Notice is hereby given to all prospective bidders that plans and specifications on the subject project are modified as hereinafter set forth. This Addendum shall be attached to and form a part of the plans and specifications. All bidders must acknowledge receipt of this addendum on the Bid Form. In case of difference with previous addenda or communications, this addendum takes precedence.

It is the responsibility of all bidders to notify all subcontractors from whom they request bids and from whom they accept bids of all changes contained in this addendum.

**PROJECT MANUAL**

1. **Item No. PM-1**  
   **Reference:** 01 14 00- Work Restrictions  
   **Description:** The area of work shown on the contract documents is diagrammatic and may not include extent of work required for utility connections, etc. Any work that is required beyond the area of work indicated must be coordinated, both in schedule and extent, with the District Project Manager prior to execution of the work.

2. **Item No. PM-2**  
   **Reference:** Section 10 51 00- Lockers  
   **Description:** 1.5 System Description. All lockers to be all welded, steel construction.  
   Revise as follows:
   1. **Width:** 15”
   2. **Depth:** 15”
   3. **Height:** 24”
   4. **Configuration:** Three tier
   5. **Mounting:** Floor and wall.
   6. **Base:** Provide 12 gauge steel Z-base provided by locker manuf - finish/color to match locker.
   7. **Locking:** Recessed handle with single point latching. 11 ga. hasp welded to the strike.
   8. **Ventilation:** Recessed mini-louvers
2.2 Materials. Revise as follows:
   1. Body     Min. 16 ga. sides, backs, tops and bottoms
   2. Door Face Min. 14 ga. door panels in rigid pan or box
   3. Door Frame Min. 14 ga. Continuous door strike
   4. Hinges   Continuous 16 ga. welded to the frame

3. Item No. PM-3
   Reference: Section 10 11 00- Visual Display Boards
   Description: Part 2- Products, 2.1 (A) Acceptable Manufacturers. Nelson Adams is an acceptable manufacturer for the products in this section.

4. Item No. PM-4
   Reference: Section 12 21 13- Horizontal Louvers
   Description: Delete this section in its entirety.

5. Item No. PM-5
   Reference: Section 12 24 13- Roller Window Shades
   Description: Part 2.3, A. Manufacturers and Products. Revise as follows:
      1. Basis of Design:
         Draper, Product: FlexShade system, 100 percent thermoplastic olefin, basketweave non-directional pattern with 1 percent openness factor.
         2. Mecho Shade Systems, Inc.
         3. Hauser Shade Company
         4. Mariak Contract
   B. Shade Fabric Manufacturers:
      1. Phifer- SheerWeave Performance +2500
      2. Verosol- Enviroscreen 802 G2
   Part 2.3, C. Characteristics- Add the following:
      5. Metallized reflective coating on outward side of fabric
      6. Fabrics to be Greenguard Certified, non-PVC

6. Item No. PM-6
   Reference: Section 14 24 00- Hydraulic Elevators
   Description: Part 2- Products, 2.1 Description of System, A. Passenger Elevator. Revise the following description of system items. All other descriptions are to remain per spec.
      1. Capacity: 2500 pounds
      12. Car Enclosure Type:
         a. Platform Size: 7'-0" wide by 5'-1" deep
         b. Inside Clear Dims: 6'-8" wide by 4'-3" deep by 8'-0" high

7. Item No. PM-7
   Reference: Section 32 13 43- Pervious Concrete- Addendum 2
   Description: Add this section in its entirety.
DRAWINGS

1. Item No. AD2-1
   Reference: DRAWING G0.03- ACCESSIBILITY SITE PLAN-LEVEL 1
   Description: Replace this sheet with the attached sheet G0.03. Only the areas clouded and noted as delta 2 have been revised. These changes, such as the deletion of the accessible stalls and crosswalk, apply to the civil drawings.

2. Item No. AD2-2
   Reference: DRAWING A2.01- FLOOR PLAN-LEVEL 1
   Description: This is to clarify that all structural supports for the basketball backstops noted on this plan are per the supplier. Refer to sheet S1.03 and specification section 11 66 00 for additional information on the requirements for these structural supports.

3. Item No. AD2-3
   Reference: DRAWING A2.04- INTERIOR FINISH LEGEND AND SCHEDULE
   Description: Material Codes. Change “OTS” to read, “OTS- Paint the underside of the metal deck per specification section 09 91 00- Painting in a color to be selected by the Architect.”

4. Item No. AD2-4
   Reference: DRAWING A5.04- ELEVATIONS-INTERIOR
   Description: Gymnasium 120. Field verify the final location of the Scoreboards. This is to clarify that the scoreboards are not in contract. Provide all the electrical infrastructure indicated in the electrical drawings as part of this contract.

5. Item No. AD2-5
   Reference: DRAWING A9.05- CEILING DETAILS
   Description: Details 6 and 7. This is to clarify that the metal filler panel at the top of the lockers are to be provided by the locker manufacturer and is to be the same material, finish, and color as the lockers.

6. Item No. AD2-6
   Reference: DRAWING A4.02- LARGE SCALE VIEWS- ELEVATOR
   Description: Enlarged Plan 10. Replace the existing enlarged plan with the attached sheet AD2-SK-1. See 15/S7.04 for additional information on the construction of the sump pit.

7. Item No. AD2-7
   Reference: DRAWING S1.01- SLAB PLAN- LEVEL 1
   Description: Slab Schedule. Revise the Type SG4 slab schedule to read, “4” conc. slab w/ #4 @ 18” o.c.e.w. centered in slab o/ vapor retarder o/ free draining crushed rock o/ mat slab below.”

8. Item No. AD2-8
   Reference: DRAWING S4.03- DETAILS CONCRETE
   Description: Details 2, 4, 8, 12, and 20. Revise the note that reads, “Vapor Retarder” to read, “Vapor Retarder over free draining crushed rock.”
9. Item No. AD2-9
   Reference: DRAWING P4.01- PLUMBING PLAN
   Description: Replace this sheet with the attached sheet P4.01. Only the areas clouded and noted as delta 2 have been revised.

END OF ADDENDUM ITEMS

ATTACHMENTS:

Project Manual:
   Division 32 13 43
   Addendum 2  16 Pages

Drawings:
   G0.03  1 Page
   AD2-SK1  1 Page
   P4.01  1 Page
SECTION 32 13 43
PERVIOUS CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Pervious Concrete.
B. Pavement Base.
C. Geotextile for Soil Separation.

1.2 RELATED SECTIONS
A. Section 31 23 00, Excavation and Fill.
B. Section 31 31 19, Vegetation Control.
C. Section 32 16 13, Concrete Curbs and Gutters.
D. Section 33 05 13.13, Manhole Grade Adjustment.
E. Section 33 05 16, Utility Structures.

1.3 RELATED DOCUMENTS
A. Geotechnical Report
B. ASTM Standards
C. Caltrans Standard Specifications
D. San Francisco Department of Public Works Engineering Standards
E. AASHTO Standards
F. ACI Standards:
   1. Section 522.1: Specification for Pervious Concrete Pavement.
   2. Section 301: Specifications for Structural Concrete.
   4. Section 308.1: Standard Specifications for Curing Concrete.
G. California Building Code:
   1. Chapter 11B – Accessibility To Public Buildings.
2. Chapter 19A – Concrete.


4. Section 1133B – General Accessibility for Entrances, Exits and Paths of Travel.

1.4 DEFINITIONS


B. ACI: American Concrete Institute

C. AASHTO: Standards of the American Association of State Highway and Transportation Officials, 1998 or latest edition

1.5 SUBMITTALS

A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

B. Design Mixes: Have all concrete mixes designed by a testing laboratory and approved by the Consulting Engineer. Conform all mixes to the applicable building code requirement, regardless of other minimum requirements listed herein or on the drawings. Submit mix designs for review before use. Show proportions and specific gravities of cement, fine and coarse aggregate, and water and gradation of combined aggregates.

1. National Ready Mix Concrete Association (NRMCA) Pervious Concrete Contractor Certifications and project experience as specified in section 1.05A.

C. Pre-Installation Submittals: The Contractor shall submit to the Engineer the following a minimum of 20 calendar days prior to the construction of the pervious cement concrete pavement:

1. NRMCA Certifications for the batch plant to be used in the production of pervious concrete for this project.

2. Proposed mix design including the following:
   a. Batch weights of all constituents.
   b. Portland cement type and brand.
   c. Non-Portland cement pozzolan type and source.
   d. Microfiber brand and type.
   e. Admixture type and brand.
   f. Aggregate source(s), gradation(s), LA abrasion, and cleanliness value(s).
   g. Fresh density of the pervious concrete per ASTM C1688.

   No concrete shall be placed until the Engineer has provided written acceptance of the mix design per Section 1.05.B.
3. Source certificates, gradations, R-values, LA abrasion, and cleanliness values of aggregates for base and reservoir course materials performed within one (1) month of product delivery to site.

4. Product data sheets for all proposed admixtures and geotextiles.

5. A detailed plan of the proposed paving pattern showing the location and type (saw cut or rolled in plastic concrete) of all planned joints. No deviation from the jointing pattern shown on the Plans will be allowed without written approval of the Engineer.

6. A detailed procedure for the production, transportation, placement, protection, curing, and temperature monitoring of concrete for hot and/or cold weather, unless written approval of the Engineer waiving the requirement is received.

7. Field technician qualifications as specified in Section 1.05.A.

8. Testing agency qualifications as specified in Section 1.05.A.

9. Density of fresh pervious concrete, length of cores, and density of cores for one (1) reference panel. Reference panel shall be placed, jointed, cured, and tested as specified in Section 1.05.D.1 and be within tolerance of the required thickness defined by the Contract Documents.

1.6 QUALITY ASSURANCE

A. Test and inspect concrete materials and operations as Work progresses as described in this section. Failure to detect defective Work or materials at any time will not prevent rejection if a defect is discovered later, nor shall it constitute final acceptance.

1. Contractor and Personnel Qualifications:

   a. Field technician qualification: Field tests of concrete required in the responsibilities of the testing agency shall be performed by an individual certified as both an NRMCA Certified Pervious Concrete Technician, or equivalent, and an ACI Concrete Field Testing Technician – Grade I, or equivalent

   b. Testing agency qualification: Agencies that perform testing on concrete materials shall meet the requirements of ASTM C1077 and provide evidence of employment for at least one (1) NRMCA Certified Pervious Concrete Technician, responsible for testing, or providing direct oversight of testing, of all concrete materials. Agencies inspecting the Work shall meet the requirements of ASTM E329. Testing agencies performing the testing shall be accepted by the Engineer before performing any Work

   c. Batch plant qualification: Batch plant used for pervious concrete shall be a semi-automatic or automatic batching plant with a current NRMCA certification.

B. Approved Mix Design: Once accepted by the Engineer, the mix design meeting the criteria specified in Section 2.01.F shall become the Approved Mix Design and shall not be modified in any way. The Approved Mix Design shall be determined from information submitted under Section 1.04 and from results of reference panel testing as described in Section 1.05.D.1. Modifications to the Approved Mix Design will not be allowed and any
modified mix placed in the Work will be rejected. Proposed modifications to the Approved Mix Design shall be submitted as a new mix design and shall require a new reference panel to validate the proposed mix design and determine the new Approved Mix Design.

C. Responsibilities of Contractor

1. Reference Panel: Place reference panels on the project site, on a subgrade and base prepared as specified, using the material and construction requirements for pavement in this Specification. Each panel must have a surface area of at least 225 square feet, and a width and thickness as specified for the pavement in the Contract Documents.

2. Pressure wash testing: Before final acceptance by the Engineer, the Contractor shall pressure wash the pervious concrete. Pressure washing shall be provided and completed by using portable washer equipment working at a minimum of 3,000 psi at 2.0 to 2.5 gpm.

D. Testing

1. Reference Panel: Testing for the reference panel shall adhere to the requirements for testing of Pavement per Section 1.05.D.2 for approval by the Engineer. Each test shall meet the acceptance criteria for Reference Panel as defined in Section 1.05.E.1.

   The Engineer shall inspect and approve the reference panel prior to the placement of additional pervious concrete.

   Failure to install acceptable reference panels of pervious concrete will indicate an unqualified installer.

   Production sections of this Work shall not be placed until achieving a complete reference panel that fully complies with the Plans and Specifications and has written acceptance issued by the Engineer.

   The completed and accepted reference panels shall be maintained and protected throughout the duration of the Work and may not be demolished and disposed of without written permission from the Engineer. If a reference panel is incorporated into the Work, it shall remain in place and be accepted as a single lot.

   Unless otherwise determined by the Engineer, density testing of fresh concrete and hardened cores will be used to validate the mix design per the design criteria set forth in Section 1.04.B and the acceptance criteria in Section 1.05.E.1.

   The average fresh density and average hardened density of the cores shall be the densities used for the Approved Mix Design.

2. Pavement: The following testing shall be conducted for approval by the Engineer for each reference panel and each lot of pervious concrete placed, where a lot is defined as the lesser of one (1) day’s production or 5,000 square feet of pervious concrete, in place, unless otherwise specified below:

   a. Density testing of at least one (1) cubic foot of fresh concrete in accordance with ASTM C1688.
b. Thickness testing of three (3), four- (4)-inch hardened concrete cores in accordance with ASTM C174 and adhering to the following requirements:

1) Removed not less than seven (7) days after placement of pervious concrete.

2) Location selected in accordance with ASTM D3665.

3) Cut in accordance with ASTM C42.

c. Density and void content testing of the three (3) hardened concrete cores extracted for thickness testing and trimmed to produce flat core ends per ASTM C42 paragraph 7.4.1 and 7.4.2. Samples shall be tested in accordance with ASTM C1754.

E. Acceptance

1. Reference Panel: Acceptance of the reference panel will be based on the criteria for acceptance of Pavement per Section 1.05.E.2 with the following deviations:

   a. Hardened Density: The density of each core shall be within five (5) pounds per cubic foot of the average hardened density of the three (3) cores.

   b. Fresh Density: The fresh density shall be within or equal to five (5) pounds per cubic foot of the average fresh density of the three (3) samples.

2. Pavement: Acceptance of a lot of pervious concrete will be based on the following criteria:

   a. Smoothness: Pervious concrete pavement smoothness shall be checked with a 10-foot straightedge. Vertical measurement should be taken between the pavement’s determined plane and straight edge, discounting surface void and roughness irregularities, in a direction perpendicular and parallel to the centerline. The finished pavement shall be uniform to a degree such that no variations greater than 3/8-inch are present between the straight edge and pavement surface over a distance of at least 6 inches.

   b. Grade: Pervious concrete shall be true to designed spot elevations plus or minus ¼ inch and shall not deviate from designed slope more than ¼ inch in ten (10) feet. Where abutting existing facilities such as sidewalks, walkways, curbs, driveways or other pavements, the pervious concrete shall be flush.

   c. Line: Pervious concrete margins shall be true to designed lines plus or minus ½ inch at any point.

   d. Slope: Pervious concrete shall be sloped as shown on the Plans. Slope shall be consistent to within 1/4 inch in ten (10) feet.

   e. Thickness: Each core sample shall be equal to the minimum section depth or more as specified on the Plans.
f. Hardened Density: The density of the core samples for each lot shall be within five (5) pounds per cubic foot of the density as accepted in the reference panel.

g. Void Content: The total void content of the core samples for each reference panel and lot shall be twenty (20) percent, plus or minus five (5) percent, in place, as constructed.

h. Infiltration Rate: The average of all surface infiltration tests shall be greater than 250 inches per hour with no single test less than 100 inches per hour.

i. Appearance: Each lot of finished pervious concrete will be inspected for appearance by the Engineer after completion of pressure washing testing per Section 1.05.C.4. The pervious concrete shall have a consistent surface texture, shall have no more than five (5) percent of the surface area within each panel (joint to joint) filled with paste, shall be free of ridges or other surface imperfections, shall have joints that are in the specified location and are constructed per specification, shall be free of cracks and shall not be raveled.

A panel will be considered raveled if aggregate is dislodged from a contiguous area of the pavement surface or longitudinally along a joint exceeding five times the nominal maximum aggregate size in any direction OR if aggregate particles are dislodged from more than two (2) percent of the pervious concrete within each panel (joint to joint). Raveling occurring during the first three (3) months after installation is subject to complete removal and replacement of affected panels with acceptable pervious concrete at the Owner’s discretion and Contractor’s expense. Requirement to replace affected panels shall continue until three (3) months after the date of replacement. Written notification of defects is the sole responsibility of the Owner.

F. Conformance to Approved Mix Design: The pervious concrete used shall conform to the Approved Mix Design within the limits set forth in ASTM C94.

PART 2 - PRODUCTS

2.1 PERVIOUS CONCRETE

A. General: Pervious Concrete shall comply with ASTM C94, except sections 4.2, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 7, 8, 16, 17, 18, 19, 20 and the requirements specified herein. The volume of fresh concrete in a given batch shall be determined from the total mass of the batch divided by the design density of the concrete. The total mass of the batch shall be determined as the net mass of the concrete in the batch as delivered, including the total mixing water as defined in ASTM C94 Paragraph 9.3.

B. Cement: Cement in the mix design shall conform to the requirements for Portland Cement or Blended Hydraulic Cement as specified herein:

2. Blended Hydraulic Cement: Blended Hydraulic Cement shall be Type IP or IS Cement conforming to ASTM C595. Type IP(X), Portland Pozzolan Cement, and IS(X) where (X) dictates pozzolan and slag percentage, respectively, shall be Portland Cement and Pozzolan. The pozzolan shall be limited to fly ash or ground granulated blast furnace slag.

The fly ash or ground granulated blast furnace slag constituent content in the finished cement shall not vary more than plus or minus 5 percent by weight of the finished cement from the certified value.

3. Supplementary cementitious material shall be as specified herein:

   a. Fly Ash: Fly ash shall conform to the requirements of ASTM C618, Class F or C.

   b. Slag Cement: Slag cement shall meet the requirements of ASTM C989, Grade 100 or Grade 120.


C. Aggregates: Aggregates shall conform to ASTM C33 except as specified herein, unless otherwise approved by the Engineer.

1. Aggregate Gradation tested in accordance with ASTM C136 at least once per 300 cubic yards of concrete.

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1 Sieve provided in nominal size square openings or United States Standard Sieve Series sizes.

In individual tests, a variation of 4 percent under the minimum percentages or over the maximum percentages will be allowed. The average of three successive tests shall be within the percentages stated above. Aggregate shall contain no pieces larger than two times the maximum sieve size for the specified grading measured along the line of greatest dimension.

2. Coarse Aggregate

   a. LA Abrasion: 35 percent (maximum) tested in accordance with ASTM C131 at least once per 300 cubic yards of concrete.
b. Cleanliness Value: 75 (minimum) tested in accordance with California Test 227 at least once per 300 cubic yard of concrete.

3. Acceptance of grading and quality of the aggregate may be based on samples taken from stockpiles at the concrete plant or a submitted gradation report at the discretion of the Engineer. The point of acceptance will be determined in the field by the Engineer.

D. Admixtures

1. Air Entraining Admixtures: Air entraining admixtures shall meet the requirements of ASTM C260.

2. Water Reducing Admixtures: Water reducing admixtures shall meet the requirements of ASTM C494, Type A.

3. Hydration Stabilizing Admixtures: Hydration stabilizing admixtures shall meet the requirements of ASTM C494, Type B or Type D.

4. Superplasticizers: Superplasticizers and retarders shall meet the requirements of ASTM C494, Type F or Type G and ASTM C1017, Type 1.

5. Viscosity Modifying Admixtures: Viscosity modifying admixtures may be used if approved by the Engineer.

6. Color Pigment: Color pigment shall meet the requirements of ASTM C979 for integrally colored concrete. Pigments shall be color stable, non-fading, and resistant to lime and other alkalis.

E. Water: Clean potable water or water conforming to ASTM C1602 shall be used in the mix design and on the jobsite. The use of hot water is not permitted.

F. Microfibers: Microfibers shall conform to the requirements of ASTM C1116, Type III and shall be monofilament and ½ inch in length.

G. Mix Design:

1. General: The Contractor shall propose a mix design for pervious concrete and shall submit the mix design to the Engineer for acceptance prior to constructing the reference panels. Pervious concrete shall not be placed in the reference panels without a mix design that has been reviewed and accepted by the Engineer.

2. Mix Design Criteria: The Contractor shall include the following elements and results of the described procedures in the proposed mix design:
   a. The cementitious content, including pozzolans if used, shall be a minimum of 480 and a maximum of 600 pounds per cubic yard.
   b. The mix may incorporate up to 5 percent fine aggregate, by weight.
   c. The mix shall incorporate a hydration stabilizing admixture.
d. The mix may incorporate microfibers or fibers per Manufacturer’s recommendations.

e. The mix shall be designed to meet the acceptance criteria for Void Content per Section 1.05.F.2 as determined by the testing methods specified in Section 1.05.E.2.

f. The water/cement ratio shall be between 0.27 and 0.35.

g. Up to 50 percent of cementitious material in the mix, by weight, may be fly ash, slag cement, or a combination of silica fume and either or both of the above, with silica fume not exceeding 10 percent.

Deviations from this mix design, such as the use of internal curing admixtures, cementitious content outside of the range specified, or finer aggregate gradations may be permitted at the sole discretion of the Engineer provided the Contractor can demonstrate the viability of the mix design through past successful installations or sound science.

2.2 PAVEMENT BASE

A. General: Pavement Base Material shall consist of clean, mechanically crushed stone, substantially free from adherent coatings. Materials shall be washed thoroughly to remove clay, organic matter, extraneous debris, or objectionable materials. Recycled materials or round river gravel are not permitted.

B. Pavement Base shall consist of up to two (2) layers as specified on the Plans and included herein:

1. “Base Course” shall be ASTM No. 3 (modified) or ASTM No. 57 (modified) stone per Section 2.02.C.

2. “Reservoir Course” shall be ASTM No. 2 (modified), ASTM No. 3 (modified), or ASTM No. 57 (modified) stone per Section 2.02.C.

C. Pavement Base Material shall meet the following specifications for grading and quality.

1. Aggregate Gradation tested in accordance with ASTM C136 at least once per 500 cubic yards of base material.

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<tr>
<th>Sieve ¹</th>
<th>Percent Passing by Weight</th>
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April 3, 2018 32 05 23 - 9 Pervious Concrete
Addendum 2
### Sieve Analysis

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<tr>
<td>No. 100&lt;sup&gt;2&lt;/sup&gt;</td>
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</table>

<sup>1</sup> Sieve provided in nominal size square openings or United States Standard Sieve Series sizes.

<sup>2</sup> Gradation modified from ASTM for portion passing the No. 100 sieve.

2. R-Value: 78 (minimum) tested in accordance with California Test 301.

3. L.A. Abrasion: 30 percent (maximum) tested in accordance with ASTM C131.

4. Cleanness Value: 75 (minimum) tested in accordance with California Test 227 at least once per 500 cubic yards of base material.

5. Crushed Particles: 90 percent (minimum) with two (2) or more fractured faces tested in accordance with California Test 205.

6. The combined portion of Material retained on the U.S. No. 4 sieve shall not contain more than 0.1 percent wood waste by weight. The portion of Material passing a U.S. No. 10 sieve shall not have wood waste that results in more than 250 parts per million of organic matter by calorimetric tests when tested.

### Geotextile for Soil Separation

A. Geotextile shall be woven, consisting only of long chain polymeric fibers or yarns formed into a stable network such that the fibers or yarns retain their position relative to each other during handling, placement, and design service life. At least 95 percent by weight of the material shall be polyolefins or polyesters. The material shall be free from defects or tears. The geotextile shall also be free of any treatment or coating which might adversely alter its hydraulic or physical properties after installation. The geotextile shall conform to the properties specified herein:

<table>
<thead>
<tr>
<th>Geotextile Property</th>
<th>Test Method</th>
<th>Requirement</th>
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</thead>
<tbody>
<tr>
<td>Grab Tensile Strength, minimum in weakest direction</td>
<td>ASTM D4632</td>
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<tr>
<td>Apparent Opening Size (AOS)</td>
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<tr>
<td>Ultraviolet (UV) Radiation Stability, minimum strength</td>
<td>ASTM D4355</td>
<td>50%</td>
</tr>
<tr>
<td>retained after 500 hours in weatherometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Rate, minimum</td>
<td>ASTM D4491</td>
<td>140 gal/min/ft&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

### PART 3 - EXECUTION
3.1 SUBGRADE PREPARATION AND PROTECTION

A. Construct subgrade to +/- ¾ inch of the grades and slopes specified on the Plans.

B. Grading of subgrade shall be with low ground pressure equipment when within six (6) inches of final subgrade elevation.

C. Compact subgrade to 90 percent (+/- 2 percent) of the maximum dry density per standard Proctor test (ASTM D698), or as directed by the Geotechnical Engineer. Determination of in-place density shall be made using a nuclear gauge per ASTM D6939.

D. Areas of the subgrade which are over-compacted, as determined by the Geotechnical Engineer, shall be ripped/tilled to a depth of 12 inches (minimum) or as directed by the Geotechnical Engineer and shall be recompacted in accordance with Section 3.01.C. Contractor shall locate all utilities within pavement footprint prior to ripping and re-compacting subgrade.

E. Proof-roll prepared subgrade with loaded dump truck, remove soft spots, and replace with permeable structural fill as directed by the Engineer to achieve uniform subgrade.

F. After compaction and proof roll, scarify subgrade ¼- to ½-inch deep by hand rake. Once scarified, materials or equipment shall not be permitted within the prepared subgrade area so as to avoid recompaction or clogging of the scarified subgrade.

G. The subgrade shall be protected from over-compaction or contamination by silty run-off or other contaminants.
   1. Provide physical barriers or direct traffic to eliminate unnecessary vehicular traffic on the subgrade during construction in accordance with SFMTA and SFPDW ordinances and specifications.
   2. Provide flow diversion and erosion control measures to protect the permeable pavement area from sedimentation until the upstream catchment area is thoroughly stabilized.

H. Areas of subgrade over-compacted by construction traffic or other impacts by the Contractor or Subcontractors shall be ripped/tilled and re-compacted in accordance with Section 3.01.D. All work and materials required to correct over-compacted subgrade, including utility locates within the pavement footprint, shall be at the Contractor’s expense.

I. Areas of subgrade contaminated by the accumulation of silty material following rains or other debris or contamination shall be removed and disposed at the Contractor’s expense.

J. The subgrade shall be inspected and accepted by the Engineer prior to placement of the geotextile or pavement base.

K. Place geotextile, if required, on scarified subgrade. Care shall be taken to provide full coverage and to prevent the geotextile from being torn. Damaged geotextile shall be repaired as indicated by the manufacturer and to the satisfaction of the Engineer at no additional cost to the Owner. Overlaps of the geotextile shall be a minimum of one (1) foot or to the manufacturer’s recommendation, whichever is greater.
3.2 PAVEMENT BASE

A. Construct pavement base to the lines, grades, and thicknesses shown on the Plans.

B. Place the pavement base so as to prevent loaded dump trucks from driving directly on the prepared subgrade.

C. Compact pavement base, in six (6) inch (maximum) lifts, by making a minimum of three passes over the pavement base material with a ten (10) ton vibratory roller, or as directed by the Geotechnical Engineer. The first two (2) passes (minimum) shall be in vibratory mode. The final pass shall be in static mode. Acceptance of the pavement base will be based on Engineer’s observation of aggregate movement during final compaction pass. Compaction equipment shall be accepted by the Engineer prior to use.

D. Pavement base shall be true to the designed grade and slope, +/- 0.05 feet, after compaction for each layer. In the event of low spots, additional material shall be added and recompacted. In the event of high spots, excess material shall be removed and the area recompacted.

E. The pavement base shall be protected from over-compaction or contamination by silty run-off or other contaminants.

1. Provide physical barriers or direct traffic to eliminate unnecessary vehicular traffic on the pavement base during construction in accordance with SFMTA and SFDPW ordinances and specifications.

2. Provide flow diversion and erosion control measures to protect the permeable pavement area from sedimentation until the upstream catchment area is thoroughly stabilized.

F. Any damage to the pavement base (including contamination by silty run-off) shall be repaired to the satisfaction of the Engineer at the Contractor’s expense. Contaminated pavement base shall be removed and replaced to the limits as determined by the Engineer.

G. The pavement base shall be inspected and accepted by the Engineer prior to placing any pervious concrete.

3.3 MIXING, PLACEMENT & CURING OF PERVIOUS CONCRETE

A. Pervious concrete formwork

1. Forms shall be made of steel or wood and shall be in good condition, clean, and capable of being anchored in place so as to ensure pavement placement true to the grades, lines and slopes as specified on the Plans.

2. Forms that are bent, warped, unclean, or otherwise deemed inadequate by the Engineer shall not be used.

3. Existing curbs, structures, or the vertical face of previously placed pervious concrete may be used as a form.

4. Set, align, and brace forms to satisfy the lines, grades, and slopes on the Plans.

5. Apply form-release agent to the form face immediately before placing concrete.
6. No pervious concrete shall be placed until the forms are inspected and accepted by the Engineer.

7. Slip forming is an acceptable method for placement of pervious concrete.

B. Batching, mixing, and delivery

1. Pervious concrete shall be batched and centrally mixed at a batching plant meeting the requirements set forth in Section 1.06.A.4. Pervious concrete shall not be shrink mixed or transit mixed.

2. Begin mixing immediately after cement has been added to aggregates. Batch and mix concrete in compliance with ASTM C94, with the following exceptions:
   a. Placement of concrete shall occur no more than 60 minutes from the time water or aggregate is added to the cement.
   b. If a hydration-stabilizing admixture is used, up to 60 minutes may be added to the placement time, resulting in a maximum placement time of 120 minutes.

   Additional water may be added on site, but the fresh density must still meet the requirements of Section 2.01.F.2 after water addition.

C. Placing and consolidation

1. Pervious concrete shall not be placed on standing water or frozen pavement base.

2. Wet the pavement base with water before concrete placement such that the material is saturated but without any standing water on the prepared base immediately before concrete placement.

3. Place pervious concrete on the prepared pavement base as close to its final position as possible, either directly from the transporting equipment or by conveyor, unless otherwise specified. Spread the concrete using mechanized equipment or hand tools, without segregation.

4. Strike off concrete between forms using a form riding paving machine or roller screed at the appropriate height, as determined by the Contractor, to allow for compaction to finished grade. Equipment used for striking off the pervious concrete shall leave a smooth surface, free of ridges or other imperfections, without drawing excessive paste to the surface. Vibratory screeds are not permitted. Other strike-off devices may be used when accepted by the Engineer.

5. Compact pervious concrete with a purpose built pervious concrete cross roller or alternate method approved by the Engineer. Rollers shall be of sufficient weight and width to compact the fresh pervious concrete to grade, leaving a smooth surface, free of ridges or other imperfections, without drawing excessive paste to the surface. Compacted pervious concrete shall meet the acceptance criteria for Smoothness set forth in Section 1.05.E.2.

6. Contractor’s personnel shall take care to avoid foot traffic in the pervious concrete to prevent non-uniform compaction and to keep contaminated material from entering the
pavement mix. Foot traffic on the fresh concrete shall not be allowed after it has been struck off.

7. Place pervious concrete continuously. Where placement has been halted for a period of 15 minutes, a header shall be placed between the forms and a construction joint formed. The construction joint shall be located at a contraction joint location, unless otherwise approved by the Engineer. The pervious concrete shall be compacted and finished to the header before placement may continue. Upon resuming placement, the header may be carefully removed and a construction joint formed at that location. Any sloughing or sagging of the previously placed pervious concrete at the header location shall be corrected prior to placing new pervious concrete against the joint.

D. Edging: Edging of the top surface shall be completed in plastic concrete to a radius of not less than 1/4 inch. Defects shall be repaired immediately.

E. Jointing: Joints shall be of three (3) types: construction, contraction, and isolation. Wherever possible, the angle between intersecting joints shall be between 80 and 100 degrees. Construct joints at the locations and to the horizontal dimensions indicated on the Plans.

1. Construction Joints: Construction joints shall be formed at the end of a day’s work or when necessary to stop production for any reason.
   a. Construction joints shall be located as near as possible to the location of a planned contraction or isolation joint.
   b. Construction joints are to be formed by placing a header between the forms, at right angles, to the full depth of the finished pervious concrete, and set to the height of the forms. Pervious concrete shall be placed against the header and compacted and finished as normal, including edging.
   c. Upon resuming paving, the header shall be carefully removed and new pervious concrete placed directly against the existing pervious concrete. The new pervious concrete shall be compacted and finished against the hardened pervious concrete as if it were a form.
   d. If an isolation joint is planned at this location, then the premolded joint filler shall be placed against the existing pervious concrete and the new pervious concrete shall be placed against the premolded joint filler. The joint shall be tooled on both sides of the premolded joint filler.

2. Contraction Joints: Contraction joints shall be used to control random cracking.
   a. Contraction joints shall be placed every 15 feet unless otherwise shown on the Plans.
   b. Plastic Formed Joints: Contraction joints may be formed in the plastic concrete using a roller designed for this purpose or by other methods accepted by the Engineer.
      1) Rollers shall have sufficient weight to produce the joint and shall not otherwise damage or mar the surface.
2) Plastic formed joints shall be a minimum depth of 1 and 3/4 inches and have a width of no more than 1/8 inch.

3) Joints shall be tooled on both sides of the joint with a radius not less than 1/4 inch.

c. Saw Cut Joints: At the option of the Contractor, contraction joints may be saw cut provided joints are early-entry dry-cut type.

1) Joints shall be cut using purpose built early-entry saw cutting equipment.

2) Saw cut joints shall be a minimum depth of 1/4 of the pervious concrete thickness, up to a maximum required depth of 1 and 1/4 inches, and have a joint width of no more than 1/8 inch.

3) Saw cutting shall occur as soon as the concrete is sufficiently cured so that it may be cut without raveling or dislodging aggregate from the finished surface, no longer than four (4) hours after placement of pavement.

4) Remove cuttings from surface immediately after saw cutting of joints.

5) To minimize drying, curing materials shall be removed only as needed to make cuts and shall be replaced immediately after cutting. The exposed pervious concrete shall be kept moist for the entire duration of exposure.

3. Isolation Joints: Isolation joints shall be used where the pervious concrete abuts existing facilities or where shown on the Plans.

a. Isolation joints shall continue through the depth of the pervious concrete using a 3/8 inch premolded joint filler.

b. Isolation joints may be formed by inserting the premolded joint filler into the plastic concrete or by forming a construction joint and affixing the premolded joint filler against one side of the joint and placing fresh pervious concrete against it.

c. Isolation joints and filler shall be flush with the surrounding pervious concrete and shall not deviate from the acceptance criteria for Grade as specified in Section 1.05.E.2.

d. The edges of the pervious concrete on either side of the premolded joint filler shall be hand tooled to a radius not less than 1/4 inch.

F. Curing

1. Begin curing within 20 minutes of concrete discharge from the truck, unless otherwise specified or approved by the Engineer.

2. Completely cover the pavement surface and all exposed edges with a minimum six-(6)-mil-thick white polyethylene sheet, unless otherwise specified or approved by the Engineer. No wetted burlap or cloth shall be used.
3. Thoroughly secure a polyethylene sheet at all exterior edges and interior laps without using soil. The method of securing the cover material shall prevent wind from removing the sheet and from blowing under the sheet across the surface of the concrete.

4. Curing compound shall not be used on any pervious cement concrete surface.

5. Cure pavement for a minimum of 7 uninterrupted days, unless otherwise specified or approved by the Engineer.

6. With the exception of saw cutting equipment, all traffic shall be kept off of the pervious concrete during the curing period.

7. Any testing for acceptance shall not occur until the end of the curing period.

G. Cold-weather construction

1. Protect concrete from freezing and record concrete temperature no less than twice per 24-hour period in accordance with ACI 306.1.

3.4 OPENING TO TRAFFIC

A. No traffic shall be allowed on the pervious cement concrete pavement for 10 days.

3.5 PROTECTION OF PAVEMENT

A. Cured and exposed pervious cement concrete pavement surface shall be kept clean and free of clogging debris and soils from the Contractor’s operations and all upstream and adjacent debris. If debris or soils contaminate the pervious pavement voids, the pavement shall be cleaned at the Contractor’s expense and to the satisfaction of the Engineer. If pervious cement concrete pavement cannot be unclogged, it shall be removed and replaced at the Contractor’s expense and to the satisfaction of the Engineer.

3.6 REJECTION

A. Pervious concrete that does not meet the acceptance criteria set forth in Section 1.05.E.2 will be rejected by the Engineer on a lot-by-lot basis. Pervious concrete that has been rejected by the Engineer or the Contractor shall be removed and replaced at no additional cost to the Owner.

END OF SECTION 32 05 23