

## SECTION 32 14 13

## PRECAST CONCRETE UNIT PAVING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Section 01 00 00 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Permeable concrete pavers
  - 2. Joint/opening filler material
  - 3. Setting Bedding material
  - 4. Open-graded Base aggregate
  - 5. Open-graded Sub-base aggregate

## 1.3 REFERENCE STANDARDS

- A. Standard Specifications of the State of California Department of Transportation (CTSS), 2006.
- B. Standard Specifications of the City and County of San Francisco, Department of Public Works (SSDPW), July 1986.
  - 1. Section 205.03 Samples and Testing
- C. American Society for Testing and Materials (ASTM)
  - 1. C67, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
  - 2. C136, Method for Sieve Analysis for Fine and Course Aggregate
  - 3. C936, Standard Specification for Solid Interlocking Concrete Pavers.
  - 4. D1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
- D. Interlocking Concrete Paving Institute
  - 1. Permeable Interlocking Concrete Pavement manual.

## 1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01 00 00 Specification Sections.
- B. Shop Drawings and Details: Indicate perimeter conditions, junction with other materials, expansion and control joints, paver layout, pattern, and color arrangement, installation details. Indicate layout, pattern, and paving joints in relationship to fixtures and project details.
- C. Sieve analysis of aggregates for base and bedding materials per ASTM C936.
- D. Permeable Concrete Pavers::
  - 1. Manufacturer's product catalog sheets with specifications

2. Four representative full-size samples of each paver type, thickness, color and finish. Submit samples indicating the range of color expected in the finished installation.
  3. Accepted samples become the standard of acceptance for the work of this section.
  4. Laboratory test reports certifying compliance of manufacturer's concrete pavers with ASTM C 936.
  5. Manufacturer's material safety data sheets for safe handling of the specified materials and products.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

## 1.5 QUALITY CONTROL

- A. Installer Qualifications: Engage an experienced Installer who has completed 5 years of unit paver installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Single-Source Responsibility: Obtain each color, type, and variety of unit pavers, joint materials, and setting materials from a single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.
- C. Mockup: Prior to installing unit pavers, construct mockups in 2 locations for each typical application to verify materials, patterns and workmanship at curves, intersections and site furnishings. Build mockups to comply with the following requirements, using materials indicated for final unit of Work, including specified base construction, special features for expansion joints, and contiguous work as indicated.
1. Locate mockup areas, 25 square feet minimum for each pattern or as directed by City Representative.
  2. Notify City Representative one week in advance of the dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship, including cutting, tapering and fitting of pavers along radial edge and straight intersections contiguous with each other; and adjacent to or under concrete edges or site furnishings. Include drilling through pavers set on mortar to anchor site furnishings.
  4. Obtain City Representative's acceptance of mockups before start of final unit of Work.
  5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    - a. When directed, demolish and remove mockups from Project site.
    - b. Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 1 Product Requirement Section.
- B. Comply with Manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged container packaging with identification tags intact.
  - 1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings and adjacent paving.
  - 2. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped cubes 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 existing construction.
- D. Storage and Protection: Store materials in protect area such that they are kept free from mud, dirt, rust, and other foreign materials.

## 1.7 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

## 1.8 MAINTENANCE

- A. Extra materials: Provide 5% additional materials for use by owner for maintenance and repair. This material shall be from the same production run as the installed materials.

## PART 2 - PRODUCTS

### 2.1 UNIT PAVERS

- A. Permeable Paver Units:
  - 1. Paver type: "City Estate Hydro-Flo" pavers, 60mm or 80mm, with spacers, and no top bevel, as manufactured by Pacific Interlock Paving stone, Hollister, CA; (831) 637-9163; or approved equal, no known equal.
    - A. Pavers: 6" x 12" x 2.36" (60mm) 6" x 12" x 3.15" (80mm) "City Estate Hydro-Flo " paver, Color: 60% Country Loam, 40% Monterey Sand. Pavers shall be taken from pallets and laid in order to show range of colors and pattern per mock up, refer to paragraph 1.5/C.
    - i. Material Standard: Comply with material standards set forth by ASTM C936-08.
    - ii. Color Pigment: Material Standard: Comply with ASTM C 979.
    - iii. Coverage: See manufacturer's literature.
    - iv. Setting Patterns: Herringbone
    - v. Average Compressive Strength (ASTM C 140): not less than 8000 psi with no individual unit under 7200psi.

### 2.2 CRUSHED STONE AGGREGATE BASE

- A. Crushed stone with 90% fractured faces, LA Abrasion <40 per ASTM C131, minimum CBR of 80% per ASTM D 1883.
- B. Do not use rounded river gravel
- C. All stone materials shall be washed with less than 1% passing the No. 200 sieve.

- D. Joint/opening filler, Setting Bed, Base, and Sub-base: conforming to ASTM D 448 gradation as shown in Tables 1, 2, 3 and 4 below:

Table 1  
Grading Requirements for ASTM No.9 Joint Filler

| Sieve size       | Percent Passing |
|------------------|-----------------|
| 9.5 mm (3/8 in.) | 100             |
| 4.75 mm (No. 4)  | 85 to 100       |
| 2.36 mm (No. 8)  | 10 to 40        |
| 1.18 mm (No. 16) | 0 to 10         |
| 300 µm (No. 50)  | 0 to 5          |

Table 2  
Grading Requirements for ASTM No.8 Setting Bed

| Sieve size        | Percent Passing |
|-------------------|-----------------|
| 12.5 mm (1/2 in.) | 100             |
| 9.5 mm (3/8 in.)  | 85 to 100       |
| 4.75 mm (No. 4)   | 10 to 30        |
| 2.36 mm (No. 8)   | 0 to 10         |
| 1.16 mm (No. 16)  | 0 to 5          |

Table 3  
Grading Requirements for ASTM No. 57 Base

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

Table 4  
Grading Requirements for ASTM No. 2 Sub-base

| Sieve size          | Percent Passing |
|---------------------|-----------------|
| 75 mm (3 in.)       | 100             |
| 63 mm (2 1/2 in.)   | 90 to 100       |
| 50 mm (2 in.)       | 35 to 70        |
| 37.5 mm (1 1/2 in.) | 0 to 15         |
| 19 mm (3/4 in.)     | 0 to 5          |

- E. Acceptable Manufacturers/Suppliers
1. Graniterock, A.R. Wilson Quarry, Aromas, CA, (831) 768-2380; or equal - submit product information for approval.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces indicated to receive paving, with Installer present, for compliance with requirements for compaction, installation tolerances and other conditions affecting performance of unit pavers. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean and remove dirt, dust, debris, and loose particles.
- B. Remove substances from concrete substrates that could impair setting, including curing and sealing compounds, form oil, and laitance.
- C. Proof-roll prepared subgrade surface to check for unstable areas and areas requiring additional compaction. Do not proceed with installation of unit pavers until deficient subgrades have been corrected and are ready to receive subbase for unit pavers.

### 3.3 INSTALLATION

- A. General
  - 1. Any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities shall be removed before application of the subbase materials.
  - 2. Keep area where pavers and base courses are to be installed free from sediment, cement dust, excess concrete from adjacent pours, and all debris and trash, during entire job.
  - 3. Base and bedding materials contaminated with sediment shall be removed and replaced with clean materials.
  - 4. Do not damage drainpipes, overflow pipes, observation wells, or any inlets and other drainage appurtenances during installation. Report any damage immediately to the Engineer.
  - 5. Prior to placement of base course material, scarify native soil to a minimum 2"-depth, while avoiding compaction of native soil material.
- B. Open-graded subbase and base
  - 1. Moisten, spread and compact the No. 2 subbase in 4 to 6 in. lifts (100 to 150 mm) lifts.
  - 2. For each lift, make at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 T vibratory roller until there is no visible movement of the No. 2 stone. Do not crush aggregate with the roller.
  - 3. The surface tolerance of the compacted No. 2 subbase shall be  $\pm 2 \frac{1}{2}$  in. ( $\pm 65$  mm) over a 10 ft (3 m) straightedge.
  - 4. Moisten, spread and compact No. 57 base in 4 in. (100 mm) lifts over the compacted No. 2 subbase with a minimum 10 vibratory roller until there is no visible movement of the No. 57 stone. Do not crush aggregate with the roller.
  - 5. The surface tolerance the compacted No. 57 base should not deviate more than  $\pm 1$  in. ( $\pm 25$  mm) over a 10 ft (3 m) straightedge.
- C. Bedding layer
  - 1. Moisten, spread and screed the No. 8 stone bedding material.
  - 2. Fill voids left by removed screed rails with No. 8 stone.
  - 3. The surface tolerance of the compacted surface should not deviate more than  $\pm 3/8$  in. ( $\pm 10$  mm) over a 10 ft (3 m) straightedge.
  - 4. Do not subject screeded bedding material to any pedestrian or vehicular traffic before paving unit installation begins.
- D. Permeable interlocking concrete pavers and joint/opening fill material
  - 1. Lay the pavers in the pattern(s) and joint widths shown on the drawings. Maintain straight pattern lines.
  - 2. Fill gaps at the edges of the paved area with cut units. Cut pavers subject to tire traffic shall be no smaller than 1/3 of a whole unit.

3. Cut pavers to be placed along the edges with a double-bladed splitter or masonry saw.
  4. Fill the openings and joints with Joint Filler material.
  5. Remove excess aggregate by sweeping pavers clean.
  6. Compact and seat the pavers into the bedding material using a low-amplitude, 75-90 Hz plate compactor capable of at least 4,000 lbs (18 kN) centrifugal compaction force. This will require at least two passes with the plate compactor.
  7. Do not compact within 6 ft (2 m) of any unrestrained edges of the paving units.
  8. Apply additional aggregate to the openings and joints, filling them completely. Remove excess aggregate by sweeping and compact the pavers. This will require at least two passes with the plate compactor.
  9. All pavers within 6 ft (2 m) of the laying face must be left fully compacted at the completion of each day.
  10. The final surface tolerance of compacted pavers shall not deviate more than  $\pm 3/8$  in. ( $\pm 10$  mm) under a 10 ft (3 m) long straightedge.
  11. The surface elevation of pavers shall be  $1/8$  to  $1/4$  in. (3 to 6 mm) above adjacent concrete curbs, headers, adjacent paving, adjacent drainage inlets, concrete collars or channels.
- E. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible or cause staining in finished work.
- F. Mix pavers from several pallets or cubes as they are placed to produce uniform blend of colors and textures.
- G. Cut unit pavers 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.

### 3.4 FIELD QUALITY CONTROL

- A. After sweeping the surface clean, check final elevations for conformance to the drawings.
- B. Lippage: No greater than  $3/32$ " (2mm) difference in height between adjacent pavers.

### 3.5 REPAIR, CLEANING, AND PROTECTION

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement. Restore setting bed to optimum conditions.
- B. Cleaning: Remove excess materials with approved materials and method. Sweep clean surface and surroundings every day before end of work.
- C. After work in this section is completed, the General Contractor shall be responsible for protecting work from sediment deposition and damage due to subsequent activity on the site. The area shall be covered with minimum 4mil thick plastic sheeting. The contractor shall be responsible for keeping this protective covering free from rips and tears and other damage for project duration.
- D. Provide final protection and maintain conditions in a manner acceptable to Installer that ensures that unit paver work is without damage or deterioration at the time of Substantial Completion.

END OF SECTION