

32-14-13

Unilock Permeable or Stabilized Base for Natural Stone and Porcelain Tile

For any additional information or assistance with this spec please contact your Unilock Representative.

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FOREWORD

These specifications have been prepared for the general guidance of architects, engineers, contractor and superintendents associated with the construction of natural stone and porcelain tile with a thin-set mortar over a stabilized aggregate setting bed.

SECTION 32 14 13

NATURAL STONE AND PORCELAIN TILE PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Natural Stone
 - 2. Porcelain Tile
 - 3. Polymeric Joint Sand
 - 4. Thin-Set Mortar
 - 5. Stabilized Setting Bed Aggregate
 - 6. Permeable Base Aggregate (Open-graded)

1.02 REFERENCES

- A. ASTM International latest edition:
 - 1. C 33, Standard Specification for Concrete Aggregates.
 - 2. C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 3. C 144 Standard Specifications for Aggregate for Masonry Mortar.
 - 4. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
 - 5. D 698 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5 lb (24.4 N) Rammer and 12 in. (305 mm) drop.
 - 6. D 1557 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (44.5 N) Rammer and 18 in. (457 mm) drop.
 - 7. D 2940 Graded Aggregate Material for Bases or Subbases for Highways or Airports.
 - 8. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

1.03 SUBMITTALS

- A. Natural Stone or Porcelain Tile:
 - 1. Samples for verification: Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
 - 2. Accepted samples become the standard of acceptance for the product produced.
 - 3. Test results from an independent testing laboratory showing performance characteristics.
- B. Polymeric Joint Sand
 - 1. Provide product data sheets.
 - 2. Provide manufacturers' written installation guide.
- C. Thin-Set Mortar Mix
 - 1. Provide product data sheets
 - 2. Provide manufacturers' written installation guide.

- D. Stabilized Setting Bed and Base Aggregate:
 1. Test results from an independent testing laboratory for compliance with ASTM D 448 No. 8 and No. 57
 2. Test results from an independent testing laboratory for sieve analysis, including washed gradations per ASTM C 136.
 - E. Paving Installation Contractor:
 1. Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
- 1.04 QUALITY ASSURANCE
- A. Utilize a Manufacturer having at least ten years of experience manufacturing interlocking concrete pavers on projects of similar nature or project size.
 - B: Source Limitations:
 1. Obtain Natural Stone or Porcelain Tile from one source location with the resources to provide products of consistent quality in appearance and physical properties.
 2. Obtain Natural Stone or Porcelain Tile from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.
 - C. Paving Contractor Qualifications:
 1. Utilize an installer having successfully completed Natural Stone or Porcelain Tile installation similar in design, material, and extent indicated on this project.
 - D. Mockups:
 1. Install a 5 ft x 5 ft paver area.
 2. Use this area to determine joint sizes, lines, laying pattern(s) and levelness. This area will serve as the standard by which the workmanship will be judged.
 3. Subject to acceptance by owner, mock-up may be retained as part of finished work.
 4. If mock-up is not retained, haul offsite and dispose legally.
- 1.05 DELIVERY, STORAGE & HANDLING
- A. [In accordance with Conditions of the Contract and Division 1 Product Requirement Section.](#)
 - B. Deliver Natural Stone or Porcelain Tile in manufacturer's original, unopened and undamaged container packaging with identification labels intact.
 1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
 2. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
 3. Unload pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.
 - C. Store and protect materials free from mud, dirt and other foreign materials.
- 1.06 PROJECT/SITE CONDITIONS
- A. Environmental Requirements:
 1. Install Natural Stone or Porcelain Tile only on unfrozen stabilized setting bed aggregate materials.
 2. Install stabilized setting bed only on unfrozen permeable base aggregate.
 3. Install permeable base only over unfrozen subgrade.
- 1.07 NATURAL STONE OR PORCELAIN TILE OVERAGE AND ATTIC STOCK
- A. [Provide a minimum of 5% additional material for overage to be used during construction.](#)
 - B. Furnish [100 square feet](#) of each product and size used to owner for maintenance and repair. Furnish Natural Stone or Porcelain Tile from the same production run as installed materials.

PART 2 PRODUCTS**2.01 NATURAL STONE OR PORCELAIN TILE**

- A. Basis-of-Design Product: The Natural Stone or Porcelain Tile shapes are based on:
1. Unilock:
 - a. **Product Name**
 2. As supplied by:
Unilock
Uxbridge MA, Brewster NY, Rittman OH, Brighton MI, Aurora IL, Marengo IL,
Elkhorn WI, Ayr ON, Georgetown ON, Pickering ON, Gormley ON
Contact: Chicago- Brad Swanson – brad.swanson@unilock.com 630-742-4168
New York - Mike Zengen – mike.zengen@unilock.com 845-538-7914
Ontario – Dave Laurie – dave.laurie@unilock.com 416-805-6399
 3. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.
 - a. To obtain acceptance of unspecified products, submit written requests at least 7 days before the Bid Date.
- Note: Unless required by the owner, an “or equal” line is not necessary when using a basis-of-design specification with the above information is listed and outline in Division 1, Product Substitution Procedures.**
- Or choose number 3 below and delete above number 3.**
- 3. Substitutions: No substitutions permitted.**
- B. Product requirements:
1. **Natural Stone: Insert product name**
 - a. Color: **Insert product color**
 - b. Edge: **Sawcut, Snapped, Chiseled**
 - c. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
 1. **Insert size**

Note: Imperial dimensions are nominal equivalents to the metric dimensions.
 2. **Porcelain Tile: Insert product name**
 - a. Color: **Insert product color**
 - b. Finish: (Select finish type from below and insert here. Finish type will affect product pricing).
 1. **Del Conca**
 2. **Caesar**
 - c. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
 1. **Insert Size**

Note: Imperial dimensions are nominal equivalents to the metric dimensions.

2.02 POLYMERIC JOINT SAND

- A. Provide Polymeric Joint Sand as manufactured by:
1. **Alliance Gator G2**
 - a. **Product Type: Dry mix, contains polymeric binding agent, activated with water.**
 - b. **Color: (Insert color Beige, Slate Grey, Ivory or Black Diamond)**
 2. **Unicare HP Polymeric Max Sand**
 - a. **Product Type: Dry mix, contains polymeric binding agent, activated with water.**
 - b. **Color: (Insert color Grey, Tan or custom)**
 3. **Polybind G2 Complete (Nevada Tan, Oxford Grey, Jet Black, Ivory White)**
- B. Provide Polymeric Joint Sand meeting the minimum material and physical properties as follows:
1. **Compression Strength: proven resistance to compression of 550 PSI after drying for 7 days under controlled conditions (73°F (23°C) at 50% humidity).**
 - a. **Test sand sample shape: cylinder (2” (5 cm) dia. X 4” (10 cm) high).**

2.03 THIN-SET MORTAR MIX

- A. Provide Laticrete 254 Platinum Thin-Set Mortar as manufactured by:
 - 1. Laticrete International
1 Laticrete Park North
Bethany, CT 06524
www.laticrete.com

2.04 STABILIZED SETTING BED AGGREGATE

- A. Mix four parts Setting Bed Aggregate with one part Portland Cement and one-half part potable water.
- B. Provide Setting Bed Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 8 as presented in Table 1.

**TABLE 1
STABILIZED SETTING BED AGGREGATE
GRADATION REQUIREMENTS**

ASTM No. 8	
Sieve Size	Percent Passing
½ in (12.5 mm)	100
3/8 in (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.18 mm)	0 to 5

- C. Provide Portland Cement meeting ASTM C 150, Type I or Type II.

2.05 PERMEABLE BASE AGGREGATE

- A. Provide Permeable Base Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 57 as presented in Table 2.

**TABLE 2
PERMEABLE BASE AGGREGATE
GRADATION REQUIREMENTS**

ASTM No. 57	
Sieve Size	Percent Passing
1-1/2 in (37.5 mm)	100
1 in (25 mm)	95 to 100
1/2 in (12.5 mm)	25 to 60
No. 4 (4.75 mm)	0 to 10
No. 8 (2.36 mm)	0 to 5

Note: For all aggregates, provide washed, clean, have zero plasticity, free from deleterious or foreign matter, crushed, angular rock and contain no No. 200 sieve size aggregate materials used in the construction of permeable pavement. Aggregate materials serve as the structural load bearing platform of the pavement as well as a temporary receptor for the infiltrated water that is collected through the openings in the pavement's surface.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following items before placing the Natural Stone or Porcelain Tile.
 - 1. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
 - 2. Verify that Geotextiles, if applicable, have been placed according to drawings and specifications.
 - 3. Verify that Permeable Base Aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
 - 4. Provide written density test results for soil subgrade, Permeable Base Aggregate materials to the Owner, General Contractor and paver installation subcontractor.
 - 5. Verify location, type, and elevations of edge restraints, concrete collars around utility structures, and drainage inlets.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Beginning of bedding sand and paver installation signifies acceptance of base and edge restraints.

3.02 PREPARATION

- A. Verify that the subgrade soil is free from standing water.
 - B. Stockpile Stabilized Setting Bed, Base Aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
 - C. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Geotextile and Permeable Base Aggregate materials.
 - D. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Geotextile, Polymeric Sand, Stabilized Setting Bed, Base Aggregate materials contaminated with sediment with clean materials.
 - E. Complete all subdrainage of underground services within the pavement area in conjunction with subgrade preparation and before the commencement of Permeable Base Aggregate construction.
 - F. Prevent damage to underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation. Report all damage immediately.
 - G. Compact soil subgrade uniformly to at least 90 percent of Standard Proctor Density per ASTM D 698 for pedestrian areas. Compact soil subgrade uniformly to at least 95 percent Modified Proctor per ASTM D 1557 for vehicular areas.
 - H. Proof-roll prepared subgrade according to requirements in Division 31 Section "Earth Moving" to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting and replace with compacted backfill or fill as directed.
- Note: Base compaction and proof-rolling of the subgrade soil on the recommendations of the Design Engineer. Request the Architect/Engineer to inspect subgrade preparations, elevations and conduct density tests for conformance to specifications.

3.03 INSTALLATION

- A. EDGE RESTRAINTS
 - 1. Provide edge restraints as indicated.
 - a. Install job-built concrete edge restraints to comply with requirements in [Division 3 Section "Cast-in-Place Concrete."](#) (Add section number and match specification name)

- b. Provide concrete edge restraint along the perimeter of all paving as specified. Install the face of the concrete edge restraint, where it abuts pavers vertical down to the subbase.
 - c. Construct concrete edge restraint to dimensions and level specified and support on a compacted base not less than 6 in (150 mm) thick.
 - 2. Provide plastic or metal edge restraints as indicated. (Delete if not being used).
 - a. Provide plastic or metal edge restraints along the perimeter of all paving as indicated and supported on a minimum of 6 inches (150 mm) of Base Aggregate.
 - b. Provide 10" spiral galvanized or stainless steel spike to fasten plastic edge restraint at 24 inches on center for straight sections and 12 inches on center for curved sections.
- B. PERMEABLE BASE AGGREGATE
 - 1. Provide the Permeable Base Aggregate in uniform lifts not exceeding 6 in., (150 mm) loose thickness and compact to at least 95 percent as per ASTM D 4254 to depths as indicated.
 - 2. Compact the Permeable Base Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.
 - 3. Tolerance: Do not exceed the specified surface grade of the compacted Permeable Base Aggregate material more than $\pm 3/4$ in. (20 mm) over a 10 ft. (3 m) long straightedge laid in any direction.
 - 4. Provide the Permeable Base Aggregate material in uniform lifts not exceeding 6 in. (150 mm) over the compacted Permeable Aggregate material and compact to at least 95 percent as per ASTM D 4254 to depths as indicated.
 - 5. Compact the Permeable Base Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the compaction device.
 - 6. Tolerance: Do not exceed the specified surface grade of the compacted Permeable Base Aggregate material more than $\pm 1/2$ in. (13 mm) over a 10 ft. (3 m) long straightedge laid in any direction.
 - 7. Grade and compact the upper surface of the Permeable Base Aggregate material sufficiently to prevent infiltration of the Permeable Setting Bed Aggregate material both during construction and throughout its service life.

Note: In-place density of the Permeable Base Aggregate materials may be checked per ASTM D 4254. Establish a Compacted density of 95% of the laboratory index density for the base stone.
- C. STABILIZED SETTING BED AGGREGATE
 - 1. Provide and spread Stabilized Setting Bed aggregate evenly over the Permeable Base Aggregate course and screed to a nominal thickness of 1-1/2 in. (40 mm).
 - a. Do not disturb screeded Stabilized Setting Bed Aggregate.
 - b. Do not substantially exceed screed area which cannot be covered by Natural Stone or Porcelain Tile in one day.
 - c. Do not use Stabilized Setting Bed Aggregate material to fill depressions in the base surface.
 - 2. Keep moisture content constant and density loose and constant until Natural Stone or Porcelain Tile are set and compacted.
 - 3. Inspect the Stabilized Setting Bed Aggregate course prior to commencing the placement of the Natural Stone or Porcelain Tile.
 - 4. Acceptance of the Stabilized Bed Aggregate occurs with the initiation of Natural Stone or Porcelain Tile.
- D. NATURAL STONE OR PORCELAIN TILE
 - 1. Replace Natural Stone or Porcelain Tile with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

2. Mix Natural Stone or Porcelain Tile from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures.
3. Exercise care in handling the Natural Stone or Porcelain Tile to prevent surfaces from contacting backs or edges of other units.
4. Provide Natural Stone or Porcelain Tile using joint pattern as indicated. Adjust joint pattern at pavement edges such that cutting of edge Natural Stone or Porcelain Tile is minimized. Cut all Natural Stone or Porcelain Tiles exposed to vehicular tires no smaller than one-third of a whole paver.
5. Use string lines or chalk lines on Stabilized Setting Bed aggregate to hold all pattern lines true.
6. Apply the bond coat to the back of the Natural Stone or Porcelain Tile.
7. Spread the thin-mortar across the back of the Natural Stone or Porcelain Tile using a 1/2 inch notched trowel.
8. Tap surface of Natural Stone or Porcelain Tile with rubber mallet until it becomes level with adjacent surface. Set surface elevation level with adjacent drainage inlets, concrete collars or channels.
9. Protect Natural Stone or Porcelain Tile for 24 hours while the thin-set mortar cures.
10. Prevent joint (bond) lines from shifting more than $\pm 1/2$ in. (± 15 mm) over 50 ft. (15 m) from string lines.
11. Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size units.
12. Cut Natural Stone or Porcelain Tile with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
13. Prevent all traffic on installed Natural Stone or Porcelain Tiles until polymeric sand has been swept into joints. Keep skid steer and forklift equipment off newly laid Natural Stone or Porcelain Tile.
14. Remove any cracked or structurally damaged units and replace with new units prior to polymeric joint sand.
15. Provide, spread and sweep polymeric sand once the mortar mix has cured for 24 hours.
16. Remove excess polymeric sand broom clean from surface when installation is complete.

3.04 FIELD QUALITY CONTROL

- A. Verify final elevations for conformance to the drawings after sweeping the surface clean.
 1. Prevent final Concrete Paver finished grade elevations from deviating more than $\pm 3/8$ in. (± 10 mm) under a 10 ft (3 m) straightedge or indicated slope, for finished surface of paving.
- B. Lippage: No greater than 1/32 in. (0.8 mm) difference in height between Natural Stone or Porcelain Tile and adjacent paved surfaces.

3.05 REPAIRING, CLEANING AND SEALING

- A. Remove and replace Natural Stone or Porcelain Tiles that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed surfaces; wash and scrub clean.
 1. Clean Natural Stone or Porcelain Tile in accordance with the manufacturer's written recommendations.

3.06 PROTECTION

- A. Protect completed work from damage due to subsequent construction activity on the site.

END OF SECTION