

SECTION 32 14 16 - UNIT PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work of this section is to furnish all labor, materials, manpower, tools and equipment required to install concrete pavers on concrete base.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Concrete pavers set in mortar setting bed.
- B. Related Sections include the following:
 - 1. Division 3 Section 03 30 00 "Cast-in-Place Concrete" for concrete base course under unit pavers
 - 2. Division 31 Section 31 20 00 "Earth Moving" for subgrade preparation, aggregate base courses under concrete bases, and compaction testing.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Concrete pavers.
 - 2. Grout.
 - 3. Expansion joints, all components.
 - 4. Wire welded Mesh.
 - 5. Bond Breaker
 - 6. Mortar Bed
- B. Samples for Initial Selection: Manufacturer's color samples consisting of full range of colors, textures, and patterns available for selection by COR.
 - 1. Grout color samples.
 - 2. Joint Sealant color samples.
- C. Samples for Verification:
 - 1. Full-size units of each type of unit paver indicated in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - 2. Joint Sealants: Submit Manufacturer's full range of colors for selection by COR.
 - 3. Expansion Joint Filler Material: Submit one 12-inch length.

4. Backer Rod Material: Submit one 12-inch length.
- D. Compatibility and Adhesion Test Reports: From latex-additive manufacturer indicating the following:
1. Mortar and grout containing latex additives have been tested with pavers for compatibility and adhesion.
 2. Interpretation of test results relative to mortar and grout performance and written recommendations for installation practices needed for adhesion.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed unit paver installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. 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.
- C. Pre-construction Coordination: Review installation procedures and coordinate paving work with other work affected by the unit paving work. Prior to beginning construction, coordinate critical dimensions of pavers with flatwork, so that there is minimal paver cutting required. Field verify that layout shown on Drawings coincides with paver critical dimensions by constructing mockup as described below. Submit evidence to Contracting Officer's Representative (COR) that this coordination work has been completed.
- D. Mockups: Before installing unit pavers, build mockups for each form and pattern of unit pavers required to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work, including same base construction, edging, special features for expansion joints, and contiguous work as indicated:
1. Build mockup in the location as directed by COR and of approximately 4 foot by 15 foot size with all joint types in place including expansion joints.
 2. Notify COR seven days in advance of dates and times when mockup will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain COR approval of mockup before starting unit paver installation.
 5. Maintain mockup during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mock-up when directed by COR.
 7. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.
 8. For materials failing tests, obtain mortar and grout manufacturer's written instructions for corrective measures, including the use of alternative materials to obtain optimum bond and prevent staining.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect unit pavers and aggregate during storage and construction against soiling or contamination from earth and other materials.
 - 1. Cover pavers with plastic or use other packaging materials that will prevent rust marks from steel strapping.
- 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 liquids in tightly closed containers protected from freezing.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Mortar and Grout: Comply with the following requirements:
 - 1. Cold-Weather Requirements: Protect unit paver work against freezing when atmospheric temperature is 40 degrees Fahrenheit and falling. Heat materials to provide mortar and grout temperatures between 40 and 120 degrees Fahrenheit. 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 degrees Fahrenheit, cover with weather-resistant membrane; below 25 degrees Fahrenheit, cover with insulating blankets; below 20 degrees Fahrenheit, provide enclosure and temporary heat to maintain temperature above 32 degrees Fahrenheit.
 - 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 degrees Fahrenheit and higher.
 - a. When ambient temperature exceeds 100 or 90 degrees Fahrenheit with a wind velocity greater than 8 mph, set pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.1 CONCRETE PAVERS

- A. Concrete Pavers:

1. Requirements: Solid, concrete paving units, ASTM C 936, and resistant to freezing and thawing when tested according to ASTM C 67 made from normal-weight aggregates in sizes and shapes indicated. Average compressive strength of 8000 PSI with no individual less than 7300 PSI when tested to ASTM C140 standards.
2. The Contractor is hereby advised that some concrete pavers manufactured and delivered will not be acceptable for use in the Work for any exposed face, edge or corner treatment, and therefore, may require that some of the pavers be rejected for use on this Project.
 - a. Permissible Extent of Chippage from Edges and Corners: 1/16 inch and 1/8 inch, respectively. The cumulative length of chips on the exposed face of a single unit shall not exceed 2 percent of the perimeter of the exposed face of the paver, and no single chip shall exceed 1/8 inch in length.
 - b. Other than chips, the paver shall be free of cracks, color and other imperfections detracting from the appearance of a designated sample when viewed from a distance of 5 feet.

B. Concrete Paver Types:

1. Concrete Paver (Mortar Set):
 - a. Manufacturer: **Hanover Architectural Products**
 - b. Product: **Prest Pavers**
 - c. Sizes: **11-3/4 x 11-3/4 and 11-3/4" x 17-5/8"**
 - d. Color: **Cream**
 - e. Finish: **Tudor**
 - f. Edge: **Square**

2.2 ACCESSORIES

- A. Expansion Joint Filler Material: BASF/Sonolastic "Expansion Joint Filler." Preformed: closed-cell polyethylene joint filler designed for use in cold joints, construction joints, or isolation joints wider than 1/4 inch. Comply with ASTM D 1056, Grade 2A1
- B. Backer Rod: BASF/Sonolastic "Soft Backer Rod", non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants. Comply with ASTM C 1330. Size as required for joint design.
- C. Expansion Joint Sealants: Two component, self-leveling, slope-grade elastomeric polyurethane sealant for horizontal joints: BASF/Master Builders "MasterSeal SL 2" with plus or minus 25 percent movement capability for horizontal joints; ASTM C 920, Type M, Grade P, Class 25; FS TT-S-00227E, Type I, Class A. Color to be selected by COR from Sonneborn's Rainbow of Colors palette.
- D. Sealant Primer: BASF/ Sonolastic "Primer No. 733" solvent based primer for preparing concrete surfaces for adhesion to sealant.
- E. Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming materials.
- F. Bond Breaker: 30-pound asphalt impregnated felt.

1. Comply with ASTM D266-97A.
2. Cut into 18-inch wide strips.
3. Install centered over contraction joints in concrete base.

G. Paver Sealer:

1. A silane/siloxane water-borne emulsion penetrating sealer for use on concrete and masonry surfaces.
2. Masco "Masco-Seal Siloxane 12 WB" or equal.

2.3 MORTAR SETTING-BED MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II.
- B. Sand: ASTM C 144.
- C. Latex Additive: Acrylic-resin or styrene-butadiene-rubber water emulsion serving as replacement for part or all of gauging water, of type specifically recommended by latex additive manufacturer for use with field-mixed portland mortar bed, and not containing a retarder.
- D. Water: Potable.
- E. Welded Wire Fabric Sheets: Hot-dip galvanized, welded, 12 gauge diameter wire; 2-by-2-inch mesh; comply with ASTM A 123, ASTM A 185 and ASTM A 82 except for minimum wire size.

2.4 MORTAR AND GROUT MIXES

- A. General: Comply with referenced standards and with manufacturer's written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics. Discard mortars when they have reached their initial set.
- B. Mortar-Bed Bond Coat: Mix neat cement or cement and sand with water to a creamy consistency.
 1. For latex-modified portland cement setting-bed mortar, substitute latex admixture for part or all of water per directions of latex-additive manufacturer.
- C. Latex-Modified, Portland Cement Setting-Bed Mortar (Thin-set): Proportion and mix portland cement, sand, and latex additive for setting bed to comply with written instructions of latex-additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.

- D. Latex-Modified Portland Cement Slurry Bond Coat: Proportion and mix Portland cement, aggregate, and latex additive for slurry bond coat to comply with directions of latex-additive manufacturer.
- E. Latex-Modified Portland Cement Grout: Add liquid-latex additive to portland cement and sand in proportion and concentration recommended by liquid-latex manufacturer. Proportion cement and sand to comply with written instructions of latex-additive manufacturer.
 - 1. Pigmented Grout: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove substances, from concrete substrates, that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- B. Clean concrete substrates to remove dirt, dust, debris, and loose particles.
- C. Remove substances, protrusions and fins from concrete edge restraints that could impair tight joints.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, and voids, which exceed the tolerances listed under Part 2. Do not use unit pavers outside the approved color range or unit pavers with discolorations and other defects that might be visible or cause staining in finished work.
- B. Pavers shall be clean and free of foreign materials prior to installation. Clean mortar-set pavers of laitance.
- C. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- D. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Where cutting is required, use the largest size unit possible. Do not use pieces smaller than 4" length. Use larger paver size (11-3/4"x 17-5/8") at edges to eliminate the use of paver pieces smaller than 4" in length.

1. Block splitter may be not used. Hammer cutting is not acceptable.
- E. Joint Pattern: As indicated on Drawings. Path widths to be composed of whole, uncut pavers unless otherwise indicated. Pavers are to be cut to fit at intersections and when abutting walls and thresholds.
- F. Tolerances: do not exceed 1/16 -inch unit-to-unit offset from flush (lippage) or 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.
- G. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide joint filler and backer rod for sealant-filled joints where indicated. Install joint filler before setting pavers.

3.4 MORTAR SETTING-BED APPLICATIONS

- A. Saturate concrete base with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
- B. Apply cement-paste bond coat over surface of concrete subbase about 15 minutes before placing setting bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch thickness for bond coat.
- C. Apply mortar bed over bond coat immediately after applying bond coat. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.
- D. Place reinforcing wire over concrete base, lapped at joints by at least one full mesh and supported so mesh becomes embedded in the middle of setting bed. Hold edges back from vertical surfaces approximately 1/2 inch. Cut fabric at expansion joints.
- E. Place mortar bed with reinforcing wire fully embedded in middle of setting bed. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated. Cut fabric at expansion joints.
- F. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Cut back, bevel edge, remove, and discard setting-bed material that has reached initial set before placing pavers.
- G. Place pavers before initial set of cement occurs. Immediately before placing pavers on setting bed, apply uniform 1/16-inch-thick, slurry bond coat to bed or to back of each paver with a flat trowel.
- H. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set and disturb pavers for purposes of realigning finished surfaces or adjusting joints.
- I. Spaced Joint Widths: 3/8 inch joints, with variations not exceeding plus or minus 1/16 inch.

- J. Grout joints as soon as possible after initial set of setting bed.
1. For concrete pavers with grouted joints, apply paver sealer to the top surface of pavers, avoiding any application of sealer into joints to be grouted. Allow sealer to dry completely before grouting joints.
 2. Force grout into joints, taking care not to smear grout on adjoining surfaces.
 3. Clean pavers as grouting progresses by dry brushing or rubbing with dry burlap to remove smears before tooling joints.
 4. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
 5. If tooling squeezes grout from joints, remove excess grout and smears by dry brushing or rubbing with dry burlap and tool joints again to produce a uniform appearance.
- K. Cure grout by maintaining in a damp condition for seven days, unless otherwise recommended by grout or liquid-latex manufacturer.

3.5 REPAIRING, POINTING, CLEANING, AND PROTECTION

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units (color, spacing and elevation) as intended at no additional cost to the Government. 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 at no additional cost to the Government.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point up joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.
- D. Protection: Do not allow vehicular traffic on new concrete paver work for a minimum of 7 calendar days. Do not allow pedestrian traffic on new concrete paver work for a minimum of 3 calendar days.

3.6 EXPANSION JOINTS

- A. General: Form isolation joints true to line with faces perpendicular to surface plane of concrete.
- B. Expansion Joints: Form expansion/isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints continuous at perimeter of paver field where abuts existing concrete paving, curbs, and other structures.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface to accommodate backer rod and sealant.

4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
5. Clean and prime concrete and unit pavers at expansion joints per manufacturer's recommendations.
6. Install backer rod and sealant per manufacturer's recommendations. Backer rod to be 25 percent wider than joint width. Sealant depth shall to be one-half width of joint, not to exceed 1/4 inch, whichever is smaller.
7. Protect sealant from pedestrian traffic until cured.
8. Clean excess sealant from paved surfaces.

3.7 PAVER AND JOINT SEALER

- A. After pavers are thoroughly cleaned and expansion joint sealant has been installed, apply paver sealer to the tops of pavers and gout joints.
 1. Apply sealer per manufacturer's written instructions.
 2. Mask adjacent surfaces not to receive sealant.
 3. After sealer is applied, protect area from traffic for 6 hours.

END OF SECTION 32 14 16