SECTION 02780
UNIT PAVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide interlocking concrete unit pavers as shown and specified. Work includes:
   1. Unit paver roadways, driveways and parking areas installed over a concrete base.
   2. Unit paver driveways, parking areas and sidewalks installed over a flexible base.
   3. Concrete base, aggregate bedding and joint sand.
   4. Aggregate base, bedding and joint sand.
   5. Edge restraints.

B. Related Sections:
   1. Section 02000 Site Construction: Site construction general requirements
   2. Section 02755 Concrete Pavement: Concrete base materials and installation.
   3. Section 02782 Grid Unit Pavers: Grid type unit paver materials and installation.
   4. Section 02300 Earthwork: Subgrade preparation.
   5. Section 02340 Soil Stabilization: Subgrade preparation.
   6. Section 03300 Cast-In-Place Concrete: Concrete base materials and installation.
   7. Section 07130 Sheet Waterproofing: Plaza deck waterproofing, insulation materials and installation.
   8. Section 07140 Fluid-applied Waterproofing: Plaza deck waterproofing, insulation materials and installation.

1.2 REFERENCES

A. Reference standards:
   1. ASTM:
      a. ASTM C33-97 "Specification for Concrete Aggregates."
      b. ASTM C67-97 "Test Methods for Sampling and Testing Brick and Structural Clay Tile."
      c. ASTM C136-96a “Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.”
      d. ASTM C140-97 "Test Methods for Sampling and Testing Concrete Masonry Units."
      e. ASTM C150-97a "Specification for Portland Cement".
      f. ASTM C418-90 "Test Method for Abrasion Resistance of Concrete by Sandblasting."
      g. ASTM C936-96 "Standard Specification for Solid Concrete Interlocking Paving Units."
      h. ASTM C979-82(1993) “Specification for Pigments for Integrally Colored Concrete."
      i. ASTM D1557-91 "Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort, (56,000 ft-lbf/cubic ft)."
   2. National Concrete Masonry Association (NCMA):
      a. NCMA TEK 11-1 “Edge Restraints for Concrete Pavers.
      b. NCMA TEK 11-2 "Pavement Construction with Interlocking Concrete Pavers."
      c. NCMA TEK 11-4 “Structural Design of Interlocking Concrete Pavements for Roads and Parking Lots.”
      d. NCMA TEK 11-6 "Cleaning and Sealing Interlocking Concrete Pavements.”
      e. NCMA TEK 11-10 “Base and Subase Options for Concrete Pavers.”
   3. Ohio Department of Transportation (ODOT):
      a. Construction and Material Specifications, 1997 Edition.

1.3 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of paver unit required.

B. Submit a minimum of five full size sample unit pavers of each type and color of unit paver required. Include the full range of style, size, exposed finish, color and texture proposed for the work.

C. Submit manufacturer's certification that unit pavers comply with ASTM C936 and specified material and physical requirements.

D. Submit test results for compliance of unit pavers with ASTM C936 from an independent testing laboratory.

E. Submit material certificates for aggregate base and sieve analysis for grading of bedding and joint sand materials.

1.4 QUALITY ASSURANCE

A. Comply with Section 02000 requirements.

B. Installation: Performed only by skilled workers with a minimum of three/five years experience installing interlocking concrete unit pavers and satisfactory record of performance on completed projects of comparable size, material, design and quality.

C. Sample panels: Before starting unit paver work, provide sample panels using materials, patterns and joints indicated for project work. Build panels of full thickness and approximately 10'-0" x 10'-0"/_____. Provide the full range of color, texture and workmanship proposed for the work. Correct and rebuild sample panels until Architect's acceptance of the work. Retain accepted panels during construction as a standard for completed paving work.
   1. The approved sample panels may be a portion of the work and remain in place. Project location as directed by Architect.
   2. Provide a sample panel for each type of interlocking concrete unit paver required.

D. Do not change source of concrete unit pavers during the course of the work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protect unit pavers from damage, chipping and soiling during delivery, storage and handling. Store materials off the ground on pallets or wood platforms. Handle materials in accordance manufacturer's instructions to prevent damage and soiling.

B. Store loose granular materials in a well-drained area on a solid surface to prevent mixing with foreign materials. Cover bedding and joint sand with waterproof covering to prevent exposure to rain or removal by wind.

1.6 PROJECT CONDITIONS

A. Review installation procedures and coordinate unit paver work with other work affected by the unit paving work.

B. Cold weather:
   1. Do not use frozen materials mixed or coated with ice or frost.

2. Do not build on frozen work or wet, saturated or muddy subgrade. Remove and replace unit paving installation damaged by frost or freezing.

C. Protect partially completed unit paving against weather damage when work is not in progress.

D. Provide temporary barricades and warning lights as required for protection of project work, worker and public safety.

E. Protect adjacent work from damage, soiling, or staining during paving operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Oberfield's, Inc. Delaware, OH.

2.2 MATERIALS

A. General: Unit paver materials and fabrication shall meet or exceed the requirements of ASTM C936 "Solid Concrete Interlocking Paving Units."
1. Portland cement: ASTM C150, Type 1.
2. Aggregate: Normal weight ASTM C33.
3. Pigments: ASTM C979.
4. Other constituents: Previously established as suitable for use in concrete, comply with ASTM standards where applicable or shown by test or experience not to be detrimental to concrete.

B. Physical properties:
1. Compressive strength: ASTM C140, when delivered to the project site, not less than 8,000 psi with no individual units less than 7200 psi.
2. Absorption: ASTM C140, average absorption not greater than 5%, with no individual units greater than 7%.
3. Resistance to freezing and thawing: ASTM C67, no breakage and not greater than 1% loss in dry mass of any individual unit after 50 cycles of freezing and thawing.
4. Abrasion resistance: ASTM C418, maximum volume loss of 0.915 cu. In/7.75 sq. in (15 cu. cm. per 50 sq. cm). Average thickness loss 0.118" (3 mm).
5. Dimension tolerances: Length maximum +/-1/16" (1.6 mm), height maximum +/-1/8" (3.2 mm) from standard dimension
6. Provide only sound units free of defects that would interfere with proper placing of units or impair strength or performance of construction. Minor cracks and minor chipping incidental to methods of manufacture, handling in shipment and delivery will be acceptable subject to Architect's review and acceptance. Excessive cracks and chipping, as determined by Architect, will be rejected as not complying with specification requirements.
7. Submit test reports certifying compliance with materials and physical requirements. Tests shall have been conducted not more than 12 months before manufacture.

C. Paver units: Oberfield's, Inc. Presidential Series Unit Pavers
1. Design style: Oberfield's, Inc. "The Washington System"
a. Washington Circle System, using circle center units, small circle paver units, and large circle paver units, forming an 8'-0" circle/12'-0" circle/16'-0" circle.
b. Washington 10 units – 4-1/8" x 5-1/2" x 2-3/8"; Washington 14 units – 5-1/2" x 5-1/2" x 2-3/8"; Washington 21 units– 5-1/2" x 8-1/2" x 2-3/8"

c. Vintage Washington 14 units – 5-1/2” x 5-1/2” x 3-1/8”; Vintage Washington 21 units – 5-1/2” x 8-1/4” x 3-1/8”.

2. Design style: Oberfield’s, Inc. “The Monroe System” (select 2-3/8” or 3-1/8” thickness)
   a. Monroe units – 4” x 8” x 2-3/8” / 3-1/8”; Monroe 4 units – 4” x 8” x 2-3/8” / 3-1/8”; Monroe 6 units – 6” x 6” x 2-3/8” / 3-1/8”;Monroe 8 units – 8” x 8” x 2-3/8” / 3-1/8”; Monroe 12 units– 12” x 12” x 2-3/8” / 3-1/8”
   b. Vintage Monroe units – 4” x 8” x 2-3/8” / 3-1/8”
3. Design style: Oberfield’s, Inc. “The Lincoln System”
   a. Lincoln units – 6-1/8” x 8-5/8” x 2-3/8”and Lincoln Edge units – 4-5/16” x 8-5/8” x 2-3/8”
4. Design style: Oberfield’s, Inc. “The Arrowhead System”
   a. Arrowhead units - 6” x 6” x 1-3/4” and Monroe 6 units - 6” x 6” x2-3/8”
5. Design style: _____
6. Color: Albany Blend; Antique Blend; Autumn Blend; Buff; Charcoal; Earth Blend; Flagstone Blend; Granite Blend; Granite Green Blend; Gray; Red
7. Color: Selected by Architect from manufacturer's standard colors.
8. Custom color:_____

D. Aggregate base material:
   1. ODOT 304 graded crushed limestone, crushed stone, or crushed gravel free from clay, organic material, or other deleterious matte matter and shall be 100% crushed with fines.
   2. ODOT 703, #68 or #57, graded crushed limestone, crushed stone, or crushed gravel free from clay, organic material, or other deleterious matte matter and shall be 100% crushed with fines.

E. Concrete base material: Provided under Section 02755/03300.

F. Bedding, leveling and joint sand material: Clean, non-plastic, free from deleterious or foreign matter; natural or manufactured from crushed rock. Grading of samples in accordance with ASTM C136. Provide sharp, washed coarse concrete sand complying with grading requirements of ASTM C33 free from foreign material. Masonry mortar sand is not acceptable as bedding and leveling material.

2.3 ACCESSORIES

A. Edge restraints:
   1. Pave Tech, Inc., Bloomington, MN “Pave Edge Restraint System” or an approved equal extruded PVC self-supporting edge restraint system designed for concrete unit paver systems.
      a. Standard loading straight sections: “Pave Edge Rigid”, one-piece section 1-3/4” high x 3-1/4” wide with 1-1/4” lip.
      b. Standard loading curved sections: “Pave Edge Flexible”, two piece section consisting of vertical flex strip and back supports 1-3/4” high x 3-7/8” wide with 5/8” lip.
      c. Heavy loading straight sections: “Pave Edge Industrial” one-piece section 3-1/8” high x 4-3/4” wide with 4-3/4” lip.
      d. Provide in manufacturer's standard 10'-0" (Industrial 15’-0”) lengths, with predrilled anchor holes 12" on center for spiking. Provide rigid straight sections for straight edges and flexible sections for curved edges. Provide manufacturer's recommended 3/8” diameter 12” long steel landscape spikes for securing edging and connector pipe for connection individual edging sections.
   2. Snap Edge Corp. “Snap Edge” one-piece extruded PVC self-supporting edge restraint system designed for concrete unit paver systems.
      a. Standard straight and curve sections: Triangular shaped section 1-3/4” high x 3-1/4” wide x 6’-8” long, secured with 3/8” diameter 12” long steel landscape spikes 10”-12” long.

B. Other materials required for proper completion of interlocking concrete unit paver work: As selected by Contractor and acceptable to the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and installation conditions. Do not start interlocking concrete unit paving work until unsatisfactory conditions have been corrected.
   1. Verify that base is dry and ready to support bedding material, pavers and imposed loads.
   2. Verify grades and elevations are correct.
   3. Verify location, type installation, and elevations of edge restraints around perimeter of paved area.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 PREPARATION

A. Do not use paving units with cracks, voids, discolorations, or other visible defects that would impair the strength or performance of unit paver construction.

B. Cut paving units with block splitter or motor driven masonry saw equipment designed to cut masonry with clean, sharp unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible. Where cutting is required, use the largest size units possible. Avoid the use of small pieces of pavers or large joint spaces.

C. Install edge restraints in accordance with manufacturer's installation instructions.
   1. Layout and secure edge restraints to compacted aggregate base with landscape spikes, spaced 12" on center, through predrilled holes in edging.
   2. Layout and secure edge restraints to predrilled holes in concrete base with landscape spikes, spaced 12" on center, through predrilled holes in edging.
   3. _____

3.3 INSTALLATION: BASE MATERIALS

A. Plaza deck waterproofing and insulation system provided under Section 07130/07140.

B. Concrete Base: Provided under Section 02755/03300.

C. Aggregate Base:
   1. Obtain Architect's inspection and acceptance of subgrade surface before placing aggregate base course materials.
   2. Spread base course materials in layers that when compacted will not exceed 4" lifts.
      a. Total compacted depth as indicated.
      b. Pedestrian sidewalks: Minimum 4"-6" thickness.
      c. Light vehicular driveways: Minimum 6"-12" thickness
      d. Moderate vehicular roadways, driveways and parking areas: Minimum 8"-16" thickness.
      e. Heavy vehicular loading roadways, driveways and parking areas: Minimum 12"-18" thickness.

3. Compact each lift of base course materials with suitable compaction equipment to 95% of maximum dry density in accordance with ASTM D1557 Modified Proctor Method.
4. Screed, level and shape base course surface to required grade and cross section with an allowable local tolerance of 1/4".

D. Bedding and leveling course:
1. Obtain Architect's inspection and acceptance of finished base course before placing bedding and leveling course materials.
2. Spread bedding and leveling course materials evenly over the entire area to be paved, screed to a minimum level that will provide a minimum 1" to 1-1/2" bedding course thickness when the paving units have been placed and vibrated.
3. Protect screeded and leveled bedding and leveling course from damage until paver installation.

3.4 INSTALLATION: UNIT PAVERS

A. Install interlocking concrete unit pavers in accordance with manufacturer's recommended installation details for aggregated base course and sand bedding and leveling course.

B. Install interlocking concrete unit pavers in accordance with manufacturer's recommended installation details for concrete base and sand bedding and leveling course.

C. Install edge restraints at all unrestrained edges of unit pavers. Securely anchor in place. Provide straight sections in true straight alignment.

D. Lay unit pavers in bond pattern indicated on the drawings, when not indicated, as directed by Architect. Maintain desired pattern and provide uniform 1/16" to 1/8" joints between units.
1. Maintain straight pattern lines and layout.

E. Fill gaps at the edge of the paved surface with manufacturer's standard edge pieces or with paver units cut to fit. Provide cut units with straight even cut surfaces, free from cracks or chips.

F. Vibrate interlocking paver units to their final level with three or more passes of a low amplitude, high frequency vibrating plate compactor capable of 3,000 to 5,000 pounds per foot of compaction force.
1. Do not vibrate within 3'-0" of an unrestrained edge.
2. All work within 3'0" of the laying face shall be fully compacted with sand filled joints at the completion of each day.
3. Cover the remaining uncompacted edge of the laying face and sand with a waterproof covering.

G. After first vibration, brush sand over the surface and vibrate into the joints with additional passes of the plate vibrator. Completely fill joints.

H. After final vibrating the finish paver surface shall be true to grade and shall not vary by more than 3/8" when tested with a 10'-0" straightedge at any location on the surface.

I. Surface elevation of pavers shall be 1/8" to ¼" above adjacent drainage inlets, concrete collars or channels.

3.5 PROTECTION

A. Restrict traffic from interlocking concrete unit paver surfaces during setting of units and until completion of installation.

B. Protect unit pavers from damage until final acceptance.

3.6 CLEANING

A. Remove and replace interlocking concrete paver units that are broken, cracked, stained, or otherwise damaged. Provide new matching units, install as specified and to eliminate evidence of replacement.

B. Perform cleaning during installation of work and upon completion of the work. Remove from site all excess materials, debris and equipment. Repair damage resulting from interlocking concrete paver unit installation operations.

END OF SECTION 02780