

SUPPLEMENTAL INFORMATION

HORIZONTAL SURFACES / INTERIOR STONE FLOORING SYSTEMS

SECTION 1. INTRODUCTION

- 1.01 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).
- 1.02 Abrasion Resistance.** See Introduction Section. (Note: abrasion resistance does not measure values for coefficient of friction or slip resistance.)

SECTION 2. RELATED COMPONENTS

- 2.01 TCNA Details.** Because natural stone tiles can be installed in certain thin-bed setting systems in the same manner as ceramic tiles, the current "Handbook for Ceramic Tile Installation" by the Tile Council of North America may be referred to for details. A list of details from this manual endorsed by the MIA is included in Chapter 13 of this manual.
- 2.02 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.
- 2.03 Grout.** Sanded or unsanded grout, or nonstaining sealant, can be used as joint filler. If sanded grout is used, mask the face of the stone tile before filling the joints to avoid scratching of the stone surface.
- 2.04 Stones Sensitive to Moisture and Alkalinity.** Stone suppliers shall identify stones that are adversely affected by moisture and alkalinity.
- 2.05 Setting Bed.** White Portland cement with low alkali content is recommended for light colored stone.
- 2.06 Bond Mortar.** White bond mortar is recommended for light colored stone.
- 2.07 Hollow Sound.** Refer to the section in introduction portion of this chapter.
- 2.08 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 rolling or heavy (greater than pedestrian) traffic should be permitted on newly installed stone flooring surfaces for at least two weeks after the floor has been grouted.
- 2.09 Sealing.** Reference Maintenance and Restoration Section of the DSDM for MIA position on sealers.

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

- 2.10 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.

SECTION 3. PRODUCT DESCRIPTION

- 3.01 Basic Use.** As interior flooring for commercial, institutional, and residential use.
- 3.02 Abrasive Hardness.** Reference Introduction Section.
- 3.03 Flatness.** The recommended maximum variation of the finished surface should be $\pm 1/8"$ over a 10'-0" lineal

measurement.

- 3.04 Fabrication.** Stone flooring units are precut and prefinished to dimensions specified on shop drawings, and delivered to the job site ready to install. Alternatively, stone flooring units may be field cut or field modified at the installation site.
- 3.05 Finishes.** Polished, honed, abrasive, thermal, sanded, and natural cleft.
- 3.06 Colors.** Most of the commercially available varieties are suitable.

SECTION 4. INSTALLATION METHODS INTERIOR STONE FLOORING IS INSTALLED BY ONE OF THE FOLLOWING METHODS

- 4.01 Mortar Bed Bonded to Concrete Subfloor.** This method is used where the concrete sub-floor is not subject to excessive movement or deflection (Recommended for installation of larger pieces [slabs]).
1. Concrete to receive bonded mortar beds or direct bond of stone shall fulfill the following requirements:
 - a. Slope if required, shall occur in the concrete substrate so as to maintain an even depth or thickness of the mortar bed and/or bond mortar.
 - b. Concrete shall have a textured surface similar to a fine broom finish and shall be free of curing of curing compounds or any other foreign materials that would inhibit an adequate bond of the mortar bed or bond mortar to the concrete.
 - c. Undersides and edges of concrete slabs on grade shall have a suitable vapor barrier so as to prevent moisture intrusion into concrete.
 - d. Concrete that requires additional work to achieve these requirements such as grinding, feathering, patching or scarifying are considered as non-compliant with Industry Standards for stonework until remedial work is completed.
 2. Limits of moisture vapor transmission shall be established by the stone supplier. Testing and certification of compliance is the responsibility of the specifying authority.
 3. Wash and dry backs and edges of pavers or tiles prior to installation.
 4. A mortar bed consisting of one part Portland cement to five parts sand is laid over the concrete subfloor to a nominal thickness of 1-1/4". Stone buttered uniformly with a cement paste bond coat 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).
- 4.02 Mortar Bed Separated From Concrete Subfloor.** This method is used where the concrete slab may be problematic such as anticipated differential movement between the slab and the stone assembly. Other factors that would favor the selection of this installation system include:
1. Cracks in the slab that may transfer through a bonded system.
 2. Contamination of the slab that may be impractical to remove.
 3. Capillary moisture issues exist.
 4. Where cold or control joints in slab do not align with stone grid modules.
 5. Where an unbondable membrane exists.
 6. In these situations, the slab will require remedial treatment commensurate with the severity of the problem. These options usually involve a membrane of some type and as such the

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mortar bed cannot be bonded to the substrate. The requirement for unbonded mortar beds is that they be reinforced as specified by the design professional; usually with wire at the approximate center of the bed. As with the bonded mortar bed systems, slope and tolerance of the slab shall be such as to maintain an even thickness of the bed. Movement joint requirements will also remain the same; however, the membrane may remain continuous.

4.03 Mortar Bed Separated From Wood Subfloor. This method is used where subfloor is subject to movement and deflection.

1. 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 with reinforcement specified by the design professional. 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 D-3 at the close of this section).

4.04 Thin Bed Over Plywood Subfloor. This method should be used only in residential construction.

1. The subfloor must be adequately designed to carry loads without excessive deflection. Subfloor must be level with a maximum variation of 1/8" in 10'-0", and a deflection not exceeding L/720. Cross-bridging or other reinforcement shall be used to limit differential deflection between adjacent framing members. Comply with all Manufacturers' written installation instructions. 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 95% contact with no voids exceeding 2 in 2 and no voids within 2" of tile corners on 3/8" tile. Back butter the stone tiles to ensure 80% contact with no voids exceeding 4 in 2 and no voids within 2" of tile corners on 3/4" or thicker material. All corners and edges of stone tiles must be fully supported and contact shall always be 95% in water-susceptible conditions. Joints are later grouted with a Portland cement based grout or other approved material.

4.05 Thin-Bed Portland Cement Mortar Over Concrete Substrate. This method is used when space for full mortar bed is not possible.

1. Concrete subfloor should not be subject to excessive movement or excessive deflection. Subfloor must be level with maximum variation of 1/4" 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 to ensure 95% contact with no voids exceeding 2 in 2 and no voids within 2" of tile corners on 3/8" tile. Back butter the stone tiles to ensure 80% contact with no voids exceeding 4 in 2 and no voids within 2" of tile corners on 3/4" or thicker material. All corners and edges of stone tiles must always be fully supported and contact shall always be 95% 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).

4.06 Thin-Bed Mortar Over Cementitious Backer Units. This method should be used only in residential construction and per manufacturers' instructions.

1. The subfloor must be adequately designed to carry loads without excessive deflection. The cementitious backer unit is considered to be a bonding layer only, and provides negligible structural contribution to the flooring system. 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 95% contact with no voids exceeding 2 in 2 and no voids within 2" of tile corners on 3/8" tile. Back butter the stone tiles to ensure 80% contact with no voids exceeding 4 in 2 and no voids within 2" of tile corners on 3/4" or thicker material. All corners and edges of stone tiles must be fully supported and contact shall always be 95% 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).

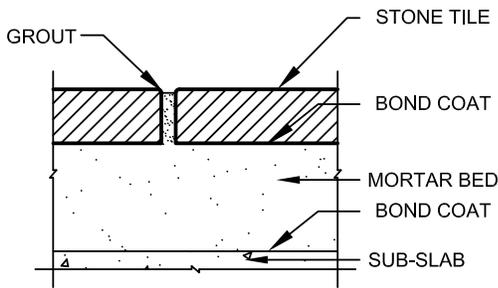
SECTION 5. HEATED FLOOR SYSTEMS

- 5.01 In frame construction, the plywood portion of the substrate must be a minimum of 1-1/2" exterior glue plywood. Leave a gap between the plywood sheets for expansion. Install a cleavage membrane over the plywood.
- 5.02 **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 Portland mix so that the mortar bed covers pipes and is at least 3/4" over the top of heating pipes, with a minimum bed thickness of 2-1/2". 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 uncoupling membrane according to Manufacturer's recommendation.

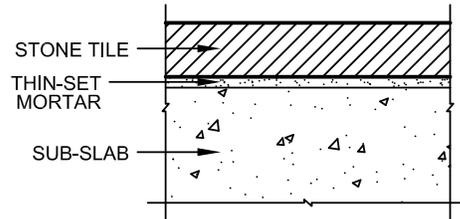
SECTION 6. PLYWOOD SUBFLOORS

- 6.01 Refer to APA form No. E30 for plywood installation methods.
 1. Plywood subfloors, including tongue- and-groove plywood, must be installed with a gap between the sheets to allow for expansion. Stagger all seams. All subfloor seams should occur over framing, with underlayment seams occurring approximately 25% to the span between framing members. Plywood should have the strength axis running perpendicular to the joist.
 2. Plywood shall be APA underlayment, C-C plugged or plugged crossband grade.
 3. Inner surfaces must be clean. Remove all sawdust and dirt before applying adhesive.
 4. Use a construction adhesive, applying a 1/8" bead at 2" intervals. Apply adhesive in accordance with manufacturer's written directions.
 5. Allow adhesive to cure per manufacturer's recommendations before beginning stone installation.
 6. Place screws 6" on center in both directions.
 7. Align strength axis of both subfloor and underlayment layers.
 8. Always apply a double layer subfloor/underlayment, regardless of joist spacing.
 9. Always use a crack suppression membrane in frame construction.

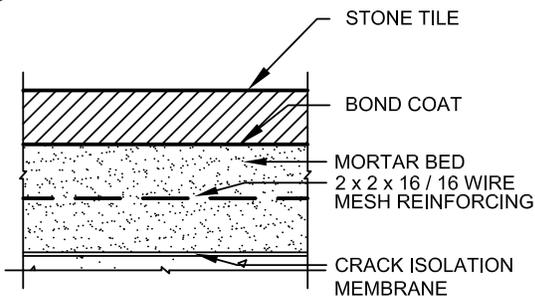
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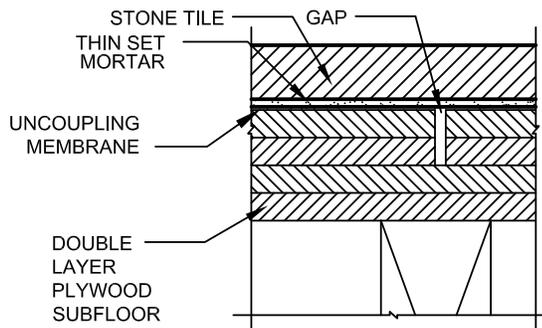
1 STONE TILE SET IN MORTAR BED



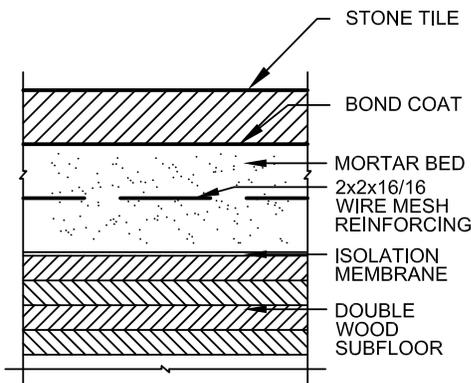
4 STONE TILE SET IN THIN-SET BED OVER CONCRETE SLAB



2 STONE TILE SET IN REINFORCED MORTAR BED



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



3 STONE TILE SET IN REINFORCED MORTAR BED OVER WOOD FRAME



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REV	DATE
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1	Oct 2006
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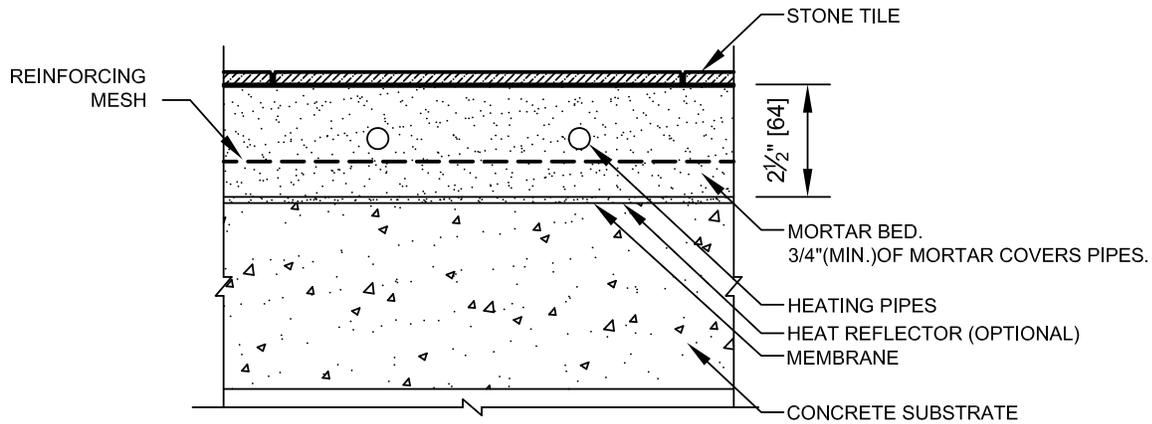
INTERIOR STONE FLOORING

MIA DIMENSION STONE DESIGN MANUAL VII

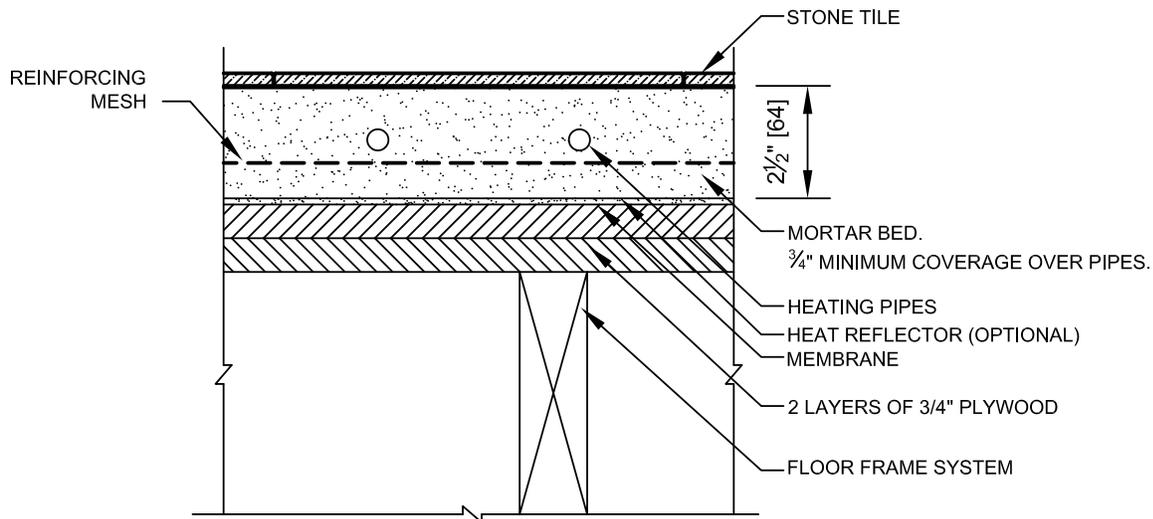
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SCALE:
3" = 1'-0"

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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"