

SECTION 09635

LIMESTONE FLOORING

This guide specification has been prepared by TexaStone Quarries LLC to assist design professionals in the preparation of a specification section covering cut limestone flooring, either thin set or set in a full mortar bed.

Requirements for waterproof membranes and clear water repellents or sealers are not included in this section due to the wide variety of products available, but can easily be added if desired and if not specified in other sections of the project manual. Latex modifiers for setting beds and grouts can also be added to this section if desired.

This section relies heavily on the Tile Council of America (TCA) *Handbook for Ceramic Tile Installation* and includes the most commonly used installation methods. Other methods described by TCA can be easily added if desired.

Note that the Dimensional Stone Handbook by the Marble Institute of America (MIA) recommends a maximum substrate deflection of L/720 for stone flooring. Ensure that the building's structural design meets this requirement.

This specification may be used as the basis for developing either a project specification or an office master specification. Since it has been prepared according to the principles established in the *Manual of Practice* published by The Construction Specifications Institute (CSI), it may be used in conjunction with most commercially available master specifications systems with minor editing.

The following should be noted in using this guide specification:

- Editing notes to assist users are separated from specification text by rows of asterisks. Delete these notes prior to final printing.
- Optional text requiring a selection by the user is enclosed within brackets, e.g.: "Section [01330.] [____.]"
- Items requiring user input are enclosed within brackets, e.g.: "Section [____ - ____]."
- Optional paragraphs are separated by an "OR" statement, e.g.:

**** OR ****

- Metric equivalents to inch-pound units follow the inch-pound units. Inch-pound units are contained within single character sets, i.e. <1 inch>. Inch-pound units are contained within double character sets, i.e. <<25 mm>>. Metric measurements are rationalized units based on the SI system of measurement. Delete either the inch-pound or metric units of measure depending on project requirements; do not include both units in a project specification, as conflicting requirements could result.

This and other guide specifications are available in both hard copy and a variety of electronic formats to suit most popular word processing programs and operating platforms. Please contact TexaStone Quarries LLC at 915-354-2569 or www.texastone.com for additional copies or for information on available electronic formats.

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 1. Cut limestone flooring, [thin] [thick] set.
 2. Setting materials and accessories.

- B. Related Sections:
 1. Division 1: Administrative, procedural, and temporary work requirements.
 2. Section [07920 - Joint Sealers:] [_____ - _____:] Joint sealer and backer rod.

1.2 REFERENCES

 Edit the following to include only those standards referenced elsewhere in this section.

- A. American National Standards Institute (ANSI):
 1. A108.1A - Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
 2. A108.1B - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
 3. A108.1C - Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
 4. A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
 5. A108.10 - Installation of Grout in Tile work.
 6. A118.1 - Dry-Set Portland Cement Mortar
 7. A118.4 - Latex-Portland Cement Mortar.
 8. A118.6 - Ceramic Tile Grouts.

- B. American Society for Testing and Materials (ASTM):
 1. C 97 - Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
 2. C 99 - Test Method for Modulus of Rupture of Dimension Stone.
 3. C 144 - Specification for Aggregate for Masonry Mortar.
 4. C 150 - Specification for Portland Cement.
 5. C 170 - Test Method for Compressive Strength of Dimension Stone.
 6. C 207 - Specification for Hydrated Lime for Masonry Purposes.
 7. C 241 - Standard Test Method for Abrasion Resistance of Stone Subject to Foot Traffic.
 8. C 270 - Specification for Mortar for Unit Masonry.
 9. C 404 - Specification for Aggregates for Masonry Grout.
 10. C 880 - Test Method for Flexural Strength of Dimension Stone.

- C. Tile Council of America (TCA) - Handbook for Ceramic Tile Installation.

1.3 SUBMITTALS

 The following provides for submission of detailed layout and installation drawings. Delete for smaller, less complex projects.

- A. Shop Drawings: Include location and sizes of pieces, arrangement and size of joints, and other details of installation.

- B. Samples:
1. Stone: <[4 x 12] [____ x ____] inch> <<[100 x 300] [____ x ____] mm>> samples showing [each] color range and finish.
 2. Grout: <[3/8 x 3/8 inch x 3 inch long] [____ x ____] inch x [____] inch long> <<[10 x 10 mm x 75 mm long] [____ x ____] mm x [____] mm long>> samples showing [[each] color.] [available colors.]
- C. Test Reports: Indicating stone compliance with specified requirements.

1.4 QUALITY ASSURANCE

 The following provides for a site-constructed mockup for review of materials and workmanship. Delete for smaller, less complex projects.

- A. Mockup:
1. Size: <[4] [____] feet> <<[1200] [____] mm>> wide x <[8] [____] feet> <<[2400] [____] mm>>-long.
 2. Locate [_____] [where directed by Architect/Engineer.]
 3. Show stone size, color, and finish; [control] [and] [expansion] joints; and joint profile.
 4. Approved mockup may [not] remain as part of the Work.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Stack stone minimum <4 inches> <<100 mm>> above ground. Provide non-staining spacers between pieces and polyethylene or other suitable film as protective covering.
- B. Protect mortar materials from moisture absorption and damage; reject damaged containers.
- C. Store sand to prevent inclusion of foreign matter.
- D. Deliver mortar and grout containers bearing hallmark certifying compliance with reference standards.

1.6 PROJECT CONDITIONS

- A. Do not install stone when ambient temperature is below <40 degrees F> <<4 degrees C>>.

PART 2 - PRODUCTS

2.1 MATERIALS

 In the following paragraphs, select one or more stones to suit project conditions. Refer to current TexaStone literature or contact your TexaStone representative for assistance in making selections.

- A. Limestone:
1. Source: "Permian Sea Coral" by TexaStone Quarries LLC, Garden City, Texas.
 2. Characteristics:
 - a. Water absorption: Maximum 3.50 percent, tested to ASTM C 97.
 - b. Specific gravity: 2.337, tested to ASTM C 97.
 - c. Density: Minimum <140 pounds per cubic foot> <<2255 kg/cu m>>, tested to ASTM C 97.
 - d. Modulus of rupture: Minimum <400 PSI> <<2.76 MPa>>, tested to ASTM C 99.
 - e. Compressive strength: Minimum <4000 PSI> <<27.68 MPa>>, tested to ASTM C 170.
 - f. Flexural strength: Minimum <700 psi> <<4.82 MPa>>, tested to ASTM C 880.

**** OR ****

B. Limestone:

1. Source: "Hadrian" by TexaStone Quarries LLC, Garden City, Texas.
2. Characteristics:
 - a. Water absorption: Maximum 8.0 percent, tested to ASTM C 97.
 - b. Specific gravity: 2.146, tested to ASTM C 97.
 - c. Density: Minimum <110 pounds per cubic foot> <<1762 kg/cu m>>, tested to ASTM C 97.
 - d. Modulus of rupture: Minimum <400 PSI> <<2.76 MPa>>, tested to ASTM C 99.
 - e. Compressive strength: Minimum <1800 PSI> <<12.41 MPa>>, tested to ASTM C 170.
 - f. Flexural strength: Minimum <300 psi> <<2.07 MPa>>, tested to ASTM C 880.

**** OR ****

C. Limestone:

1. Source: "Desert Sunset" by TexaStone Quarries LLC, Garden City, Texas.
2. Characteristics:
 - a. Water absorption: Maximum 8.0 percent, tested to ASTM C 97.
 - b. Specific gravity: 2.059, tested to ASTM C 97.
 - c. Density: Minimum <110 pounds per cubic foot> <<1762 kg/cu m>>, tested to ASTM C 97.
 - d. Modulus of rupture: Minimum <400 PSI> <<2.76 MPa>>, tested to ASTM C 99.
 - e. Compressive strength: Minimum <1800 PSI> <<12.41 MPa>>, tested to ASTM C 170.
 - f. Flexural strength: Minimum <450 psi> <<3.10 MPa>>, tested to ASTM C 880.

**** OR ****

D. Limestone:

1. Source: "TexaStone Pink" by TexaStone Quarries LLC, Garden City, Texas.
2. Characteristics:
 - a. Water absorption: Maximum 8.0 percent, tested to ASTM C 97.
 - b. Specific gravity: 2.075, tested to ASTM C 97.
 - c. Density: Minimum <110 pounds per cubic foot> <<1762 kg/cu m>>, tested to ASTM C 97.
 - d. Modulus of rupture: Minimum <400 PSI> <<2.76 MPa>>, tested to ASTM C 99.
 - e. Compressive strength: Minimum <1800 PSI> <<12.41 MPa>>, tested to ASTM C 170.
 - f. Flexural strength: Minimum <400 psi> <<2.76 MPa>>, tested to ASTM C 880.

**** OR ****

E. Limestone:

1. Source: "Cedar Hill Cream" by TexaStone Quarries LLC, Garden City, Texas.
2. Characteristics:
 - a. Water absorption: Maximum 9.0 percent, tested to ASTM C 97.
 - b. Specific gravity: 2.067, tested to ASTM C 97.
 - c. Density: Minimum <110 pounds per cubic foot> <<1762 kg/cu m>>, tested to ASTM C 97.
 - d. Modulus of rupture: Minimum <400 PSI> <<2.76 MPa>>, tested to ASTM C 99.
 - e. Compressive strength: Minimum <1800 PSI> <<12.41 MPa>>, tested to ASTM C 170.
 - f. Flexural strength: Minimum <500 psi> <<3.49 MPa>>, tested to ASTM C 880.

**** OR ****

F. Limestone:

1. Source: "Peach" by TexaStone Quarries LLC, Garden City, Texas.

2. Characteristics:
 - a. Water absorption: Maximum 8.0 percent, tested to ASTM C 97.
 - b. Specific gravity: 2.154, tested to ASTM C 97.
 - c. Density: Minimum <110 pounds per cubic foot> <<1762 kg/cu m>>, tested to ASTM C 97.
 - d. Modulus of rupture: Minimum <400 PSI> <<2.76 MPa>>, tested to ASTM C 99.
 - e. Compressive strength: Minimum <1800 PSI> <<12.41 MPa>>, tested to ASTM C 170.
 - f. Flexural strength: Minimum <500 psi> <<3.49 MPa>>, tested to ASTM C 880.

 In the following paragraphs select finish for exposed faces of stone. Refer to current TexaStone literature or contact your TexaStone representative for assistance in making selections.

3. Finish: [Split face.] [Sawn.] [Honed.] [Sandblasted.] [Etched.] [Polished] [Tumbled] [Bush hammered.]
4. Free from cracks, seams, and starts that could impair its structural integrity or function. Inherent variations characteristic to quarry from which it is obtained are acceptable.
5. Color, texture, and finish consistent with range of samples approved by Architect/Engineer.

 Include the following paragraph for a thin set installation and for a thick set installation per ANSI A108.1B with a cured mortar bed and dry-set or latex portland cement mortar; edit to suit project requirements.

- G. Thin Set Mortar Material: ANSI [A118.1, dry set] [A118.4, polymer modified latex] type, white, non-staining to stone.

**** OR ****

 Include the following paragraph for a thick set installation.

- H. Thick Set Mortar Materials:
 1. Portland cement: ASTM C 150, Type I, white, non-staining to stone.
 2. Lime: ASTM C 207, Type S.
 3. Aggregate: ASTM C 144, standard masonry type.
- I. Grout: ANSI A118.6, polymer modified dry set type, [sanded,] [un-sanded,] [_____] color [to be selected from manufacturer's standards].
- J. Water: Potable.

 Include the following paragraph for a thick set installation where a cleavage membrane is desired.

- K. Cleavage Membrane: <[6] [____] mil> <<[0.15] [____] mm>> thick polyethylene film or No. 15 asphalt saturated felt.

 Include the following paragraph for a thick set installation where a reinforced mortar bed is desired.

- L. Reinforcing Mesh: <[2 x 2] [____x____] inch> <<[50 x 50] [____x____] mm>> mesh, [16/16]

[____/____] wire size; welded fabric, galvanized.

2.2 ACCESSORIES

Ensure that joint sealers specified in other sections are non-staining to stone.

- A. Joint Sealer: Specified in Section [07920.] [____.]
- B. Stone Cleaner: Not harmful to stone, joint materials, or adjacent surfaces. Non-proprietary acids not permitted.

2.3 MIXES

- A. Mix and proportion thin set mortar materials in accordance with manufacturer's instructions.

**** OR ****

- B. Mix and proportion thick set mortar materials in accordance with ANSI [A1.01.A.] [A1.01.B.] [A1.01.C.]

2.4 FABRICATION

- A. Fabricate for <[3/8] [____] inch> <<[10] [____] mm>> wide joints.
- B. Cut or saw joint surfaces square.
- C. Saw backs of stone.
- D. Fabrication Tolerances:
 - 1. Variation in face dimension: Plus or minus <[1/16] [____] inch> <<[1.5] [____] mm>>.
 - 2. Variation in thickness: Plus or minus <[1/8] [____] inch> <<[3] [____] mm>>.
 - 3. Variation from true plane: Plus or minus <[1/16] [____] inch in 3 feet> <<[1.5] [____] mm/m>>.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean stone prior to installation. Do not use wire brushes or implements that can mark or damage exposed surfaces.
- B. Wet stone in preparation for placement to minimize moisture suction from mortar.
- C. Clean surfaces to remove loose and foreign matter that could impair adhesion.
- D. Remove ridges and projections. Fill voids and depressions with patching compound compatible with setting materials.

Include the following paragraph for a thin set installation.

- E. Allowable Substrate Tolerances:
 - 1. Maximum variation in substrate surface: <1/8 inch in 8 feet> <<3 mm/2400 mm>>.
 - 2. Maximum height of abrupt irregularities: <1/32 inch> <<0.08 mm>>.

**** OR ****

Include the following paragraph for a thick set installation.

- F. Allowable Substrate Tolerances: Maximum <1/4 inch in 10 feet> <<6 mm/3 m>> variation in subfloor surface.
- G. Layout:
 - 1. Determine location of control joints.
 - 2. Minimize pieces less than half size.
 - 3. Locate cuts to be inconspicuous.

3.2 INSTALLATION

Include the following paragraph for a thin set installation; edit to suit project conditions. Insert installation method from TCA Handbook if desired.

- A. Install flooring, grout, and accessories in accordance with ANSI A108.5, thin set with [dry set] [latex portland cement] mortar [and to TCA Method [____]].

**** OR ****

Include the following three paragraphs for a thick set installation; edit to suit project conditions. Insert installation method from TCA Handbook if desired.

- B. Install flooring, grout, and accessories in accordance with ANSI [A108.1A, thick set with wet mortar bed] [A108.1B, thick set with cured mortar bed with [dry set] [latex portland cement] mortar] [A108.1C, thick set with either wet mortar bed or cured mortar bed with [dry set] [latex portland cement] mortar [over cleavage membrane] [and to TCA Method [____]].
- C. Mortar Bed Thickness: Minimum <[5/8] [1-1/4] [____] inch> <<[15] [31] [____] mm>> [, unless otherwise indicated].
- D. [Place reinforcing at mid-height of mortar bed.]
- E. Lay flooring to pattern [shown on Shop Drawings.] [furnished by Architect/Engineer.] Do not interrupt flooring pattern through openings.
- F. Arrange stone pattern to provide uniform color distribution throughout.
- G. Place flooring with [uniform <[3/8] [____] inch> <<[10] [____] mm>> wide joints.] [joints of varying width.] Maintain <[3/8] [____] inch> <<[10] [____] mm>> joints between flooring and abutting vertical surfaces.
- H. Fit flooring around projections and at perimeter. Smooth and clean cut edges. Ensure that trim will completely cover cut edges.
- I. Allow flooring to set minimum of [48] [____] hours before grouting.
- J. Grout joints in accordance with ANSI A108.10 without excess grout.

- K. Provide control joints over joints in substrate. Form joints to full depth of stone and setting bed, and equal to typical grout joint in width.
- L. Keep expansion joints free from mortar and grout.
- M. Fill control and expansion joints with sealer as specified in Section [07920.] [____.]

3.3 PROTECTION

- A. Do not permit traffic over finished floor surfaces until grout has cured.
- B. Do not permit storage of materials or equipment on completed floors.
- C. Protect completed work until Project completion with non-staining sheet coverings.

3.4 CLEANING

- A. Clean <[4 x 4] [____ x ____] foot> <<[1200 x 1200] [____ x ____] mm>> sample panel in location directed by Architect/Engineer. When approved, use same materials and techniques to clean remainder of stone.
- B. Protect adjacent surfaces.
- C. Apply cleaner in accordance with manufacturer's instructions.
- D. Do not use steel or metallic brushes.
- E. Thoroughly rinse surfaces with clean water after completion of cleaning; remove all traces of cleaning solution.

END OF SECTION