HORIZONTAL SURFACES - EXTERIOR STONE PAVING

1.0 INTRODUCTION

1.1 Installation Methods. Stone paving can be installed by several methods. Consideration should be given to the various features of each method in making a selection for a specific installation. See illustrations of installation examples at the close of this section.

2.0 DESIGN CRITERIA

2.1 Class of usage establishes the abrasion resistance a stone requires to withstand the foot traffic requirements of the project. This is determined according to the ASTM C241 test for abrasion resistance as measured by abrasive hardness (Ha). There are three classes of usage for stone flooring:

2.1.1 Light Traffic class is reserved for residential use where there is relatively little traffic and/or shoes are not always worn. Stone must have an Ha of 6.0 minimum.

2.1.2 Moderate Traffic class is reserved for residential entranceways and small commercial installations. Foot traffic is less than 50 persons/minute. Stones must have an Ha of 7.0 minimum, increasing up to 10.0 at maximum of 50 persons/minute.

2.1.3 Heavy Traffic class is reserved for commercial installations (banks, shopping malls, train or bus stations, etc). Foot traffic is over 50 persons/minute. Minimum Ha is 10.0, increasing to 12.0 for stairways, elevator halls, and other concentration areas. Exterior paving should always have a minimum Ha of 12.0.

It must be noted that these classifications are for the stone's abrasion resistance only. The stone's finish (polished, honed, thermal, etc.) will wear with traffic. Polished finish stones are not suitable for most moderate and any heavy-traffic areas. Thermal finish is recommended for exterior paving.

2.2 Physical Property Values. Final design should always be based on specific property values of the stone to be used. These values may be obtained from the Stone Supplier. When reliable physical property data is not available from the supplier, re-testing of the stone should be considered.

2.3 Hollow Sound. Because of the weight and consequent difficulties in handling large-sized pavers, it is impossible to avoid an occasional "hollow" sound found in some stone units after installation.

2.4 Reasons for hollow sounds include:

2.4.1 Frequently, a hollow sound is interpreted to mean the stone is not bonded properly.

2.4.2 Hollow sounds may be acoustical effects rather than bonding problems.

2.4.3 Air may be entrapped in either the setting bed or slab, causing one part of the floor to sound differently than another.

2.4.4 Separation or crack-isolation membranes installed between a slab and the setting bed may alter the sound report.

2.4.5 The elevation or composition of the subsurface may be irregular, causing one part of the floor to sound differently than another.

2.5 Bonding Test. If it is necessary to test the bond of a stone, the following procedure is to be used:

2.5.1 Ungrouted Stone. An epoxy-bonded fixture may be used to test the bond. A tensile strength of more than 50 lbs/in² would indicate sufficient bond.

2.5.2 Grouted Stone. 55 lbs/in² would indicate sufficient bond. Any cracking in the grout joint is considered failure.

2.5.3 Determination of Shear Strength. The weight per square foot of the stone must be added to the test load. If the test is to indicate bonding of the setting bed to the substrate, the weight per square foot of the setting bed should be included in the calculation.

2.5.4 Test Load. Stone should withstand the test load for five (5) minutes.

2.6 Width of Joints Between Stones. Joints between stones should be of sufficient width to ensure that the grout being used can be placed at the bottom face of the stone. This would normally be at least ¼" and preferably 3/8".

2.6.1 Where vertical surfaces meet horizontal paving, the material of choice is elastic sealant over grout. These joints should be at least 3/8" in width.

2.6.2 In areas close to water, it is recommended to use elastic sealant in lieu of grout. Joint width should be at least ¼" and preferably 3/8".

2.6.3 Grout should be selected for its ability to restrict movement of water between the stone paving units. Harder grouts will tend to have engineering qualities superior to softer or "designer" grouts. Make sure that the grout bonds well to the stone paving units.

2.7 Stone dust must be washed off the pavers prior to installation.

2.8 Minimum Thickness. Suggested minimum thickness for commercial exterior stone pavers is 1¼".

2.9 Setting Bed. White portland cement is recommended as a setting bed for light colored granite and marble. White portland cement with a low alkali content is recommended for limestone.

2.10 For additional information, refer to Chapter 13, INSTALLATION - GENERAL INFORMATION.

2.11 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.

DATA SHEET

EXTERIOR STONE PAVING

1.0 PRODUCT DESCRIPTION

1.1 Basic Use. Exterior paving for plazas, promenades, and similar applications.

1.2 Limitations. If several varieties of stone are used together, care should be taken to ensure that the abrasive hardness (Ha) of the stones is similar. Proper testing (ASTM C241 or ASTM C1353) should be performed on each stone variety.

1.3 Fabrication. Stone paving units are precut and prefinished to dimensions specified on shop drawings, and are delivered to the job site ready to install.

1.4 Classifications. Stones selected for exterior paving generally should have a minimum Ha of 12.0. If marble is selected, it should be a Soundness Classification Group A or B marble.

1.5 Finishes. Abrasive, natural cleft, thermal, and rough sawn finishes are recommended for exterior paving.

1.6 Colors. Any of the commercially available varieties are suitable.

1.7 Sizes. Size and thickness should be based on:

1.7.1 Flexural Strength (per ASTM C880) of the stone

1.7.2 The unsupported span.

1.7.3 The anticipated load.

1.7.4 Standard thicknesses are 1¼", 1½", and 2" or greater may be required.

1.8 Movement Joints. All stone paving systems shall include adequate movement joints. Refer to TCNA EJ 171 for movement joint design.

2.0 TECHNICAL DATA

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

2.1.1 Granite: ASTM C615 Standard Specification for Granite Dimension Stone

2.1.2 Limestone: ASTM C568 Standard Specification for Limestone Dimension Stone

2.1.3 Marble: ASTM C503 Standard Specification for Marble Dimension Stone (Exterior)

2.1.4 Quartz-Based Stone: ASTM C616 Standard Specification for Quartz-Based Dimension Stone

2.1.5 Serpentine: ASTM C1526 Standard Specification for Serpentine Dimension Stone

2.1.6 Slate: ASTM C629 Standard Specification for Slate Dimension Stone

2.1.7 Soapstone: No ASTM Standard exists at this time

2.1.8 Travertine: ASTM C1527 Standard Specification for Travertine Dimension Stone

3.0 INSTALLATION

3.1 Mortar Bed Bonded to Concrete Subsurface

3.1.1 Preparatory Work. Adequate slope for surface drainage must be provided in rough concrete slab. Before being installed, all stone must be clean and free of foreign matter of any kind.

3.1.2 Method. Stone paving should be installed in a full mortar bed consisting of one part portland cement and from four to five parts sand. Minimum thickness of a mortar bed is 1¼". The recommended thickness is 2". A bond coat of portland cement paste (slurry) is recommended.

3.1.3 Joints. The joints may be pointed with mortar, raked out to receive an approved sealant, or left entirely open to receive a resilient filler strip and approved sealant.

3.1.4 Latex. Mortar beds that are reinforced with latex may be applied in a thickness less than 1¼". Stones used in these applications should be at least 1¼" in thickness and the substrate should meet the deflection criteria recommended by the MIA.

3.1.5 Lippage. On smooth surface stones, lippage should be limited to ±1/32". On natural cleft stones, lippage will vary depending on the stone and the cleft. In those installations, joint width should be at least 3/8" to ½" and up to ¾" in width.

3.1.6 ADA Requirements. All stone floors should have a safe walking surface. Those concerned with this issue usually turn to the Americans with Disabilities Act (ADA) recommendations.

3.1.6.1 Slips and falls are frequently caused by merely a change in COF of a floor caused by, for example, a spilled beverage. Because of this, the maintenance of a floor is an important factor in its ability to provide a safe walking surface.

3.2 Corner Spot Method (Pedestal System)

3.2.1 Preparatory Work. Adequate slope for surface drainage must be provided in rough concrete slab. Before being installed, all stone must be clean and free of foreign matter of any kind.

3.2.2 Method. Stone slabs (pavers) should be set on bricks, plastic pods, or mortar spots of one part portland cement and from three to five parts sand, at or near the corners with the joints left entirely open for drainage (see illustration at the close of this section).

3.3 Sand Bed Method

3.3.1 Preparatory Work. Excavate sub-grade material and fill with crushed stone aggregate.

3.3.2 Method. Upon tamped and level bedding course of limestone screening or sand, lay stone pavers and tamp solid and level. Tamp sand tightly into joints (see illustration at the close of this section).

3.4 Thin Bed Method

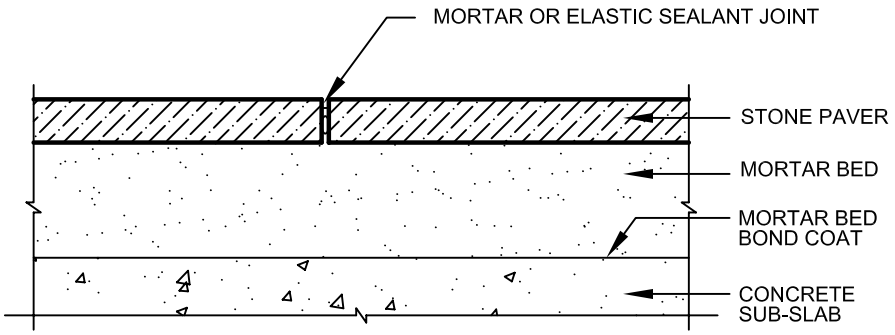
3.4.1 This method is not recommended for thick stone pavers.

3.4.2 Preparatory Work. Concrete subslab should be fine broom finished and free of cracks, wax, oily films, and curing compounds. Slope, when required, must be in subslab. Maximum variation in subslab cannot exceed 1/8" in 10'-0" from the required plane.

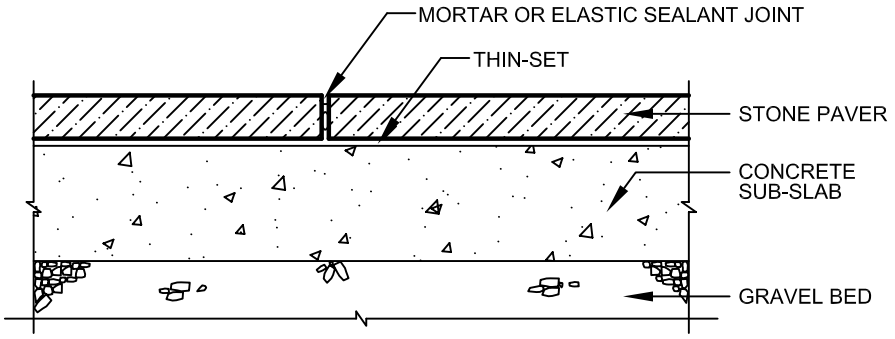
3.4.3 Method. Stone pavers should be installed in a mortar bed laid by notched trowel over sub-slab (see illustration on page 173).

3.4.3.1 Joints may be pointed with mortar, raked out to receive an approved sealant, or left entirely open to receive a resilient filler strip and approved sealant.

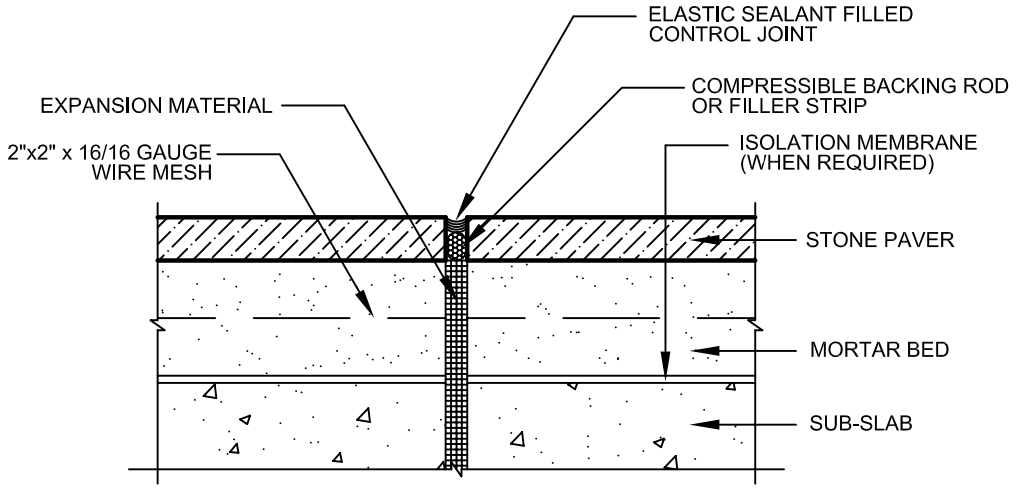
3.4.4 General Precaution. During construction, the General Contractor shall protect all stone from staining or damage.



1 MORTAR BED WITH BOND COAT



2 MORTAR BED WITH THINSET



3 FULL MORTAR BED WITH MEMBRANE AND EXPANSION JOINT

NOTE: *IT IS NOT THE INTENT OF THIS MANUAL TO MAKE EXPANSION, CONTROL, OR MOVEMENT JOINT RECOMMENDATIONS FOR A SPECIFIC PROJECT. THE SPECIFYING AUTHORITY MUST DESIGN AND LOCATE EXPANSION, CONTROL, AND MOVEMENT JOINTS ON THE CONSTRUCTION DOCUMENTS.*

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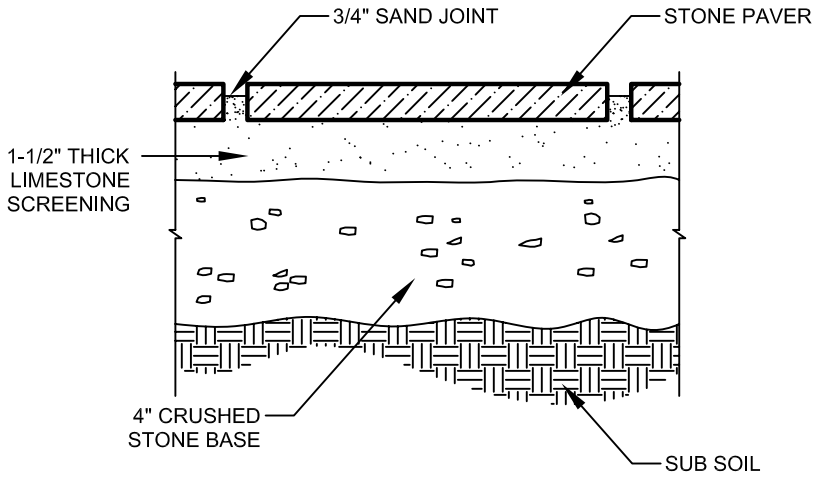
REV	DATE
0	Aug 2006
1	Oct 2006

EXTERIOR STONE PAVING

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 14-D-1

SCALE: 3" = 1'-0"



1 STONE PAVERS SET IN SAND BED

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REV	DATE
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1	Oct 2006

EXTERIOR STONE PAVING

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 14-D-2

SCALE: 3" = 1'-0"

HORIZONTAL SURFACES - INTERIOR STONE FLOORING

1.0 INTRODUCTION

1.1 Installation Methods. Interior stone flooring can be installed by several methods. Consideration should be given to the various features of each method in making a selection for a specific installation. (See Data Sheet Installation section and illustrations of installation examples at the close of this section).

2.0 DESIGN CRITERIA

2.1 Deflection. Setting stone flooring over a wood subfloor should only be attempted after subfloor has been reinforced to prevent excessive deflection. All wood frame construction surfaces to receive stone are to have a maximum deflection of L/720. All concrete floor surfaces must have a total load deflection of L/360.

2.2 Final Design. Final design should always be based on specific values for the stone to be used. If several varieties of stone are used together in an alternating pattern, care should be taken to ensure that the abrasive hardness (Ha) values of the stones selected are similar. These values may be obtained from the Stone Supplier. Abrasive hardness is determined by testing in accordance with ASTM C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic. (Note: abrasion resistance does not measure values for coefficient of friction or slip resistance.)

2.2.1 The Americans With Disabilities Act (ADA) recommends that walking surfaces have an adequate static coefficient of friction so as to provide a safe walking surface. Local building codes take precedence. Natural stone used for paving provides an adequate walking surface when properly maintained. Proper maintenance includes prompt cleanup of spills and correcting other conditions that can cause a sudden reduction in a floor's static coefficient of friction.

2.3 Setting Systems. Because granite, limestone, marble, quartz-based stone, and slate tiles can be installed in certain thin-bed setting systems in the same manner as ceramic tiles, the current Tile Council of North America Handbook may be referred to for details. Attention should be given to placement of control and expansion joints.

2.4 Curing Compounds. Check the concrete slab to ascertain the presence of curing compounds. If a curing compound is present, remove it by bead blasting ro scarification prior to stone installation to facilitate proper bonding. The concrete must be free of sealers, coatings, oil, dirt, and dust, and must be dry.

2.5 Stone dust must be washed off the stone units prior to installation.

2.6 Minimum Thickness. Suggested minimum thickness for commercial stone floors is ¾". Whereas a polished-finish granite generally withstands foot traffic, a honed-finish marble or limestone is recommended for commercial floor use.

2.6.1 Stones with a hardness value of a minimum of 12.0 as measured by ASTM C241 or ASTM C1353 should be used. These values may be obtained from the Stone Supplier.

2.6.2 If marble is used, a Soundness Classification of "A" or "B" is recommended; marbles with lesser soundness can be considered if waxing, sticking, filling, cementing, and reinforcing are properly done.

2.7 Joint width should always be specified. Thin stone tiles (nominal ½" and less) are normally manufactured to tolerances which require a minimum joint of 3/32".

Custom-fabricated stonework can be properly installed with joints as small as 1/16".

2.8 Joint Width Tolerance. The tolerance of a joint width is determined by the dimensional tolerance of the stone being used. In general, joint widths should be accurate to the greater of 25% of the joint width being used or ±1/32". MIA recommends use of joint spacers. Joints should always read true and straight.

2.9 Lippage. Adjacent stone flooring or tile units with smooth finishes shall not have lippage (offset in plane of finished surface) exceeding 1/32".

2.10 Stone Abuts Softer Floor Material. Where stone abuts softer flooring materials, a stone threshold or metal edge protection strip may be used. This will help prevent edge chipping caused by impact.

2.11 Grout. Sanded or unsanded grout, or nonstaining sealant, can be used as joint filler. If sanded grout is used, tape the face of the stone tile before filling the joints to avoid scratching them.

2.12 Stone Weight. The approximate weight of stone can be estimated as one pound per square foot per every 1/16" of thickness.

2.13 Mortar Bed Weight. Typically, a 1" thick mortar bed will weigh approximately 12 lb per square foot.

2.14 Water-Based Adhesives. Avoid the use of water-based adhesives when installing certain green-colored stones. Obtain additional information from the Supplier.

2.15 White portland cement is recommended as a setting bed for light-colored granite and marble. White portland cement with a low alkali content is recommended for limestone.

2.16 Hollow Sound. Because of the inherent handling and setting difficulties encountered working with stone, it is impossible to avoid the occasional "hollow sound" found in some stone units after installation. Refer to examples at the close of this section.

2.17 Other Resources. Check current edition of the Tile Council of North America Handbook for additional installation methods and details.

2.18 Traffic After Installation. After the stone flooring has been installed, the General Contractor must keep all traffic off the floors for at least 48 hours. No heavy traffic should be permitted on newly installed stone flooring surfaces for at least two weeks after the floor has been grouted.

2.19 Sealing. Marble Institute of America (MIA) recognizes the benefits that sealers can provide in certain applications. MIA recommends that care be exercised in the application of any chemical to a stone's surface. Although normally harmless in and of themselves, some sealers have reportedly reacted with some cleaning/maintenance chemicals and/or with components within the stone surface, causing some reactions. Consult Stone Supplier for recommendations on sealing.

2.20 For additional information, refer to Chapter 13, INSTALLATION - GENERAL INFORMATION.

2.21 Geographic Methods. Some installation methods and materials are not recognized and may not be suitable in some geographical 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.

DATA SHEET

INTERIOR STONE FLOORING

1.0 PRODUCT DESCRIPTION

1.1 Basic Use. As interior flooring for commercial, institutional, and residential use.

1.2 Abrasive Hardness. If several varieties of stone are used together, care should be taken to ensure that the abrasive hardness (Ha) of the stones selected is similar, particularly when using stones of lower abrasion resistances.

1.3 Flatness and Lippage. As a general rule, the recommended maximum variation of the finished surface should be no more than 1/8" cumulative over a 10'-0" lineal measurement, with no more than 1/32" variation between smooth-surfaced tiles.

1.3.1 Natural cleft and other irregular-surfaced stone tiles should have minimum joints of ¼", with joint widths up to ½" recommended. Stones so supplied will not be able to meet the 1/32" lippage standard

1.4 Deflection. Stone flooring should not be installed over a wood subfloor unless it is reinforced to limit deflection to allowable values. The wood floor areas over which stone tile is to be applied must be designed to a deflection not exceeding L/720 of the span. Cross-bridging or other reinforcement shall be used to limit differential deflection between adjacent framing members.. All concrete floor surfaces must have a total load deflection of L/360.

1.4.1 Allowance should be made for live load and impact as well as all dead load, including weight of stone and setting bed.

1.4.2 Plywood shall be installed with a gap for expansion between sheets. Refer to APA form No. E30 for plywood installation methods.

1.5 Fabrication. Stone flooring units are precut and prefinished to dimensions specified on shop drawings, and are delivered to the job site ready to install. Alternatively, stone flooring units may be field cut at the installation site.

1.6 Finishes. Polished, honed, abrasive, thermal, and natural cleft.

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

1.8 Sizes. Standard thicknesses vary from ¼" to 2", depending on area and method of installation.

2.0 TECHNICAL DATA

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

2.1.1 Granite: ASTM C615 Standard Specification for Granite Dimension Stone

2.1.2 Limestone: ASTM C568 Standard Specification for Limestone Dimension Stone

2.1.3 Marble: ASTM C503 Standard Specification for Marble Dimension Stone (Exterior)

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

2.1.5 Slate: ASTM C629 Standard Specification for Slate Dimension Stone

2.1.6 Serpentine: ASTM C1526 Standard Specification for Serpentine Dimension Stone

2.1.7 Soapstone: No ASTM Standard exists at this time

2.1.8 Travertine: ASTM C1527 Standard Specification for Travertine Dimension Stone

3.0 INSTALLATION

3.1 Preparatory Work. Before installation, all stone should be clean and free of foreign matter.

3.2 Methods. Interior stone flooring is installed by one of the following methods.

3.3 Mortar Bed Bonded to Concrete Subfloor

(Recommended for installation of larger pieces [slabs].)

3.3.1 This method is used where the concrete sub-floor is not subject to movement or deflection. A mortar bed consisting of one part portland cement to four to five parts sand is laid over the concrete subfloor to a nominal thickness of 1¼". Stone tiles buttered with a cement paste are laid over the mortar bed and tamped into a true and level plane. Joints are grouted with a portland cement based grout or other approved material. (See Detail at the close of this section).

3.4 Mortar Bed Separated From Concrete Subfloor

(Recommended for installation of larger pieces [slabs].)

3.4.1 This method is used where the concrete sub-floor is subject to movement and deflection. Mortar bed floats over the slab and minimizes the possibility of stone cracking from structural movement. A crack isolation, crack suppression, or cleavage membrane conforming to ANSI 118.10 or 118.12 is installed over the concrete subfloor. A mortar bed consisting of one part portland cement to four to five parts sand and reinforced with 2" x 2" x 16/16-gauge welded wire mesh is laid over the membrane, if deemed necessary. Stone tiles are laid over the mortar bed and tamped into proper plane. Joints are grouted with a portland cement based grout or other approved material. (See Detail at the close of this section).

3.5 Mortar Bed Separated From Wood Subfloor

3.5.1 This method is used where subfloor is subject to movement and deflection. Mortar bed floats over subfloor and minimizes possibility of stone cracking from structural movement. An isolation membrane is laid over the sub-floor. A mortar bed consisting of one part portland cement to four to five parts sand and reinforced with 2" x 2" x 16/16-gauge welded wire mesh is laid over the membrane. Stone tiles are laid over the mortar bed and tamped into proper plane. Joints are later grouted with a portland cement based grout or other approved material. (See Detail 3 at the close of this section).

3.6 Thin Bed Over Wood Subfloor

3.6.1 This method should be used only in residential and light construction, and then only if a structurally sound subfloor can be provided. Subfloor must be level with a maximum variation of 1/16" in 3'-0", and a deflection limited to L/720. Cross-bridging or other reinforcement shall be used to limit differential deflection between adjacent framing members. Apply mortar with flat side of trowel over an area that can be covered with tile while mortar remains plastic. Within ten minutes and using a notched trowel sized to facilitate the proper coverage, comb the mortar to obtain an even setting bed without scraping backing material. Key the mortar into the substrate with the flat side of the trowel. Back butter the stone tiles to ensure 100% contact on 3/8" tile, and not less than 80% contact on ¾" or thicker material. All corners and edges of stone tiles must always be fully supported and contact shall always be 100% in water-susceptible conditions. Joints

are later grouted with a portland cement based grout or other approved material. (See Detail at the close of this section).

3.7 Thin-Bed Portland Cement Mortar Over Concrete Subfloor

3.7.1 This method is used when space for full mortar bed is not possible. Concrete subfloor should not be subject to movement or excessive deflection. Subfloor must be level with maximum variation of 1/8" in 10'-0". Mortar bed is laid using a notched trowel over subfloor to a thickness of not greater than 3/32". Apply mortar with flat side of trowel over an area that can be covered with tile while mortar remains plastic. Within ten minutes and using a notched trowel sized to facilitate the proper coverage, comb mortar to obtain an even setting bed without scraping the backing material Key the mortar into the substrate with the flat side of the trowel. Back butter the stone tiles to ensure 100% contact on 3/8" tile, and not less than 80% contact on ¾" or thicker material. All corners and edges of stone tiles must always be fully supported and contact shall always be 100% in water-susceptible conditions. Joints are later grouted with a portland cement based grout or other approved material. (See Detail at the close of this section).

3.8 Thin-Bed Mortar Over Cementitious Backer Units

3.8.1 This method should be used only in residential and light construction, and then only if a structurally sound subfloor can be provided. Subfloor must be level with a maximum variation of 1/16" in 3'-0", and a deflection not exceeding L/720. Cross-bridging or other reinforcement shall be used to limit differential deflection between adjacent framing members.. Apply mortar with flat side of trowel over an area that can be covered with tile while mortar remains plastic. Within ten minutes and using a notched trowel sized to facilitate the proper coverage, comb mortar to obtain an even setting bed without scraping the backing material. Key the mortar into the substrate with the flat side of the trowel. Back butter the stone tiles to ensure 100% contact on 3/8" tile, and not less than 80% contact on ¾" or thicker material. All corners and edges of stone tiles must always be fully supported and contact shall always be 100% in water-susceptible conditions. Joints are later grouted with a portland cement based grout or other approved material. (See Detail 6 on page 181).

4.0 HEATED FLOOR SYSTEMS

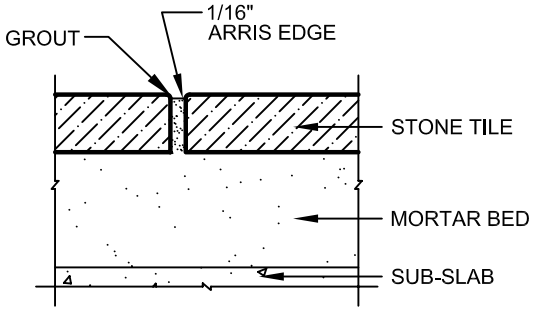
4.1 Load Deflection. The wood substrate must not exceed a total load deflection of L/720. Cross-bridging or other reinforcement shall be used to limit differential deflection between adjacent framing members… All concrete floor surfaces must have a total load deflection of L/360.

4.2 In frame construction, the plywood portion of the substrate must be a minimum of 1½" exterior glue plywood. Leave a gap between the plywood sheets for expansion. Install a cleavage membrane over the plywood.

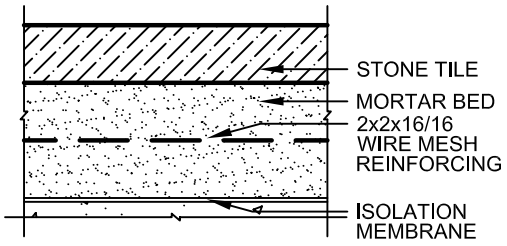
4.3 Frame and Mortar Bed. Heated floor systems are generally proprietary in nature, and the manufacturer's installation guidelines shall be closely followed. Consider using a heat deflector on top of the membrane. The Heating Contractor should install the heating system per Manufacturer's recommendation. Fill cavity with a wire or fiber-reinforced portland mix so that the mortar bed covers pipes and is at least ¾" over the top of heating pipes, with a minimum bed thickness of 2½". Allow to cure for at least 30 days. This mortar bed thickness is necessary to dissipate heat to avoid damaging the stone by uneven heating. Follow applicable Data Sheet Installation methods listed previously, but first install a crack-suppression or uncloupling membrane

according to Manufacturer's recommendation.

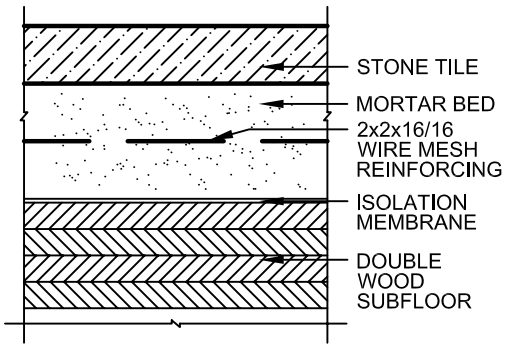
NOTES:



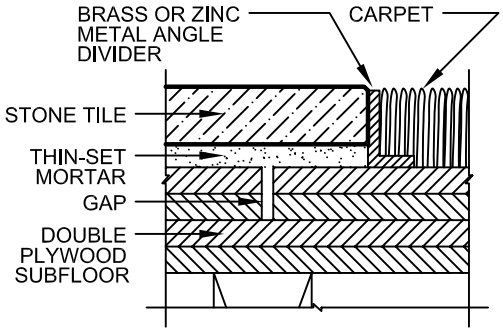
1 STONE TILE SET IN MORTAR BED



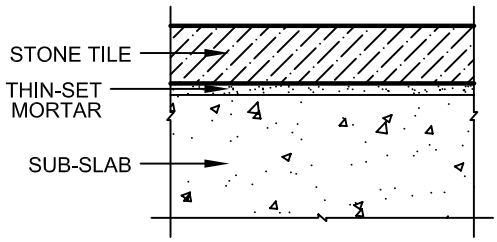
2 STONE TILE SET IN REINFORCED MORTAR BED



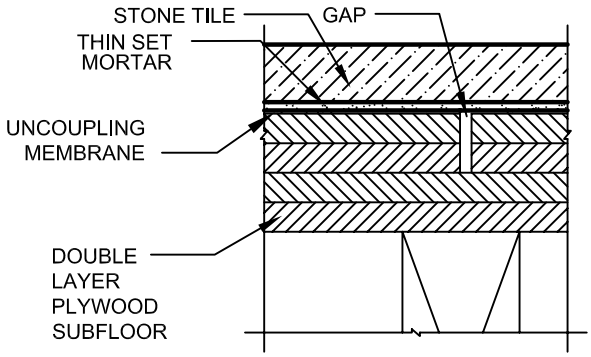
3 STONE TILE SET IN REINFORCED MORTAR BED OVER WOOD FRAME



4 STONE TILE SET IN THIN-SET BED AT STONE/CARPET TRANSITION



5 STONE TILE SET IN THIN-SET BED OVER CONCRETE SLAB



6 STONE TILE SET IN THIN-SET BED WITH UNCOUPLING MEMBRANE OVER WOOD FRAME

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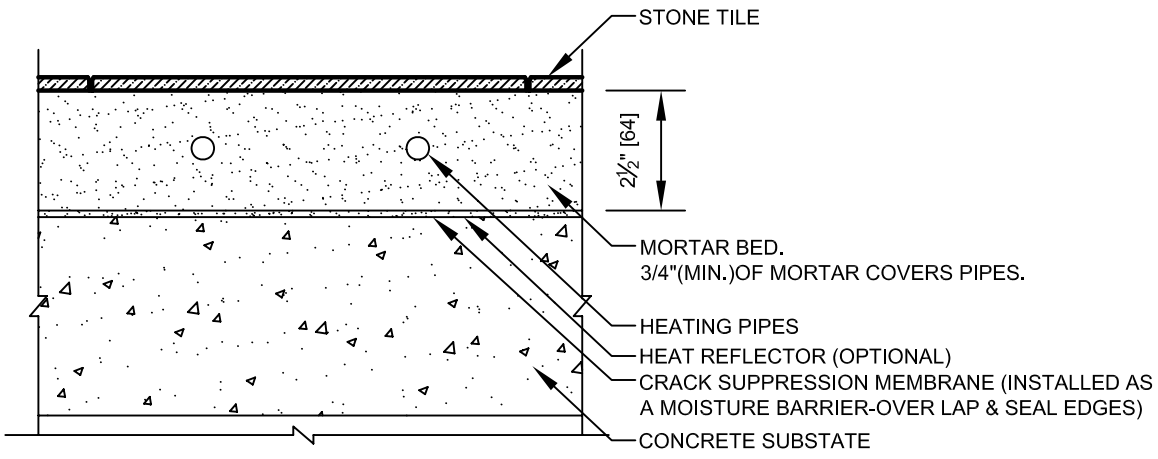
REV	DATE
0	Aug 2006
1	Oct 2006

INTERIOR STONE FLOORING

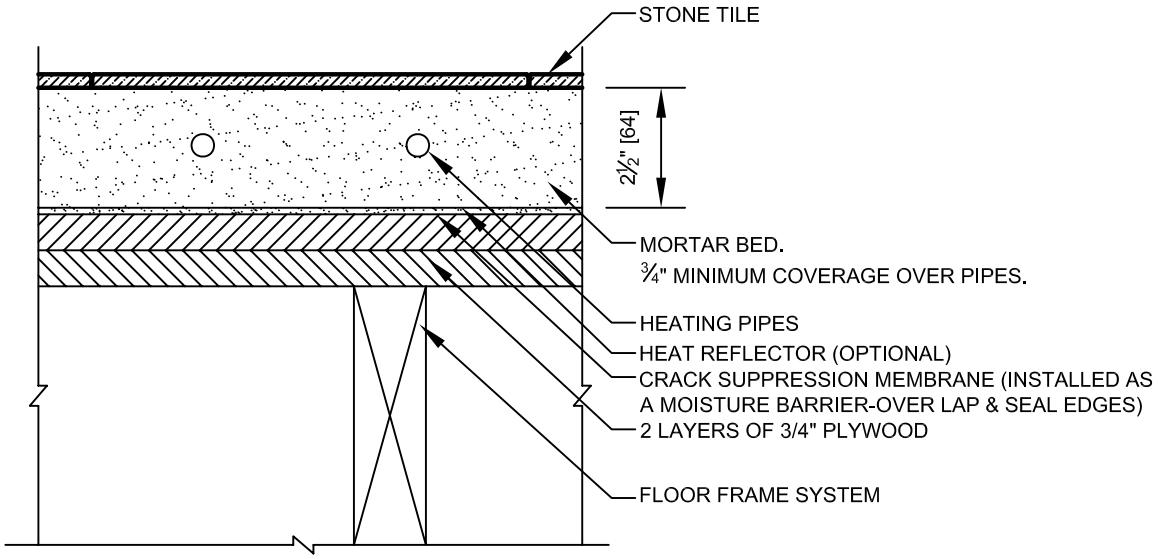
MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 14-D-3

SCALE: 3" = 1'-0"



1 STONE TILE OVER HYDRONIC RADIANT HEAT SYSTEM WITH CONCRETE SUBSTRATE



2 STONE TILE OVER HYDRONIC RADIANT HEAT SYSTEM WITH WOOD FRAME SUBSTRATE

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INTERIOR STONE PAVING
RADIANT HEAT DETAILS
MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 14-D-4

SCALE: 3" = 1'-0"

HORIZONTAL SURFACES - STONE THRESHOLDS

1.0 INTRODUCTION

1.1 Installation Methods. Stone thresholds can be installed by several methods. Consideration should be given to the various features of each method in making a selection for a specific installation. (See Data Sheet Installation section and illustrations of installation examples at the close of this section).

2.0 DESIGN CRITERIA

2.1 Thresholds. By acting as a transitional piece between two different finished floor levels, thresholds permit the use of the conventional, thick-bed mortar method in rooms where it would not otherwise be possible. They also can be used with thin-set methods.

2.2 Abrasive Hardness. Care should be taken to ensure the abrasive hardness (Ha) of the varieties selected is a minimum of 12.0 as measured by ASTM C241. These values may be obtained from the Stone Supplier.

2.3 Stone Abuts Softer Floor Material. Where stone abuts softer flooring materials, stone thresholds or metal edge protection profiles may be used. This will help prevent chipping caused by impact.

2.4 Traffic After Installation. After the stone thresholds have been installed, the General Contractor must keep all traffic off the thresholds for at least 48 hours. No heavy traffic should be permitted on newly installed stone flooring surfaces for at least two weeks.

2.5 White portland cement is recommended as a setting bed for light-colored granite and marble. White portland cement with a low alkali content is recommended for limestone.

2.6 Exposed edges may be eased, rounded, arrised or beveled. If instructions are not given as to type of edge required, Supplier will furnish according to industry standards.

2.7 For additional information, refer to Chapter 13, INSTALLATION - GENERAL INFORMATION.

2.8 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.

DATA SHEET

STONE THRESHOLDS

1.0 PRODUCT DESCRIPTION

1.1 Basic Use. Floor structural element that lies below a door or other entranceway.

1.2 Limitations. Only varieties having a minimum abrasive hardness (Ha) of 12.0, as measured by ASTM C241, are recommended.

1.3 Fabrication. Stone thresholds are precut and prefinished to dimensions specified on shop drawings, and delivered to the job site ready to install.

1.4 Finishes. Polished and honed.

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

1.6 Sizes. Thicknesses of ½", ¾", and 1¼", or as specified.

2.0 TECHNICAL DATA

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

2.1.1 Granite: ASTM C615 Standard Specification for Granite Dimension Stone

2.1.2 Limestone: ASTM C568 Standard Specification for Limestone Dimension Stone

2.1.3 Marble: ASTM C503 Standard Specification for Marble Dimension Stone

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

2.1.5 Slate: ASTM C629 Standard Specification for Slate Dimension Stone

2.1.6 Serpentine: ASTM C1526 Standard Specification for Serpentine Dimension Stone

2.1.7 Soapstone: No ASTM Standard exists at this time

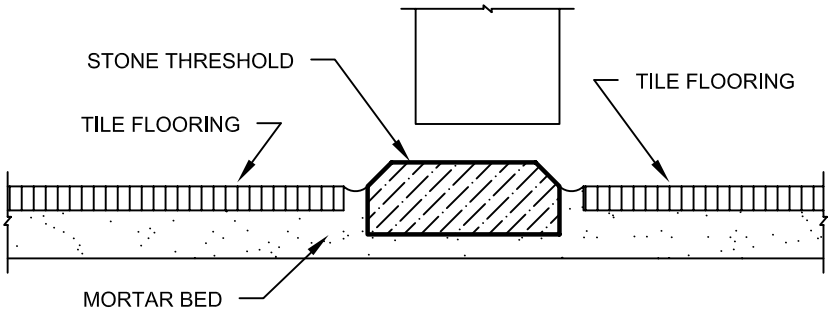
2.1.8 Travertine: ASTM C1527 Standard Specification for Travertine Dimension Stone

3.0 INSTALLATION

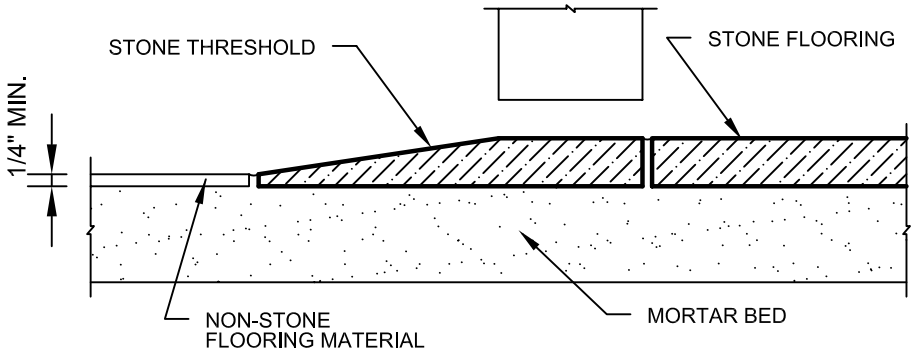
3.1 Methods. Stone thresholds may be installed using a cement mortar bed, epoxy mortar, or any of the thin-set mortar methods. (See detail illustrations at the close of this section).

100% coverage of mortar bed material between threshold and subfloor is recommended.

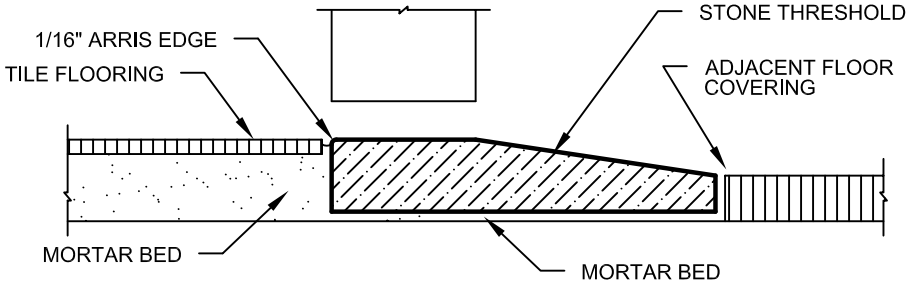
3.2 General Precaution. During construction, the General Contractor shall protect all stone from staining or damage.



1 MEDIUM BED MORTAR METHOD



2 FULL MORTAR BED METHOD



3 THIN-SET METHOD

NOTE: USE 100% COVERAGE OF BOND COAT MATERIAL BETWEEN THRESHOLD AND SUB-SLAB.

NOTE: Minimum Abrasive Hardness Of Threshold Material Should Be 12.0 (ASTM C241).

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STONE THRESHOLDS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 14-D-5

SCALE: 6" = 1'-0"

NOTES:

HORIZONTAL SURFACES - STONE STAIR TREADS

1.0 INTRODUCTION

1.1 Installation Methods. Stone stair treads can be installed by several methods, each dependent upon the design detail. Consideration should be given to the various features of each method in making a selection for a specific installation. (See Data Sheet Installation section and illustrations of installation examples at the close of this section).

2.0 DESIGN CRITERIA

2.1 Final design should always be based on physical properties of the stone to be used. If the open-tread detail is planned utilizing the stone tread as a structural member spanning the stringers, the thickness should be developed by an Engineer based on the strength properties furnished by the Stone Supplier.

2.2 Safety. Abrasive strips or filled grooves are recommended in heavy-traffic areas. These can be specified as shop fabricated or field installed.

2.3 Deflection. The backup for stone steps must be of limited (<L/720) deflection for installation of thin (1¼" or less) treads. If there is greater deflection, the thickness of the tread is determined by calculating the load and ensuring that the flexural strength (ASTM C880) of the stone is sufficient to resist the load. In any event, the minimum recommended thickness is 1¼" for treads and ¾" for risers.

2.4 Traffic After Installation. After the stone treads have been installed, the General Contractor must keep all traffic off the treads for at least 48 hours. No heavy traffic should be permitted on newly installed treads for at least two weeks.

2.5 Thin stone (½" and under) treads and risers may be installed using a thin-set portland cement mortar bed over clean and level concrete subtreads or double layers of ¾" plywood installed in opposite directions with 1/8" gaps between sheets. These types of applications will not withstand high impact or wheel loads. No overhang is permitted when stones of this thickness are used.

2.6 White portland cement is recommended as a setting bed for light-colored granite and marble. White portland cement with a low alkali content is recommended for limestone.

2.7 For additional information, refer to Chapter 13, INSTALLATION - GENERAL INFORMATION.

2.8 Geographic Methods. Some installation methods and materials are not recognized and may not be suitable in some geographical areas because of local trade practices, building codes, climatic conditions, or construction methods. Therefore, while every effort has been made to produce accurate guidelines, local building codes should be consulted for compliance.

DATA SHEET

STONE STAIR TREADS

1.0 PRODUCT DESCRIPTION

1.1 Basic Use. Horizontal top part of a step in a staircase.

1.2 Limitations. Only varieties having a minimum abrasive hardness (Ha) of 12.0 or more, as measured by ASTM C241, are recommended.

1.3 Finishes. Honed, polished, abrasive, thermal, and natural cleft for interior uses; rough, textured, abrasive, thermal, honed, and natural cleft for exterior uses.

1.4 Colors. Most of the commercially available varieties.

1.5 Sizes. Tread thicknesses of ¾", 1¼", and 1½" for interior uses. Thicknesses of 1½", 2" and cubic (greater than 2") for exterior. Risers may be ¾" or 1¼" thick.

2.0 TECHNICAL DATA

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

2.1.1 Granite: ASTM C615 Standard Specification for Granite Dimension Stone

2.1.2 Limestone: ASTM C568 Standard Specification for Limestone Dimension Stone

2.1.3 Marble: ASTM C503 Standard Specification for Marble Dimension Stone (Exterior)

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

2.1.5 Slate: ASTM C629 Standard Specification for Slate Dimension Stone

2.1.6 Serpentine: ASTM C1526 Standard Specification for Serpentine Dimension Stone

2.1.7 Soapstone: No ASTM Standard exists at this time

2.1.8 Travertine: ASTM C1527 Standard Specification for Travertine Dimension Stone

3.0 INSTALLATION

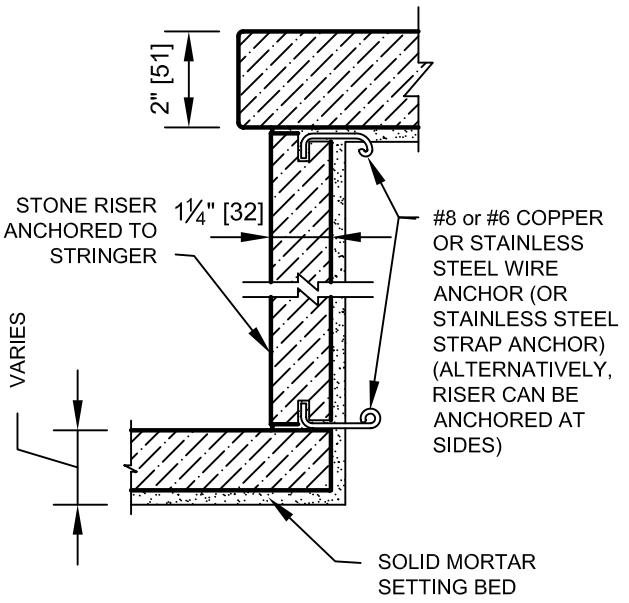
3.1 Methods. Stone stair treads may be installed in a cement mortar bed, or in a thin-set cement mortar bed, over a subtread, or supported by stringers. (See detail illustrations at the close of this section).

3.1.1 100% coverage of mortar bed material between tread and subtread is desirable.

3.1.2 Risers ¾" or thicker must be anchored with wire or stainless steel strap anchors. If risers thinner than ¾" are used, they may be installed using the thin-bed portland cement mortar method.

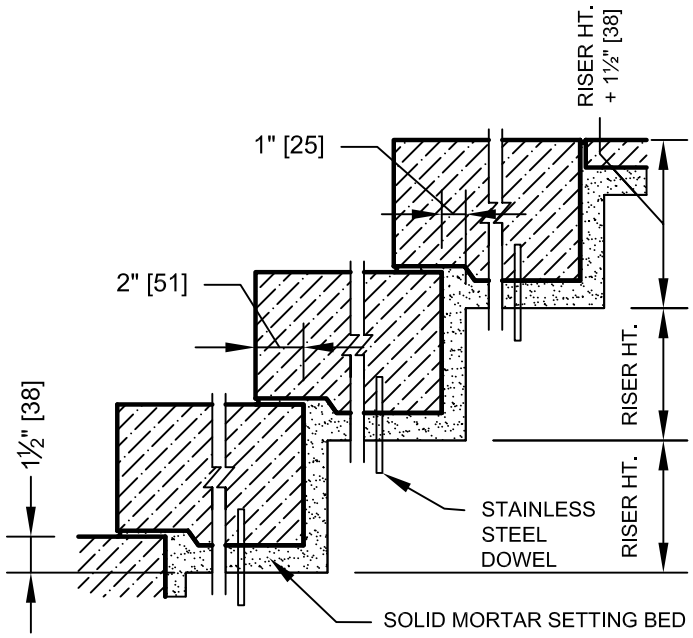
3.2 General Precaution. During construction, the General Contractor shall protect all stone from staining or damage.

NOTES:



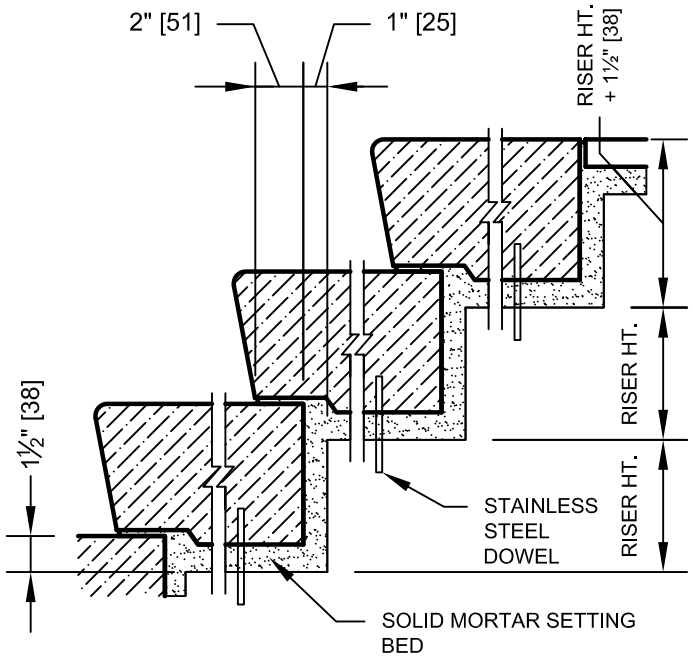
1 VENEERED STEP DETAIL

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



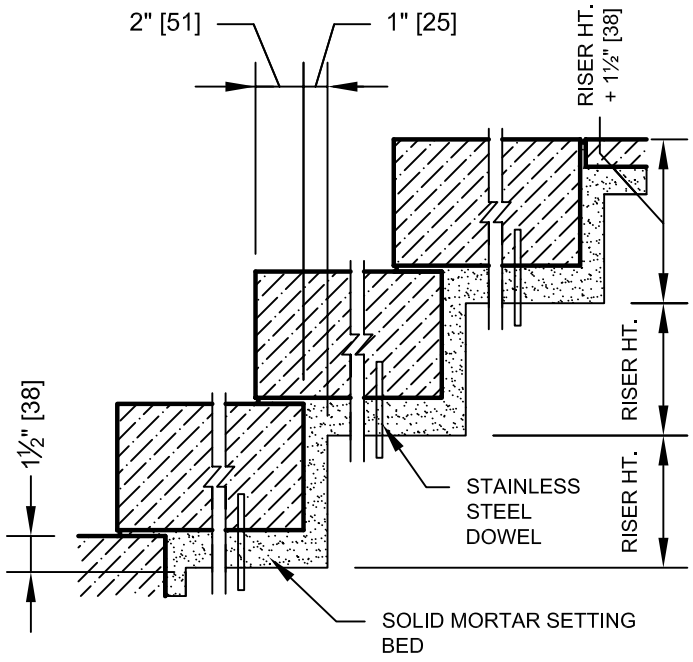
2 CUBIC STEP DETAIL

SCALE: 1½" = 1'-0" (1:8)



3 CUBIC STEP DETAIL

SCALE: 1½" = 1'-0" (1:8)



4 CUBIC STEP DETAIL

SCALE: 1½" = 1'-0" (1:8)

NOTES: *1. A ROUGH OR TEXTURED FINISH IS RECOMMENDED FOR EXTERIOR USAGE.*
2. MINIMUM ABRASION RESISTANCE OF 12.0 (TESTED PER ASTM C 241) IS RECOMMENDED FOR STONE TREADS.

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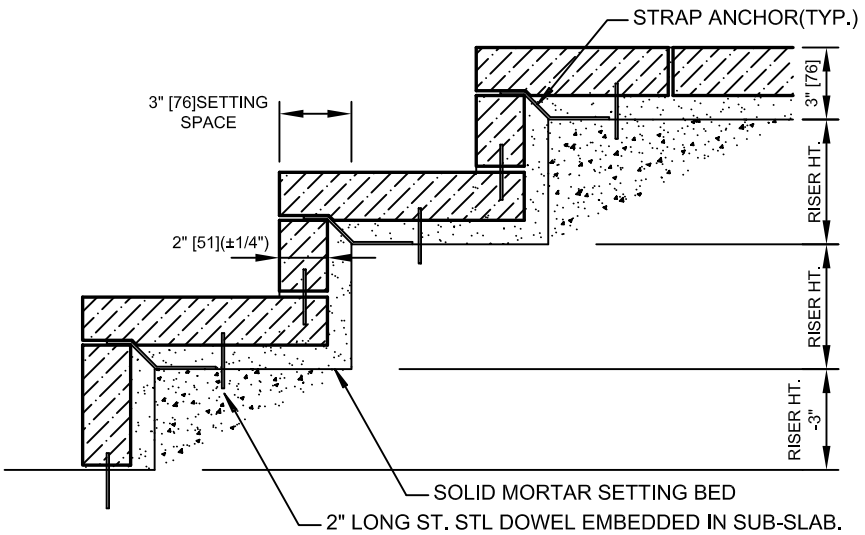
STONE STAIR TREAD DETAILS

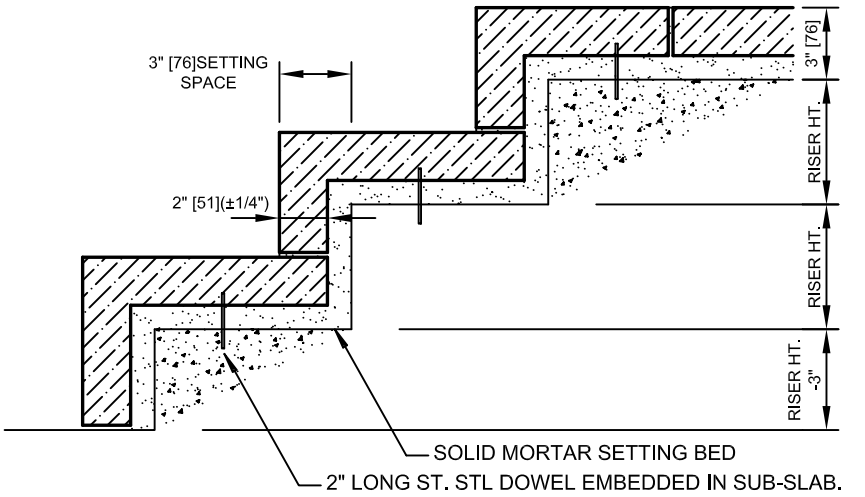
MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 14-D-6

SCALE: As Noted



5 VENEERED STEP DETAIL



6 HOOKED STEP DETAIL

NOTE: 1. A ROUGH OR TEXTURED FINISH IS RECOMMENDED FOR EXTERIOR USAGE.
2. MINIMUM ABRASIVE HARDNESS OF 12.0 IS RECOMMENDED FOR STONE TREADS(ASTM C241).
3. FABRICATION LABOR REQUIREMENTS COMMONLY MAKE DETAIL 6 A HIGHER COST ALTERNATIVE.

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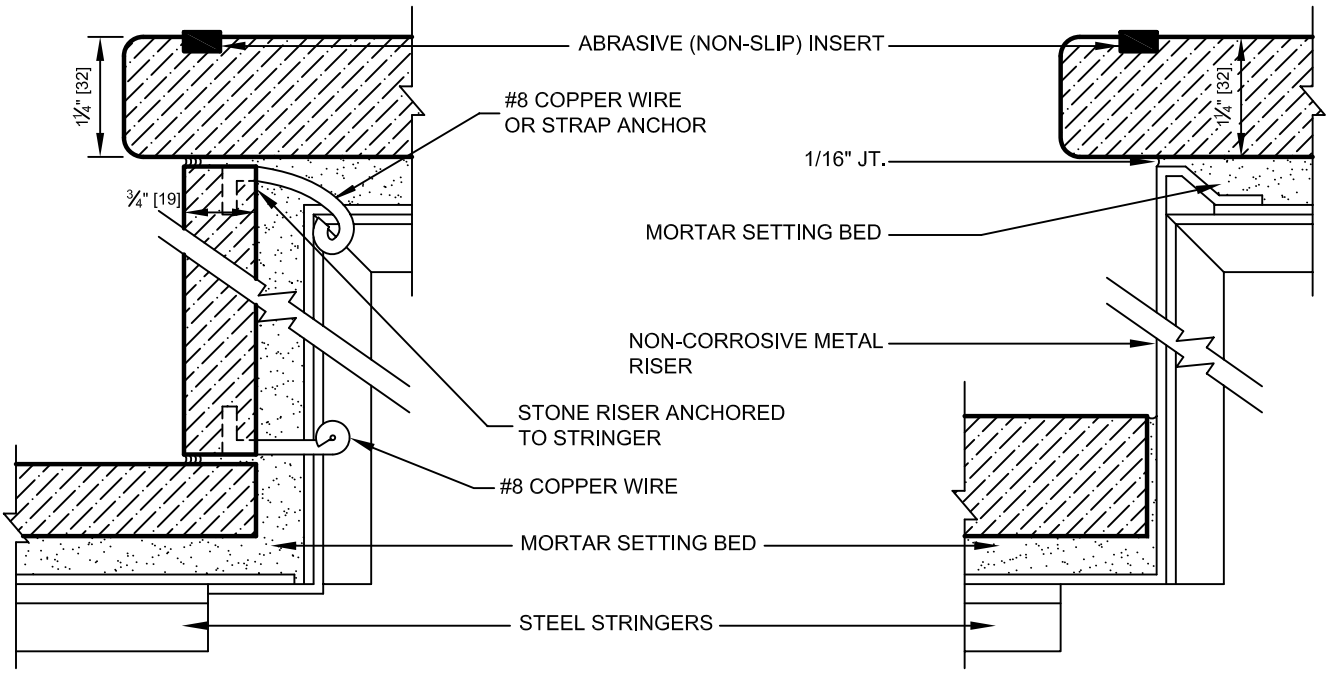
STONE STAIR TREADS

MIA DIMENSION STONE DESIGN MANUAL VII

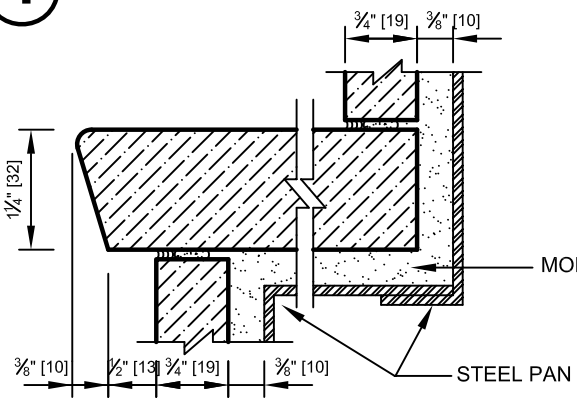
DRWG NO: 14-D-7

SCALE: 1½" = 1'-0"

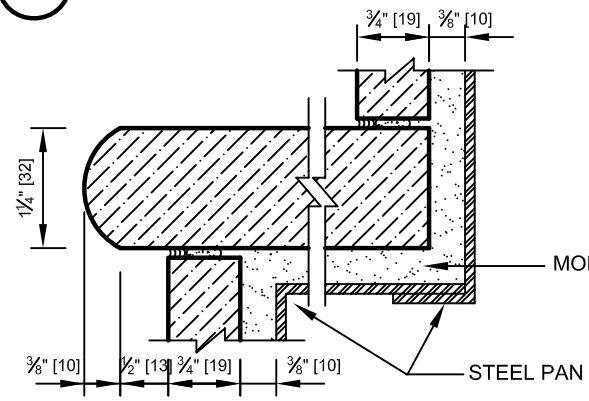


1 STEP DETAIL ON METAL PAN

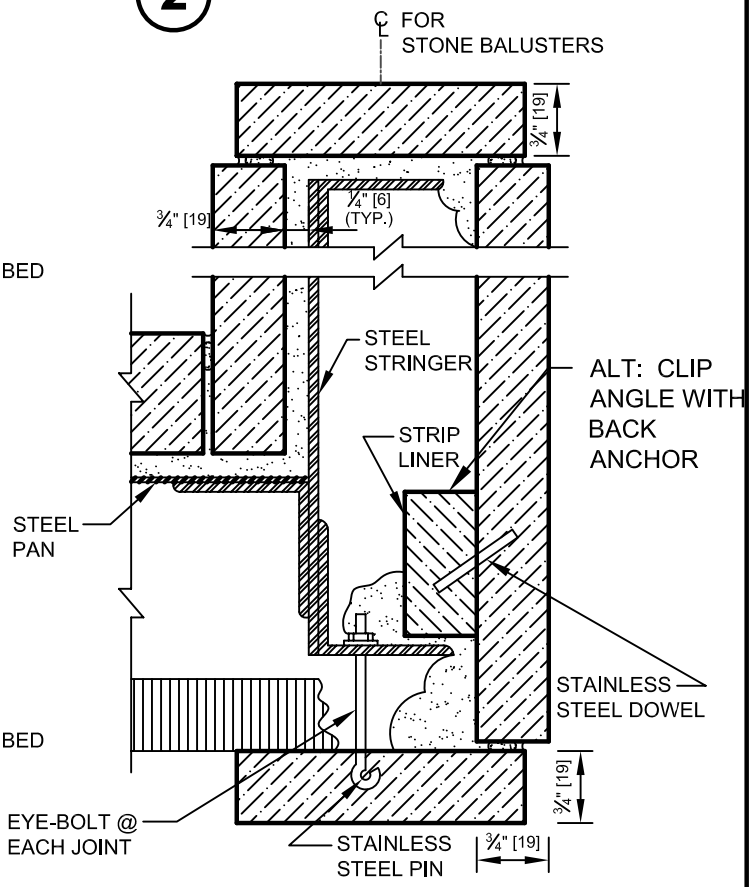
2 STEP DETAIL ON METAL PAN



3 STEP DETAIL ON METAL PAN



4 STEP DETAIL ON METAL PAN



5 STEP DETAIL ON METAL PAN

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STONE STAIR TREADS/TYPICAL DETAILS /INTERIOR TREADS

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 14-D-8

SCALE: 6" = 1'-0"