASTM C629 Standard Specification for Slate Dimension Stone

3.1.7 Soapstone: No ASTM Standard exists at this time

3.1.8 Travertine: ASTM C1527 Standard Specification for Travertine Dimension Stone

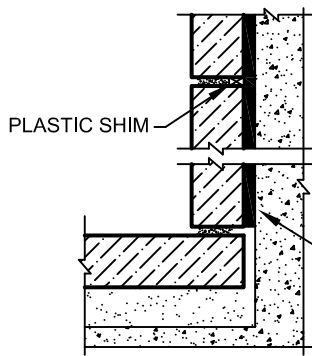
4.0 INSTALLATION

4.1 Methods. Interior stone base can be installed either by the standard set method or the thin-set method.

4.2 Joints. Joints are pointed with white cement, grout, or nonstaining sealant. Joint width must be specified.

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

5.0 NOTES:



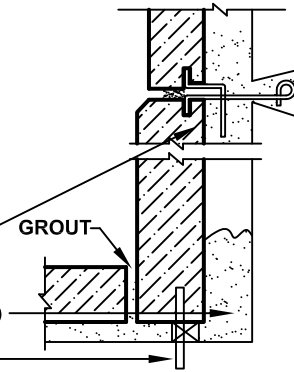
1 SECTION

NOTES:

1. SECTION 1: STONE BASE AND WALL FACING ANCHORED TO MASONRY BACK-UP WITH NON-STAINING ADHESIVE.

2. SECTION 4: STONE BASE AND WALL FACING ANCHORED TO MASONRY BACK-UP WITH COPPER WIRE TIE- BACK ANCHORS OR STRAP ANCHORS.

COPPER WIRE TIE BACK ANCHORS
NON-STAINING ADHESIVE
MORTAR SPOTS (TYP.)
LONG DOWEL

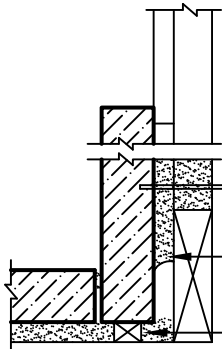


4 SECTION

NOTES:

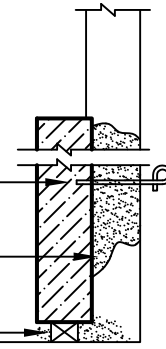
1. SECTION 2: STONE BASE ANCHORED TO WOOD STUD WITH WIRE TIE BACK ANCHORS. INTERIOR BASE 6" HIGH OR LESS DOES NOT REQUIRE ANCHORS.

2. SECTION 5: STONE BASE ANCHORED TO PLASTERED PARTITION WITH WIRE TIE BACK ANCHORS. INTERIOR BASE 6" HIGH OR LESS DOES NOT REQUIRE ANCHORS.



2 SECTION

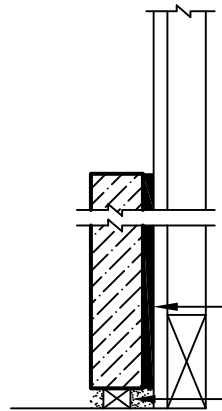
WIRE TIE BACK ANCHORS
MORTAR SPOTS
PLASTIC SPACER SHIMS (TYP.)



5 SECTION

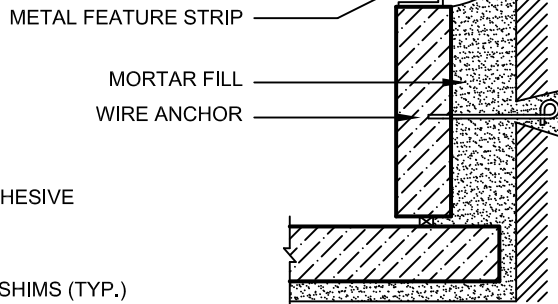
NOTES:

SECTION 3 STONE BASE ANCHORED TO GYPSUM BOARD PARTITION WITH NON-STAINING ADHESIVE. BASE 6" HIGH OR LESS DOES NOT REQUIRE WIRE TIE ANCHORS.



3 SECTION

NON-STAINING ADHESIVE
PLASTIC SPACER SHIMS (TYP.)



6 SECTION

NOTE: ALL METALS CONTACT WITH STONE MUST BE CORROSION RESISTANT.



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INTERIOR STONE BASE
TYPICAL DETAILS
MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-21

SCALE:
6" = 1'-0"

NOTES:

VERTICAL SURFACES - STONE SOFFITS

1.0 INTRODUCTION

1.1 Installation Methods. There are several methods by which stone soffits 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.

2.0 DESIGN CRITERIA

2.1 Anchoring and Installation. Each soffit stone should be independently anchored and installed. When designing stone soffits, allow ample space above soffit for anchoring to the structure. Anchor quantity, type, and position shall be determined by load calculation and anchor strength, allowing adequate factors of safety in the design.

2.2 Soffit stones experience flexural stress due to gravity induced loads. Unlike windload, gravity loads are constant, and therefore allowable stresses in the stone panel design should be reduced to eliminate creep deformation.

2.3 Free spanning, exterior soffit stones of limited thickness may not have enough mass to resist uplifting forces caused by high wind conditions. It is therefore necessary to mechanically anchor the stone to resist upward in addition to downward forces.

2.4 Soffit installations encounter combined gravity and windloads working in the same direction. For this reason, fabrication tolerances with reference to panel thickness and anchor prep offset from panel face may become critical in soffit installations.

2.5 Caution. The use of wedge-type or expansion anchors in stone panels is not recommended due to the concentrated

internal stresses experienced by the stone. In extreme cases these stresses can be great enough to fracture the stone panel.

2.6 Fascia Courses. Soffit stone of limited dimension may be attached to the fascia course by mechanical methods. Soffit stones of greater dimension may induce unacceptable rotational forces on the fascia stone. Reliance on adhesive attachment alone is not allowed.

2.7 Movement Joints: When anchoring soffit stones to overhead structure, care must be taken to recognize differential movement between floors and other structural elements. Movement joints must be adequately sized and accurately located to accommodate all anticipated movements. Ensure that movement joints are free of shims or other materials capable of transferring loads across the joint between the stones.

3.0 PRECAUTIONS

3.1 Only sound stone varieties should be used. Marble for soffit conditions is limited to soundness classification Group "A" and "B" marbles. If the soundness of any proposed stone cannot be reliably verified, other means of reinforcement will be necessary.

3.2 All stone soffit panels are to be mechanically anchored. Thin-setting thin stone tiles in soffit and ceiling applications is not recommended without the specific endorsement of the thin-set manufacturer.

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

3.4 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.

4.0 PRODUCT DESCRIPTION

4.1 Basic Use. Horizontal underside of structural elements such as beams, arches, and cornices.

4.2 Fabrication. Soffits are precut and prefinished to dimensions specified on shop drawings, and delivered to the job site ready to install.

4.3 Finishes. Polished, honed, abrasive, thermal, and natural cleft for interior use; honed, abrasive, thermal, natural cleft, rough, and textured for exterior use. Polished marble or limestone is not recommended for exterior use.

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

4.5 Sizes. Thicknesses of 1¼", 1½", 2", or greater are common. The actual required thickness is subject to the strength and durability of the selected stone.

5.0 TECHNICAL DATA

5.1 Each stone variety used for soffits should conform to the applicable ASTM standard specification and the physical requirements contained therein. The specification for each stone type are as follows:

5.1.1 Granite: ASTM C615 Standard Specification for Granite Dimension Stone

5.1.2 Limestone: ASTM C568 Standard Specification for Limestone Dimension Stone

5.1.3 Marble: ASTM C503 Standard Specification for Marble Dimension Stone (Soundness Groups A & B)

5.1.4 Quartz-based Stone: ASTM C616 Standard Specification for Quartz-based Dimension Stone

5.1.5 Slate: ASTM C629 Standard Specification for Slate Dimension Stone

5.1.6 Serpentine: ASTM C1526 Standard Specification for Serpentine Dimension Stone

5.1.7 Travertine: ASTM C1527 Standard Specification for Travertine Dimension Stone

6.0 INSTALLATION

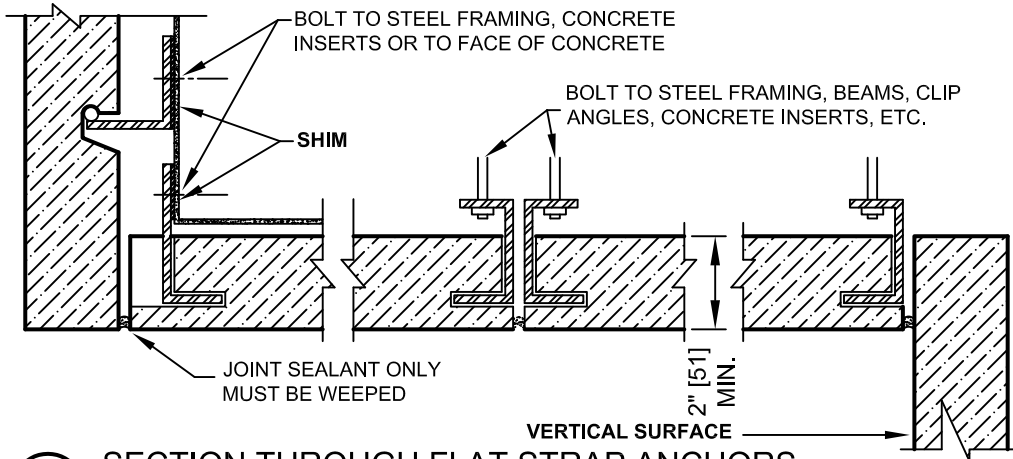
6.1 Preparatory Work. The General Contractor must furnish suitable structural substrate to accommodate loads imposed upon it by the soffit anchorage.

6.2 Method. Soffits can be installed by conventional anchorage techniques or preassembled systems. Anchors shall be of non-staining and corrosion resistant metals.

6.2.1 Each soffit stone should be independently anchored and installed.

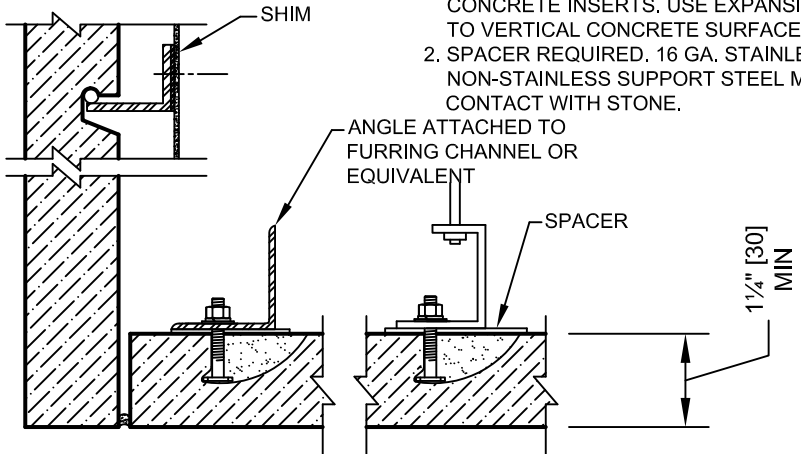
6.2.2 Joint widths shall be a minimum of 1/4". Wider joints are frequently required to accommodate thermal expansions and/or building movements. Caulk with nonstaining sealant.

6.3 General Precaution. During construction, the General Contractor shall protect all stone from staining or damage.

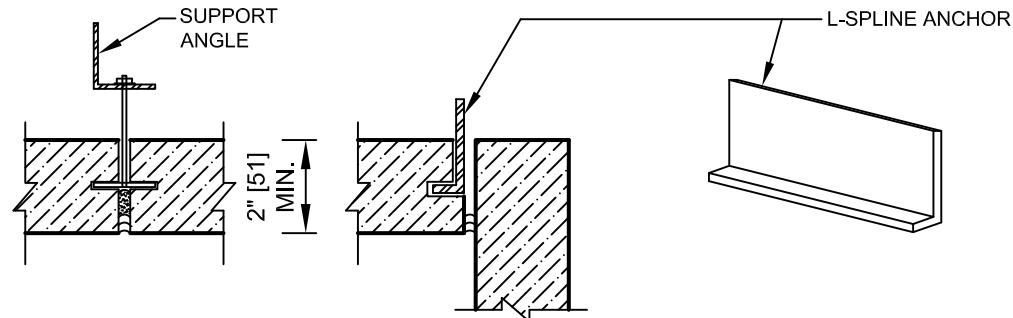


1 SECTION THROUGH FLAT STRAP ANCHORS

NOTE: 1. BOLT ANCHORS TO STEEL FRAMING, BEAMS, CLIP ANGLES OR CONCRETE INSERTS. USE EXPANSION BOLTS TO FASTEN TO VERTICAL CONCRETE SURFACES ONLY.
 2. SPACER REQUIRED. 16 GA. STAINLESS STEEL OR AS SPECIFIED. NON-STAINLESS SUPPORT STEEL MUST NOT BE IN DIRECT CONTACT WITH STONE.



2 SECTION THROUGH T-31 BACK ANCHORS



3 SECTION THROUGH DISC & L-SPLINE ANCHORS

NOTE: EACH STONE SOFFIT PIECE SHOULD BE ANCHORED INDEPENDENTLY FROM OTHER SOFFIT AND VERTICAL PIECES.



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STONE SOFFITS
 EXTERIOR SOFFIT DETAILS
 MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-22

SCALE:
 3" = 1'-0"

VERTICAL SURFACES - STONE FIREPLACE FACINGS

1.0 INTRODUCTION

1.1 Methods. There are several methods by which stone fireplace facings may be installed. Consideration should be given to each method when making a selection for a specific installation. See information about installation methods on the following page, and illustrations of examples at the close of this section.

2.0 DESIGN CRITERIA

2.1 Fireplace headers and legs (uprights) may be thin-set if stone is no thicker than ½". Fastening of stone slab thicker than ½" must be mechanical unless specifically designed and approved by the thin-set manufacturer.

2.2 Exposed stone edges must be gauged to the precise thickness specified. Gauging tolerance cannot be over $\pm 1/32$ ".

2.3 Backup Materials/Temperature. Cracking of fireplace facings is primarily due to expansion and contraction of backup materials. Ensure that stone surface temperatures do not exceed ability to safely and comfortably touch the stone facing when a fire is burning in the fireplace. Setting space between stone and backup should be at least ¾".

2.4 White portland cement is recommended for light-colored granite and marble. White portland cement with a low alkali content is recommended for limestone.

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

2.6 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.

3.0 PRODUCT DESCRIPTION

3.1 Basic Use. As interior stone fireplace facings for commercial, institutional, and residential use.

3.2 Finishes. Polished, honed, natural cleft.

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

3.4 Sizes. Thicknesses of 3/8", ½", ¾", 7/8", 1¼", or as specified.

4.0 TECHNICAL DATA

4.1 Each stone variety used for fireplace facings should conform to the applicable ASTM standard specification and the physical requirements contained therein. The specification for each stone type are as follows:

4.1.1 Granite: ASTM C615 Standard Specification for Granite Dimension Stone

4.1.2 Limestone: ASTM C568 Standard Specification for Limestone Dimension Stone

4.1.3 Marble: ASTM C503 Standard Specification for Marble Dimension Stone

4.1.4 Quartz-based Stone: ASTM C616 Standard Specification for Quartz-based Dimension Stone

4.1.5 Slate: ASTM C629-99 Standard Specification for Slate Dimension Stone

4.1.6 Serpentine: ASTM C1526 Standard Specification for Serpentine Dimension Stone

4.1.7 Soapstone: No ASTM Standard exists at this time

4.1.8 Travertine: ASTM C1527 Standard Specification for Travertine Dimension Stone

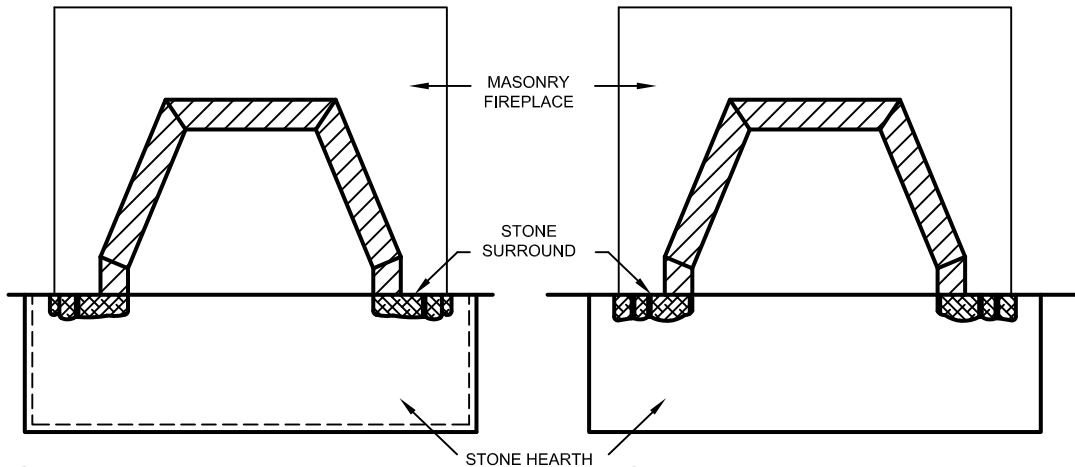
5.0 INSTALLATION

5.1 Standard Set System. Stone facings are set firmly against mortar spots located at anchors.

5.2 Thin Set System. A nonstaining adhesive should be spread over the backup wall with a notched trowel and the stone facing positioned plumb against the adhesive. Used for stone no thicker than ½".

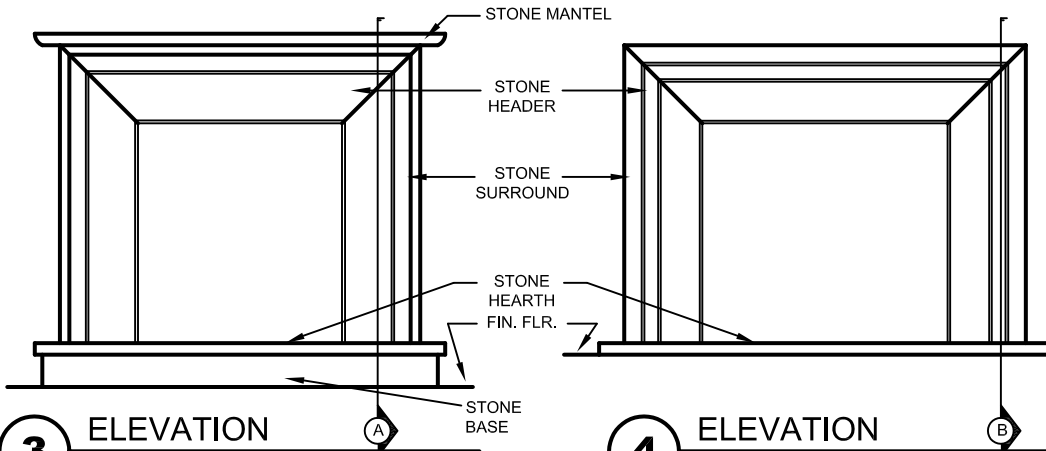
5.3 Back Buttering. For all applications, the stone tile shall be back buttered to achieve, as close as practical, 100% adhesive contact between the stone and the backup.

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



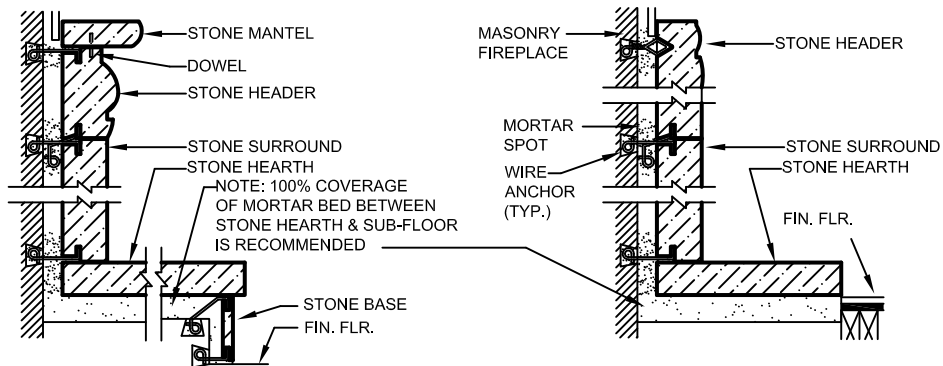
1 PLAN DETAIL
Scale: 1/2" = 1'-0"

2 PLAN DETAIL
Scale: 1/2" = 1'-0"



3 ELEVATION
Scale: 1/2" = 1'-0"

4 ELEVATION
Scale: 1/2" = 1'-0"



A SECTION
Scale: 1 1/2" = 1'-0"

B SECTION
Scale: 1 1/2" = 1'-0"



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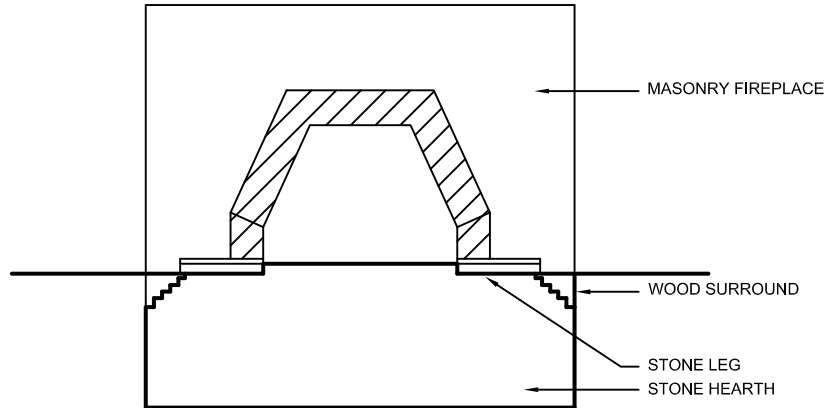
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STONE FIREPLACE FACINGS
TYPICAL DETAILS

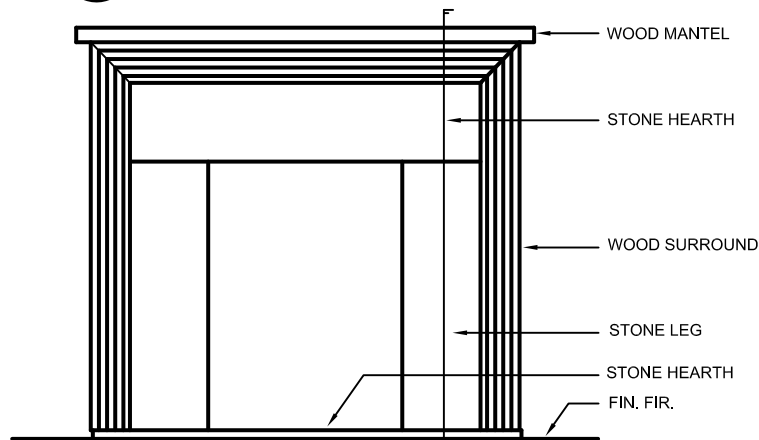
MIA DIMENSION STONE DESIGN MANUAL VII

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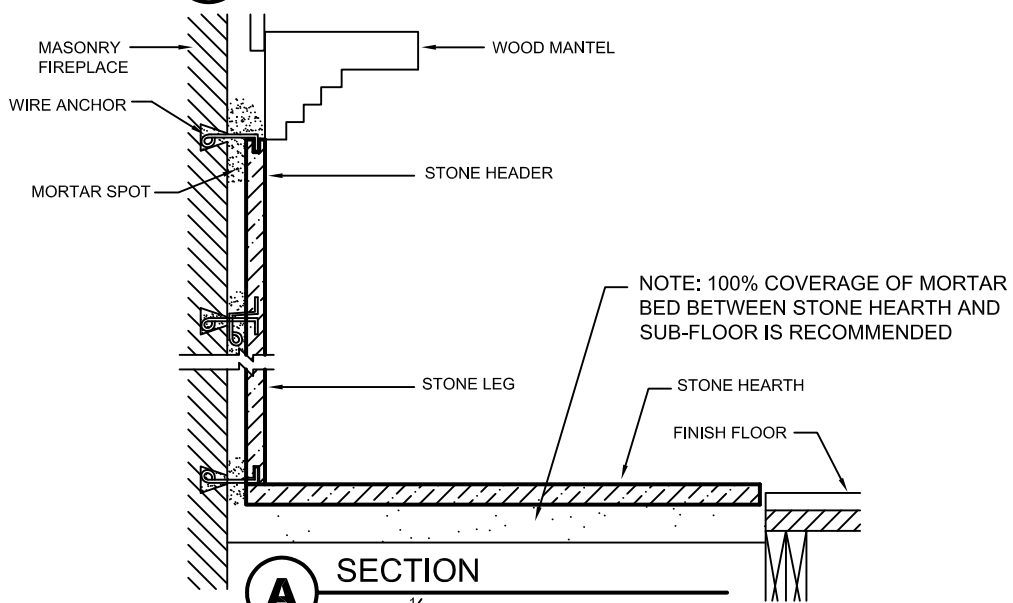
SCALE:
As Noted



1 PLAN DETAIL
Scale: 1/2" = 1'-0"



2 ELEVATION
Scale: 1/2" = 1'-0"



A SECTION
Scale: 1/2" = 1'-0"



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STONE FIREPLACE FACINGS
TYPICAL DETAILS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 15-D-24

SCALE:
As Noted