
SECTION 32 14 00 - UNIT PAVING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes all labor, materials, equipment and testing requirements necessary to complete the installation of unit pavers as specified on the drawings:
1. Clay brick pavers set in concrete base and aggregate setting beds.
 2. Roadway Brick pavers set on concrete base with concrete sand and mortar setting bed.
 3. **Custom made brick pavers for bikeway symbol and arrow.**
 4. Aluminum and Cast-in-Place edge restraints.
 5. Joint sand.
 6. Grout.
 7. Filter Fabric.
 8. Granite curbs.
- B. Related Requirements:
1. Section 31 20 00 "Earth Moving" for excavation and compacted subgrade.
 2. Section 32 13 13 "Concrete Paving" for concrete base under unit pavers and for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers.
 3. Section 32 13 73 "Joint Sealants" for sealing control and expansion joints in unit pavers with elastomeric sealants.
 4. Section 32 91 40 "Planting Prep Sand Based Structural Soil" for soil subbase material under pavement.

1.02 REFERENCES AND STANDARDS

- A. Federal, State and local laws and regulations governing this Work are hereby incorporated into and made part of this Section. When this Section calls for certain materials, workmanship, or a level of construction that exceeds the level of Federal, State, or local requirements, provisions of this Section take precedence.
- B. The following references are used herein and shall mean:
1. Ohio Department of Transportation (ODOT) Construction and Material Specifications, Latest Edition, sections:
 - a. 203 Roadway Excavation & Embankment
 - b. 204 Subgrade Compaction & Proof Rolling.
 - c. 304 Aggregate Base.
 - d. 305 Portland Cement Concrete Base.
 2. City of Canton Engineering Dept (COCED) Standard Construction Drawings and Specifications.
 3. ASTM: American Society of Testing Materials
 - a. C902 Standard Specification for Pedestrian and Light Traffic Paving Brick
 - b. C1272 Standard Specification for Heavy Vehicular Paving Brick
 - c. C67 Method of Sampling and Testing Brick and Structural Clay Tile
 - d. C-33 Standard Specification for Concrete Aggregates.
 - e. C-136 Standard Method for Sieve Analysis for Fine and Coarse Aggregates
 4. BIA: The Brick Institute of America
- C. American Disabilities Act, Part 36, Appendix A- Standards for Accessible Design.

1.03 SUBMITTALS (OR ACTION SUBMITTALS)

- A. Product Data: For materials other than water and aggregates.
- B. Product Data: For the following:
 - 1. Clay Pavers – product literature, installation instructions and material safety data sheets.
 - 2. Aggregate setting bed materials
 - 3. Mortar and grout materials.
 - 4. Edge restraints.
 - 5. Granite Curbs
- C. Samples for Initial Selection: For the following:
 - 1. Each type of unit paver indicated.
 - 2. Joint materials involving color selection.
 - 3. Exposed edge restraints involving color selection.
 - 4. Granite for stone curbs.
- D. Samples for Verification:
 - 1. Full-size units of each type of unit paver indicated. Assemble not less than five Samples of each type of unit on suitable backing and grout joints.]
 - 2. Joint materials.
 - 3. Exposed edge restraints.
 - 4. Granite curbs.

1.04 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with manufacturers standards. Provide for each type and size of unit.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.
 - 1. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C 67.
 - 2. Submit test results from qualified independent testing laboratory indicating ASTM C 902 and ASTM C 1272 compliance, as applicable.
 - 3. Submit manufacturer's certification of conformance to ASTM standards.
- C. Cleaning and Maintenance Instructions:
 - 1. Brick Pavers.
 - 2. Joints.
- D. Shop Drawings and Details:
 - 1. Plans: Show location, laying patterns, and sizes of each type of unit paving, edge restraints, expansion and control joint locations, and drain locations.
 - 2. Details: Show detail of each type of setting assembly and interface between each type of adjoining paving.
- E. 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.
- F. Paving Installer: Job references from projects similar in size and design to this project.

1. Provide Owner, General Contractor names, postal address, phone, fax and email address.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.
- B. Certificates: Provide certificates as required by law for transportation and inspections of materials. Inspection and/or approval by governmental agencies does not preclude rejection of materials at project site.
- C. Paver Manufacturer's Qualifications:
 1. The manufacturer shall demonstrate a minimum of 5 years successful experience in the manufacture of interlocking pavers.
 2. The manufacturer shall have sufficient production capacity and established quality control procedures to produce, transport, and deliver the required number of pavers with the quality specified, without causing a delay to the work.
 3. The manufacturer shall have suitably experienced personnel and a management capability sufficient to produce the number of quality pavers as depicted on the contract drawings and as specified herein.
- D. Installer Qualifications:
 1. Time: Not less than 3 years successful experience with installation of work of the type required by this project (with at least 100,000 square feet of sand set brick pavers installed).
 2. Projects: Successfully completed a minimum of five projects of not less than the size required by the Work of this Section. The project sizes must represent not less than the minimum amount of unit paving types required for this project.
 3. Workmanship: Use an adequate number of skilled personnel who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the Work of this Section.
- E. Installer's foreman shall have at least 5-year's of experience and be on site at all times while this Section is being performed. Foreman shall not be changed during the course of work unless approved in writing by Landscape Architect.
- F. Preconstruction Compatibility and Adhesion Testing: Submit to latex-additive manufacturer, for testing indicated below, samples of paving materials that will contact or affect mortar and grout that contain latex additives.
 1. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimum adhesion with, and will be nonstaining to, installed pavers and other materials constituting paver installation.
 2. COCED Standards Drawings and details apply for all work within public right-of ways.
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Demonstrate the proposed range of aesthetic effects and workmanship.
 - a. Install a 10 ft by 10 ft area of pavers on a prepared substrate including edge restraint to illustrate component pattern and edge details.
 - b. Provide mock-up for each paver type and bonding pattern.
 - c. Use mock-up to determine pre-compaction bedding sand level, joint sizes, lines, laying pattern(s), and color and texture ranges.

2. Obtain Owner's Representative approval of mockups before starting unit paver installation.
3. Document approved mock-up with photographs.
4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
5. Demolish and remove mockups when directed.
6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquids in tightly closed containers protected from freezing.

1.07 FIELD 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.
- B. Weather Limitations for Mortar and Grout:
 1. Cold-Weather Requirements: Protect unit paver work against freezing when ambient temperature is 40 deg F and falling. Heat materials to provide mortar and grout temperatures between 40 and 120 deg F. Provide the following protection for completed portions of work for 24 hours after installation when the mean daily air temperature is as indicated: below 40 deg F, cover with weather-resistant membrane; below 25 deg F, cover with insulating blankets; below 20 deg F, provide enclosure and temporary heat to maintain temperature above 32 deg F. TMS 602/ACI 530.1/ASCE 6 applies.
 2. Hot-Weather Requirements: Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher. TMS 602/ACI 530.1/ASCE 6 applies.
 - a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set pavers within 1 minute of spreading setting-bed mortar.

1.08 WARRANTY / GUARANTY

- A. Neither the final certificate of payment nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by the Owner, shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.
- B. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of **two years** from the date of final

acceptance of the work unless a longer period is specified. The Owner will give notice of observe defects with reasonable promptness.

PART 2 - PRODUCTS

2.01 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.

2.02 CLAY BRICK PAVERS

- A. All clay paving brick specified or shown on drawings shall be manufactured by (No substitutions permitted):

Name: The Belden Brick Company
Address: P. O. Box 20910
Canton, Ohio 44701-0910
Phone: 330-456-0031
Email: jim.piteo@beldenbrick.com

- B. Clay Brick Pavers: Light-traffic paving brick; ASTM C 902, Class SX, Type I, Application PS. Provide brick without frogs or cores in surfaces exposed to view in the completed Work. Subject to compliance with requirements, provide products by the following:

1. P1 – Pedestrian
 - a. Thickness: 2-1/4 inches.
 - b. Face Size: 4 by 12 inches (nominal).
 - c. Color: 80% Carbon Black, 20% Landmark Grey.
 - d. Pattern: Herringbone
 - e. Edge: Straight
2. P3 - Promenade
 - a. Thickness: 2-1/4 inches.
 - b. Face Size: 4 by 12 inches (nominal).
 - c. Color: Carbon Black
 - d. Pattern: Stacked Bond
 - e. Edge: Straight
3. P4 – ADA Band
 - a. Thickness: 2-1/4 inches.
 - b. Face Size: 4 by 8 inches (nominal).
 - c. Color: Landmark Grey (Tumbled)
 - d. Pattern: Stacked Bond
 - e. Edge: Straight

- C. Clay Brick Pavers: Heavy vehicular paving brick; ASTM C 1272, Type R, Application PS. Provide brick without frogs or cores in surfaces exposed to view in the completed Work. Subject to compliance with requirements, provide products by the following:

1. P1.2 – Vehicular
 - a. Thickness: 2-3/4 inches.
 - b. Face Size: 4 by 12 inches (nominal).
 - c. Color: 80% Carbon Black, 20% Landmark Grey.
 - d. Pattern: Herringbone

- e. Edge: Straight
 - 2. P2 – Vehicular
 - a. Thickness: 2-3/4 inches.
 - b. Face Size: 4 by 8 inches (nominal).
 - c. Color: 80% Carbon Black, 20% Landmark Grey.
 - d. Pattern: Herringbone
 - e. Edge: Chamfered
 - 3. P5 – Pavement Markings (Roadway) **and Custom Bikeway Symbol and Arrow**
 - a. Thickness: 2-3/4 inches.
 - b. Face Size: 4 by 8 inches (nominal) with lugs.
 - c. Color: Ivory Bay.
 - d. Edge: Chamfered
- D. Efflorescence: Brick shall be rated "not effloresced" when tested according to ASTM C 67.

2.03 CURBS AND EDGE RESTRAINTS

- 1. Aluminum Angled Edge Restraints: Standard-profile extruded-aluminum edging, ASTM B 221, Alloy 6063-T6, fabricated in standard lengths with interlocking sections.
 - a. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - 1) Curve-Rite, Inc.
 - 2) Permaloc Corporation.
 - 3) Sure-Loc Edging Corporation.
 - b. Thickness: 3/16-inch, 2 inch min. height, 2" min. flange.
- B. Job-Built Concrete Edge Restraints: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 4000 psi.
- C. Granite Curbs: Standard and Flush Granite Curbs complying with ASTM C 615/C 615M.
 - 1. Varieties and Sources: Subject to compliance with requirements, provide the following:
 - a. Type: W5 - Granite Curbs by Cold Spring Granite Inc.
 - 2. Granite Color and Grain: Carnelian Granite.
 - 3. Top Width: as per drawings.
 - 4. Face Height: as per drawings.
 - 5. Total Height: as per drawings.
 - 6. Finish: Thermal finish all exposed faces or surfaces unless noted otherwise on the drawings.

2.04 ACCESSORIES

- A. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.
- B. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.05 AGGREGATE SETTING-BED MATERIALS

- A. Paver - Aggregate for Leveling or Bedding Course:
 - 1. Crushed #9 limestone grits—ASTM D 448 for size

-
- B. W5 – Straight Granite Curb – Sub-Base:
 - 1. ODOT 703, Compacted No. 57 course aggregate.
 - 2. Solid Brick Pavers for setting and leveling curb.
 - 3. ODOT Item 499 at 2000 psi backfill material.
 - C. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

2.06 MORTAR SETTING-BED MATERIALS

- A. Brick Paver Mortar Setting bed – 1-inch maximum compacted concrete ODOT 703.02 (ASTM C33) Setting Bed with mortar.
- B. Water: Potable.

2.07 SAND JOINT FILLERS

- A. Joint Sand - a polymeric sand stabilizer for granite pavers.
 - 1. Alliance Design Products: Eurostone Bond for natural stone paver joints. www.alliancegator.com
 - 2. Color of polymeric sand shall be uniform matching the paver in color and shall be approved by the Landscape Architect.
 - 3. Sand shall be supplied by a single source. Source of supply shall not be changed during course of project without written permission of the Architect.

2.08 FILTER FABRIC

- A. Filter fabric separator shall be 12" meeting ODOT 712.09, Type E. Located at the top of each weep hole, below all setting beds.
 - 1. Aggregate backfill in hole: No. 8 stone.

PART 3 - EXECUTION

- A. Methodology: The installer's method statement shall be a detailed narrative describing all aspects of paver installation. It must include but not be limited to indicating the proposed starting points, direction of operations and progress of Works, the pattern dimensional controls to be used and the personnel and equipment to be kept on site at all times.
- B. Substrate: The Contractor shall inspect concrete base with the installer and the Construction Manager to ensure that it meets the grade requirements for proper installation and that the area is free from standing water, debris or obstructions prior to commencing paver installation. The Contractor shall rectify any deviations in the underlying surface levels greater than plus or minus ¼ inch or other deficiencies if and when they occur and shall not permit the installer to continue paving these areas until they are rectified. The Landscape Architect will not be responsible for determining whether the substrate is ready for power operation to begin.
- C. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- D. Clean concrete substrates to remove dirt, dust, debris, and loose particles.

3.02 INSTALLATION, GENERAL

- A. CIP Concrete / Precast / Stone Curbs: Install per details on the Drawings.
- B. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

-
- C. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures as recommended by the manufacturer.
 - D. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Use a wet saw if possible. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
 - 1. The pavers shall be laid away from an edge restraint or the existing laying face in such a manner as to ensure squareness of pattern. Cut header course pavers to accommodate alignment tolerances of the restraints. Full pavers shall be laid first.
 - E. Joint Pattern: As indicated.
 - F. Cut pavers as required using table type wet saws. Modify paver pattern and /or provide additional cuts to adjacent pavers as necessary when the cutting of a paver will result in less than one third of a full paver. Pavers sliced longitudinally, except when being placed around utility manholes will not be accepted. All cut paver faces to be vertical, top edges shall be free from chips and pattern modification/additional cuts shall be as acceptable to the Landscape Architect.
 - 1. Oversized pavers may be required to avoid undersized paver pieces. See details for further information.
 - G. At the end of the laying period, the pavers shall be adjusted to form straight pattern lines and uniform joints. The maximum deviation from a 30 ft. string line shall be +/-1/4 inch. Minimum joint width is 1/16". The maximum joint width shall not exceed twice the manufacturer's material tolerance for length and width.
 - H. If weather conditions are such that the performance of the pavement may be compromised, laying operations shall be discontinued and all laid pavers shall be aligned and compacted prior to suspension of the works.
 - I. On recommencement of laying operations the edge two courses of existing paving shall be lifted and the sand rescreeded before further pavers are laid.
 - J. At the end of each day, after the pavers have been aligned, and cut pavers incorporated at edge restraints and between lanes, the pavers shall be compacted.
 - K. Spread dry jointing sand over the surface of the pavers so that it penetrates into the joints and secures the pavers. Remove all sand prior to compaction. Never apply polymeric sand to wet, moist, or damp pavers. Never allow polymeric sand to come in contact with asphalt surfaces.
 - L. The pavement shall be compacted using a high frequency / low amplitude plate compactor with a plate area of not less than 2-1/2 sq. ft. capable of 3,000 lbf to 5,000 lbf transmitting at frequency of 75 – 100 Hz. The installer shall take necessary precautions to prevent damage to the paver. Compaction shall be permitted within 4 ft. of an unrestrained edge.
 - M. After vibration of the pavers to finished elevations, dry jointing sand shall be brushed over the surface and the pavement shall be re-compacted until all joints are completely filled with sand. Great care shall be taken to ensure that the joints are filled; sand shall be constantly brushed over the surface and the pavement re-compacted as necessary.
 - N. On completion of vibration, before and after joint filling, surface tolerances shall be within 3/16 in. under a 10 ft. straight edge and plus 1/4 in. to minus 1/8 in. from finished elevation. There shall not be a difference in elevation between adjacent units of greater than 1/16 in. Elevations should be such that no water ponds on the surface.
 - O. Tolerances: Do not exceed 1/16-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches and 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.
 - 1. No "birdbaths" or other surface irregularities will be permitted.
 - 2. Correct irregularities to the satisfaction of the Architect.
 - P. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide foam filler as backing for sealant-filled joints, unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete.

Install joint filler before setting pavers. Sealant materials and installation are specified in Division 07 Section "Joint Sealants."

- Q. 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.
- R. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
 - 2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.
 - 3. Install job-built concrete edge restraints to comply with requirements in Division 03 Section "Cast-in-Place Concrete."
- S. Joint Sand Stabilizer: Install joint sand filler with sand stabilizer per manufacturer's directions.

3.03 AGGREGATE SETTING-BED APPLICATIONS (Over Concrete Base)

- A. Core drill 1" diameter holes through concrete subbase in areas specified on drawings.
 - 1. Fill hole with No. 8 drainage aggregate and place 12" square filter fabric over hole prior to placing aggregate leveling course.
- B. Place leveling course and screed to a thickness of 1 inch (or as per detail), ensuring that moisture content remains constant and density is loose and constant until pavers are set and compacted.
 - 1. The bedding material shall be spread over the areas to be constructed to create an uncompacted loose surface onto which the pavers shall be placed. The laying course shall be such that after compaction it forms a uniform layer nominally one inch thick.
 - 2. Where distances between screed rails exceed 12 ft. intervals an intermediate rail shall be set to line and level. Screed rails shall be used at 4 ft. centers where grade changes occur.
 - 3. The screeded bedding sand shall not be subjected to any traffic by either mechanical or pedestrian use.
 - 4. Sufficient material shall be placed to ensure that no delay occurs to paver laying. Bedding aggregate that has been screeded but not covered with pavers at the end of each days work shall be taken up and re-screeded prior to re-commencement of work.
 - 5. The voids left after the removal of screed rails shall be filled with loose bedding material as the laying of pavers proceeds.
 - 6. Spreading of the bedding course material shall stop when weather conditions are unsuitable. If inclement weather causes deterioration of the laying course sand it shall be lifted and stored to one side to drain before its reuse.

3.04 SAND-CEMENT SETTING-BED APPLICATIONS.

- A. Conform to Canton Standard Drawing No. 41 detail and specifications.
- B. Place sand-cement setting bed where indicated by spreading material not less than 1 inch thick.
- C. Place pavers carefully by hand in straight courses, with hand tight joints maintaining accurate alignment and uniform top surface. Protect newly laid pavers with plywood panels on which workers can stand. Advance protective panels as work progresses but maintain protection in areas subject to continued movement of materials and equipment to avoid creating depressions or disrupting alignment of pavers. If additional leveling of paving is required, and before treating joints, roll paving with power roller after sufficient heat has built up in the surface from several days of hot weather.

-
- D. Joint Treatment: Place unit pavers with hand-tight joints. Fill joints by sweeping sand over paved surface until joints are filled. Use a vibrating plate compactor over the entire surface making several passes. Refill the joints and remove excess sand after joints are filled.

3.05 MAINTENANCE

- A. Inspection: Undertake an inspection of the paver surface with the installer, the construction manager and Landscape Architect and rectify all noted defects prior to handover.
- B. Repairs: Repair or replace any damaged Work to original specified condition prior to handover.
- C. Maintenance:
 - 1. The Contractor shall arrange for the installer to return to the site, as directed by the Owner's Representative, to rectify any problems in the Work caused by his failure to adequately align or bond the pavers, compact the bedding material or fill the joints.
 - 2. Where lateral displacement of the sand set pavers has occurred adjacent to edge restraints the cut pavers shall be replaced with new pavers of the correct size to comply with the specified joint widths and the joint sand shall be re-sanded and additional joint sand stabilizer applied.

3.06 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

3.07 PROTECTION

- A. Provide barricades and warning devices as required to protect pavement and the general public.
- B. Protect completed paving against damage during subsequent construction activities until date of Final Completion.
- C. Cover openings of structures in the area of paving until permanent coverings are placed.

3.08 FINAL ACCEPTANCE

- A. Review Date: Submit a written request for review for Final Acceptance at least five (5) working days in advance
- B. Completion: Work will be accepted upon satisfactory completion of all unit paving work

END OF SECTION 32 14 00