SECTION 32 14 00 – TRUNCATED DOME UNIT PAVING

Maintain Section format, including the UH master spec designation and version date in bold in the center columns of the header and footer. Complete the header and footer with Project information

Edit and finalize this Section, where prompted by Editor's notes, to suit Project specific requirements. Make selections for the Project at text identified in bold.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:

1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
2. The University of Houston's *Supplemental General Conditions and Special Conditions for Construction*.

1.2 SUMMARY

A. Section Includes:

1. Concrete truncated dome pavers
2. Bedding and joint sand
3. Cast-in-place concrete edge restraints.
4. Breathable joint sand stabilizing sealer for Concrete Pavers

1.3 REFERENCES

A. American Society for Testing and Materials

1. ASTM C 33, Standard Specification for Concrete Aggregates
2. ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
3. C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

4. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
5. C 936, Specification for Solid Interlocking Concrete Paving Units.
6. C 979, Standard Specification for Pigments for Integrally Colored Concrete.
7. ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
8. ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
9. C 1645, Standard Test Method for Freeze-thaw, and De-icing Salt Durability of Solid Concrete Interlocking Paving Units.
10. ASTM D 2940, Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports

B. Interlocking Concrete Pavement Institute (ICPI)

1. ICPI Tech Spec Technical Bulletins

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site in accordance with the requirements of Section 01 3100 “Project Management and Coordination.”

1.5 SUBMITTALS

A. Concrete Truncated Dome Pavers:

1. Submit manufacturer’s product literature, installation instructions, and material safety data sheets.
2. Submit four sample units of each paver type representative of size, shape, color, and finish, indicating color variation and texture range expected in finished installation.
3. Submit manufacturer’s certification of conformance to ASTM standards.
4. Submit manufacturer’s certification of compliance with Texas Accessibility Standards 705.1, including test reports demonstrating compliance with minimum color contrast requirements.

B. Submit shop drawings and details: Indicate materials, thicknesses, sizes, finishes, shapes, edge restraints, perimeter conditions, expansion, and control joints.

1. Indicate layout and pattern describing materials, expansion joints, geotextile location, layout and drain locations and installation details and methods.
2. Indicate relationships of paving joints to adjoining materials, fixtures, and assemblies.

C. Bedding and Jointing Sand:

1. Submit sieve analysis results in accordance with ASTM C 136 for bedding and joint sand.
2. Provide supplier name, source and type of sands used for bedding and jointing.

D. Breathable Joint Sand Stabilizing Sealer:

1. Submit manufacturer's product literature, installation instructions, and material safety data sheets.
2. Submit manufacturer's certification of conformance to ASTM standards.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data for Installer.

B. Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with ASTM C 936.

1.7 QUALITY ASSURANCE

A. Paving Installer Qualifications:

1. Three years' experience of sand set concrete pavers installed.

a. Provide job references from projects similar in size and design to this Project. Provide Client names, postal address, phone, fax, and email address

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution

1. Install a 2 foot by 4-foot area of pavers on a prepared substrate including edge restraint to illustrate component application including pattern and edge details.
2. When required, provide a separate mock-up for each paver type and bonding pattern.
3. Use mock-up to determine pre-compaction bedding sand level, joint sizes, lines, laying pattern(s), color and texture range, joint sand stabilizers, and joint sand color and installation.
4. Do not start Work until Architect has approved mock-up.
5. Approved mock-up is the standard by which appearance, workmanship, substrate preparation and material application will be judged.
6. Document approved mock up with photographs or retain until completion of work.
7. Approved field sample may be retained as part of finished work. Remove mock-up and dispose of materials when directed by Architect.

1.8 DELIVERY, STORAGE, AND HANDLING

A. General:

1. Deliver, store and handle in accordance with Section 01 6000 "Product Requirements."
2. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
3. Deliver, store and handle in accordance with manufacturer's and supplier's written recommendations.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged packaging with identification labels intact.

1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
2. Deliver pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by fork lift or clamp lift.
3. Unload pavers with proper equipment, so no damage occurs to pavers.

C. Storage: Store materials so they are protected from contamination by foreign substances and excessive moisture.

1. Store pavers to prevent damage and staining.
2. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
3. Store liquids in tightly closed containers protected from freezing.
4. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
5. Do not store bedding sand and jointing sand on compacted aggregate base course or in areas that channel water into the sand.
6. Cover bedding sand and jointing sand with waterproof covering. Secure the covering in place.

1.9 FIELD CONDITIONS

A. Environmental Requirements:

1. Do not install sand or pavers during heavy rain or snowfall.
2. Do not install sand and pavers over frozen aggregate base materials.
3. Do not install frozen sand or saturated sand.
4. Do not install concrete pavers on frozen or saturated sand.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 CONCRETE PAVERS

A. Concrete Pavers: Solid interlocking paving units complying with ASTM C 936/C 936M and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates.

1. Truncated Dome Unit Paver

a. Manufacturer: Jewell, an Oldcastle Company
b. Paver: Belgard Holland Stone ADA Paver (Standard – Chamfered edges)

1) Dimensions: 3-7/8 x 7-13/16 x 3-1/8 inches
2) Color: Grey/Graphite

c. No substitutions.

B. Average Compressive Strength: 8000 psi with no individual unit under 7200 psi when tested in accordance with ASTM C 140.

C. Average Water Absorption: 5 percent with no unit greater than 7 percent when tested in accordance with ASTM C 140.

D. Freeze/Thaw Resistance (ASTM C 1645): Provide test results to 28 freeze/thaw cycles with no greater loss than 225 g/m2 of surface area or 49 cycles with no greater loss than 500 g/m2 of surface area when tested in accordance with ASTM C 1645. Freeze-thaw testing requirements shall be waived for applications not exposed to freezing conditions.

2.3 CURBS AND EDGE RESTRAINTS

A. Job-Built Concrete Edge Restraints: Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 3000 psi.

2.4 BEDDING AND JOINT SAND

A. Provide bedding and joint sand as follows:

1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
2. Do not use limestone screenings, stone dust, or sand for the bedding sand material that do not conform to the grading requirements of ASTM C 33.
3. Do not use mason sand or sand conforming to ASTM C 144 for the bedding sand.
4. Where pavers are subject to vehicular traffic, utilize sands that are as hard as practically available.
5. Sieve according to ASTM C 36.
6. Bedding Sand Material Requirements: Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 1.

Table 1

ASTM C 33 Grading Requirements for Bedding Sand

Sieve Size	Percent Passing
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60

No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 mm)	2 to 10
No. 200 (0.075 mm)	0 to 1

7. Joint Sand Material Requirements: Conform to the grading requirements of ASTM C 144 as shown with modifications in Table 2 below:

Table 2

ASTM C 144 Grading for Joint Sand

Sieve Size	Natural Sand Percent Passing	Manufactured Sand Percent Passing
No. 4 (4.75 mm)	100	100
No. 8 (2.36 mm)	95 to 100	95 to 100
No. 16 (1.18 mm)	70 to 100	70 to 100
No. 30 (0.600 mm)	40 to 75	40 to 100
No. 50 (0.300 mm)	10 to 35	20 to 40
No. 100 (0.150 mm)	2 to 15	10 to 25
No. 200 (0.075 mm)	0 to 1	0 to 10

2.5 ACCESSORIES

A. Provide accessory materials as follows:

1. Breathable Joint Sand Stabilizing Sealer

a. Basis of Design Product: Surebond SB 1300 Matte Finish Breathable Joint Sand Stabilizing Sealer.
   1) Manufacturer: SEK-Surebond, Inc.
   2) To propose a substitution, refer to Section 01 2500 “Substitution Procedures.”

b. Product Description:
   1) The product shall be a clear, epoxy-modified joint sand stabilizer and concrete sealer, capable of penetrating and sealing the pavement surface without causing a glossy or shiny surface finish.
   2) The product shall be manufactured as a joint sand stabilizer and labeled as such.
   3) The product shall conform to ASTM C1028 Static Coefficient of Friction requirements
   4) The product, as delivered, shall be liquid at typical ambient temperatures.
   5) The product shall have a VOC of less than 100 grams per liter.
   6) The product shall be designed to be installed after the joint sand has been installed.
   7) The product shall be water based and shall not contain solvents.

8) The product shall be breathable as to allow efflorescence to escape.

c. Product Performance Requirements
1) Testing requirements:
a) The product shall be tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.
2) Independent Laboratory:
a) Testing shall be performed by an independent laboratory meeting the requirements of ASTM E 329.95 and certified by the United States Bureau of Standards. Testing laboratory shall obtain all samples.
3) Permeability:
a) The product shall conform to ASTM E 514.
4) Water Vapor Transmission:
a) The product shall have a minimum water vapor transmission rate of 60 grams/meter^2/day at an average dry film thickness of 3.5 to 4.0 mils and a relative humidity of 40% when tested as per ASTM D 1653.

2. Cleaners

a. Product: Provide cleaners and maintenance instructions per manufacturer's recommendations.
b. Cleaner shall not cause discoloration, noticeable sheen, or reduce pavement slip or skid resistance below specified value.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Site Conditions:

1. Inspect, and certify in writing to Owner, that site conditions meet the following prior to bedding sand and paver installation:

a. Remove substances from concrete substrates including curing and sealing compounds, form oil, and laitance.
b. Remove organic, unstable, or unconsolidated material.
c. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.
d. Verify conformance of subgrade preparation, compacted density, and elevations to specified requirements.
e. Verify geotextile placement, if applicable, in accordance with Drawings and Specifications.
f. Verify base course conformance to specified requirements. Do not use bedding sand to correct deficiencies in base course surface.
g. Verify written density test results for soil subgrade and base course.
h. Verify type, location and elevations of edge restraints, concrete collars around utility structures and drainage inlets.

i. Verify that base course and geotextile fabric, if applicable, are ready to support sand, edge restraints, pavers, and imposed loads.

2. Do not proceed with bedding sand or paver installation until satisfactory base course conditions are verified by Contractor.
3. Verify that base course is dry and certified by Contractor as meeting material, installation, and grade specifications.
4. Field Measurements:

a. Determine actual paver dimensions (including tolerances) and coordinate with dimensions for pavement areas indicated on Drawings prior to any pavement installation. Adjust pavement area dimensions to eliminate unnecessary paver cutting.

3.2 PREPARATION

A. Edge Restraint Preparation:

1. Install edge features and penetrations including curbs, surrounds and bases prior to placing bedding sand layer.
2. Install edge restraints as indicated on Drawings and in accordance with manufacturer's recommendations

3.3 INSTALLATION – GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Expansion and Control Joints: Provide joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

C. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

1. Install job-built concrete edge restraints to comply with requirements in Section 03 3000 "Cast-in-Place Concrete."

3.4 INSTALLATION – CONCRETE UNIT PAVERS

A. Spread bedding sand evenly over the base course and screed to a nominal 1 inch thickness.

B. Spread bedding sand evenly over the base course and screed rails, using the rails and/or edge restraints to produce a nominal 1 inch thickness, allowing for specified variation in the base surface.

1. Do not disturb screeded sand.
2. Screeded area shall not substantially exceed that which is covered by pavers in one day.
3. Do not use bedding sand to fill depressions in the base surface.

C. Lay pavers in pattern(s) shown on Drawings.

1. Place units hand tight without using hammers.
2. Mix pavers from at least three pallets to produce uniform color blends. Follow manufacturer's recommendations for color blending.
3. Make horizontal adjustments to placement of laid pavers with rubber hammers as required.

D. Provide joints between pavers between 1/16 inch and 3/16 inch wide. No more than 5% of the joints shall exceed 1/4 inch wide to achieve straight bond lines.

E. Joint (bond) lines shall not deviate more than ± 1/4 inch. .

F. Fill gaps at the edges of the paved area with cut pavers or edge units.

G. Cut pavers to be placed along the edge with a double blade paver splitter or masonry saw.

H. Adjust bond pattern at pavement edges such that cutting of edge pavers is minimized. All cut pavers exposed to vehicular tires shall be no smaller than one-third of a whole paver.

I. Keep skid steer and forklift equipment off newly laid pavers that have not received initial compaction and joint sand.

J. Use a low-amplitude plate compactor capable of at least minimum of 4,000 lbf at a frequency of 75 to 100 Hz to vibrate the pavers into the sand. Remove any cracked or damaged pavers and replace with new units.

K. Simultaneously spread, sweep and compact dry joint sand into joints continuously until full. This will require at least 4 to 6 passes with a plate compactor. Do not compact within 6 feet of unrestrained edges of paving units.

L. All work within 6 feet of the laying face shall be left fully compacted with sand-filled joints at the end of each day or compacted upon acceptance of the work. Cover the laying face or any incomplete areas with plastic sheets overnight if not closed with cut and compacted pavers with joint sand to prevent exposed bedding sand from becoming saturated from rainfall.

M. Remove excess sand from surface when installation is complete.

N. Allow excess joint sand to remain on surface to protect pavers from damage from other trades. Remove excess sand when directed by Owner's Representative.

O. Surface shall be broom clean after removal of excess joint sand.

P. Apply Joint sand stabilizing sealer per manufacturer's installation instructions.

Q. Return to site over a period of up to one year to add sand to fill joints as needed.

3.5 REPAIRING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units.

B. 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.

3.6 FIELD QUALITY CONTROL

A. The final surface tolerance from grade elevations shall not deviate more than ±3/8 in. under a 10-foot straightedge.

B. Check final surface elevations for conformance to Drawings.

C. The surface elevation of pavers shall be 1/8 inch to 1/4 inch above adjacent drainage inlets, concrete collars, or channels.

D. Lippage: No greater than 1/8-inch difference in height between adjacent pavers.

3.7 CLEANING

A. Clean pavers in accordance with the manufacturer's written recommendations.

3.8 PROTECTION

A. After work in this Section is complete, Contractor shall be responsible for protecting work from damage due to subsequent construction activity on the site.

END OF SECTION