

## SUPPLEMENTAL INFORMATION

### HORIZONTAL SURFACES / GENERAL INFORMATION

#### SECTION 1. INTRODUCTION

**1.01 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.

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

#### SECTION 2. DESIGN CRITERIA

**2.01** 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/ C 1353 test for abrasion resistance as measured by abrasive hardness (Ha). There are three classes of usage for stone flooring:

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

- 1. Moderate Traffic** class is reserved for residential entranceways and small commercial installations. Foot traffic is less than 50 persons/minute. Stones must have a minimum Ha of 7.0
  - 2. 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 for general areas, increasing to 12.0 for stairways, elevator halls, and other concentration areas. Exterior paving should always have a minimum Ha of 12.0.
  - 3.** 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 on stones with abrasion indices < 20.0 are not suitable for most moderate and any heavy-traffic areas. Thermal finish is recommended for exterior paving.
  - 4.** Stone with high abrasion resistance (>20.0) will generally maintain a polished surface in foot traffic areas. Stones with lesser abrasive indices are likely to abrade in service, and generally perform better if supplied in honed finish.
  - 5. 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. If the abrasion resistance of either stone is < 20.0, then the difference in abrasion resistance between the stone shall be < 5.0. This can be ignored when using stones with abrasion resistances >20.0, since the resultant wear will be very slight.
- 2.02 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, retesting of the stone should be considered.
- 2.03 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.

- 1. Reasons for hollow sounds include:**
  - a. A hollow sound may indicate that insufficient bonding of the paver exists, although it is not necessarily a reliable test. Other influences can cause a hollow sound from a properly bonded paver.
  - b. Hollow sounds may be acoustical effects rather than bonding problems.
  - c. Air may be entrapped in either the setting bed or slab, causing one part of the floor to sound differently than another.
  - d. Separation or crack-isolation membranes installed between a slab and the setting bed may alter the sound report.
  - e. The elevation or composition of the subsurface may be irregular, causing one part of the floor to sound differently than another.

**2.04 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 and properly compacted within the joint.

- 1. Typical joint widths are:**
  - a. Exterior Stone Pavement Installation:** Minimum 1/4", preferably 3/8". Joints of 1/2" or larger are frequently required for large unit size installation.
  - b. Interior Stone Flooring Installation:** Minimum 1/16", preferably 1/8". Joints of 1/4" or larger are frequently required for large unit size installation.
  - c. Joints of 1/2" to 1" are frequently required for installing stones with split, or "snapped" edges.
  - d. Stone units with "cleft" or other non-planar surface finishes generally require larger joints to minimize perceived lippage. Joint widths of 3/4" or 1" are not uncommon in these cases.
  - e. Joints of stone with an arris or chamfer will appear wider than its actual dimension when filled.

#### **2. IN NO CASE SHOULD NATURAL STONE BE INSTALLED WITH TIGHT JOINTS.**

- 3.** Where vertical surfaces meet horizontal paving, the joint should be filled with an elastomeric sealant in lieu of grout. These joints should be at least 3/8" in width, and continue through the stone assembly, all the way down to the substrate or backing (membranes may remain continuous). For joint depths greater than 3/8", backer rod is required. It is recommended that the horizontal surface go under the vertical surface.
- 4.** Movement Joints are also required in fields of paving.

*Reference ANSI A108.01 section 3.7 and ANSI A108.02 section 4.4 for guidance on movement joint location.*

- 5. Movement Joints:** In addition to field and abutment to vertical surface requirements for movement joints in stone work, any expansion or construction joints in the substrate will need to carry completely through the stone installation assembly.

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6. Wash and dry backs and edges of all pavers prior to installation.

#### 2.05 MINIMUM THICKNESS.

*Suggested minimum thicknesses for stone walking surfaces:*

- 2.06 Exterior Stone Pavers, Pedestrian Traffic:** 1-1/4".
- 2.07 Exterior Stone Pavers, Vehicular Traffic:** Is best determined by engineering analysis, but is generally 3" or thicker.
- 2.08 Interior Residential Stone Flooring:** 3/8".
- 2.09 Interior Commercial Flooring, light duty:** 3/8".
- 2.10 Interior Commercial Flooring, Heavy Duty/High Traffic:** 3/4", or 1-1/4" pending stone variety selection.
- 2.11 Note:** Large stone unit sizes, specific loading/traffic requirements may dictate the use of greater thicknesses than those listed above.

#### SECTION 3. LIPPAGE.

*On stones, lippage should be limited to  $\pm 1/32$ ".*

- 3.01 Allowable lippage is an installation tolerance, and is additive to the inherent warpage of the stone unit.
- 3.02 This lippage will 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 3/4" may be required.
- 3.03 This degree of accuracy may not be achievable with extremely large format stone pavers, in which case larger than typical joint widths are recommended to minimize perceived lippage.

#### SECTION 4. ADA REQUIREMENTS.

*All stone floors should provide a safe walking surface to facilitate human ambulation. Some stone floor installations will be required to comply with the provisions outlined by the Americans with Disabilities Act (ADA)*

- 4.01 Slips and falls may be caused by inadequate available friction or due to a sudden change in available friction. For example, a spilled beverage or other contaminant may reduce available friction in a given area. Because of this, the maintenance of a floor is an important factor in its ability to provide a safe walking surface. Local building codes normally take precedence over other regulatory agencies. Natural stone used for paving provides an adequate available static coefficient of friction for human ambulation when supplied with an appropriate finish and 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. Aftermarket products are available for application on natural stones to increase available friction if required. Such products must be applied and maintained according to manufacturer's recommendations.

#### SECTION 5. MEMBRANES.

*The use of membranes to improve system performance is common in the design of stone walking surface installations.*

- 5.01 Always comply with the membrane manufacturer's written instructions regarding the applicability and installation of the membrane product.

- 5.02 Common types of membranes and their intended contribution to the system performance:

1. **Cleavage Membranes.** Cleavage membranes are used in thick-bed installations below a reinforced mortar bed to intentionally prevent the bond between the stone setting system and the substrate slab, allowing independent movement (free floating) of the stone and setting system. Cleavage membranes can be either sheet applied or liquid applied.
2. **Crack Isolation Membranes.** Crack Isolation membranes are used to isolate the stone from minor in-pane cracking of the substrate surface in thin-set applications. Crack Isolation membranes can be sheet applied, trowel applied, or liquid applied and must meet ANSI A118.12.
3. **Uncoupling Membranes.** Uncoupling membranes are sheet applied, and geometrically configured to provide a small airspace which accommodates lateral flexibility between the tile and the substrate, reducing the transfer of stresses to the thin-set stone installation system.
4. **Waterproof Membranes.** Waterproof membranes are used to prevent the migration of liquid water. These membranes can be sheet applied, sheet metal, or liquid applied. In many cases these membranes are installed by other trades and must meet ANSI A118.10.

#### SECTION 6. TECHNICAL DATA

- 6.01 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:

1. Granite: ASTM C615 Standard Specification for Granite Dimension Stone

- 6.02 GEOGRAPHIC METHODS.

- A) 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.
- B) During construction, the General Contractor shall protect all stone from staining and damage.