



**SPECIAL PROVISIONS
FOR
UNIT PAVERS**

**Dallas County
ICAAP-SWAP-8177(626)--SH-25**

**Effective Date
December 15, 2020**

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

154040.01 GENERAL.

1.01 SECTION INCLUDES

- A. Concrete unit pavers on asphaltic setting bed atop concrete subslab with joint sand.
- B. Concrete unit pavers on sand setting bed atop aggregate base with joint sand.

1.02 REFERENCES: ASTM INTERNATIONAL, LATEST EDITION

- A. C 33, Standard Specification for Concrete Aggregates
- B. C 33, Standard Specification for Concrete Aggregates
- C. C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8, Freezing and Thawing
- D. C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- E. C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
- F. C 144 Standard Specifications for Aggregate for Masonry Mortar
- G. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction
- H. C 936, Standard Specification for Solid Concrete Interlocking Paving Units
- I. C 979, Standard Specification for Pigments for Integrally Colored Concrete
- J. D 698 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5 lb (24.4 N) Rammer and 12 in. (305 mm) drop

- K. D 1557 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (44.5 N) Rammer and 18 in. (457 mm) drop
- L. C1645 Standard Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units
- M. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils
- N. D 2940 Graded Aggregate Material for Bases or Subbases for Highways or Airports
- O. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

1.03 SUBMITTALS

- A. Submit samples for selection by Engineer of color and texture, in the form of manufacturer's actual units or sections of units showing the specified color, texture and layout pattern for each type of unit paver included. Include similar samples of materials for joint sand and accessories involving color selection.
- B. Submit manufacturer's data on each paver type. Indicate color, thickness, finish, laying pattern and joint sand.
- C. Paving Installation Contractor Qualifications: Job references from a minimum of three projects similar in size and complexity. Project experience must reflect the same setting bed details required by this project. Provide Owner/Client/Contractor names, postal address, phone, fax, and email address.
- D. Sealant as recommended by the unit paver manufacturer.
- E. Cleaner as recommended by the unit paver manufacturer.
- F. Submit plan illustrating installation of pavers.
- G. See "Mock-Ups" under Quality Assurance.
- H. Submit materials data and sample of paver edge restraint.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed unit paver installations similar in material, design and extent to that included in this project, with a record of successful in-service performance.
- B. Utilize a Manufacturer having at least 10 years of experience manufacturing unit pavers on projects of similar nature or project size.
- C. Source limitations:
 - 1. Obtain unit pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
 - 2. Obtain joint sand from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.
 - 3. Obtain setting bed material from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.
- D. Paver Installation Contractor Qualifications: Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project. The proof of required experience must be project with the same setting bed detail.

E. Mockups:

1. Install a 5 foot by 5 foot paver area per each paving pattern prior to mastic application. The pavers shall be remain removable until approved.
2. Once the layout patterns are approved this are can be adhered. Joint sizes, lines, laying pattern(s) and levelness shall be per specification and this area will serve as the standard by which the workmanship will be judged.
3. Subject to acceptance by Engineer, mock-up may be retained as part of finished work.
4. If mock-up is not retained, remove and dispose legally.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect unit pavers and joint sand during storage and construction against soilage or contamination from earth and other materials.
- B. Deliver unit pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.
 1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
 2. Deliver unit pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
 3. Unload unit pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.
- C. Store and protect materials free from mud, dirt and other foreign materials.
- D. Prevent joint sand from exposure to rainfall or removal by wind with secure, waterproof covering.
- E. Store joint sand on elevated platforms, under a cover and/or in a dry location.

1.06 PROJECT / SITE CONDITIONS

Install setting bed or unit pavers only when there is no heavy rain or snowfall.

1.07 CONCRETE PAVER OVERAGE AND ATTIC STOCK

- A. Provide a minimum of 5% additional material for overage to be used during construction.
- B. Contractor to provide 50 square feet of each product and size used to owner for maintenance and repair. Furnish pavers from the same production run as installed materials.
- C. Manufacturer to supply maintenance and reinstallment manuals for concrete paver units.

157150.02 MATERIALS.**2.01 UNIT PAVERS**

- A. Basis-of-Design Product: The Concrete Paver shapes are based on:
 1. Artline 7 Unit random bundle (Type 1), Town Hall (Type 2), and Umbriano (Type 3) as manufactured by Unilock Chicago, IL, 302 East Sullivan Road, Aurora, IL, Contact: Brad Punke, (603) 892-9191.
 2. Or approved equal. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.

B. Product requirements:

1. Unit Paver Type 1: 7 cm Artline 7 Unit Random Bundle
 - a. Mixed installation of three varieties of Artline finish/color types:
 - 1) Finish/Color: Smooth/Steel Mountain in (50%)
 - 2) Finish/Color: Umbriano/Midnight Sky in (20%)
 - 3) Finish/Color: Il Campo/Granite (30%)
 - b. Laying Pattern: Per manufacturer, randomly mixed.
 - c. Size: Manufacture the sizes indicated with a maximum tolerance of $\pm 1/16$ in all directions.
 - 1) UNIT A - 4 7/8 inches by 6 3/4 inches by 2 3/4 inches
 - 2) UNIT B - 4 7/8 inches by 10 3/8 inches by 2 3/4 inches
 - 3) UNIT C - 4 7/8 inches by 13 3/8 inches by 2 3/4 inches
 - 4) UNIT D - 4 7/8 inches by 17 3/4 inches by 2 3/4 inches
 - 5) UNIT E - 7 1/2 inches by 8 7/8 inches by 2 3/4 inches
 - 6) UNIT F - 7 1/2 inches by 13 3/8 inches by 2 3/4 inches
 - 7) UNIT G - 7 1/2 inches by 17 3/4 inches by 2 3/4 inches
2. Unit Paver Type 2: 7 cm Town Hall
 - a. Color: Basalt
 - b. Laying Pattern: Pattern B, herringbone
 - c. Size: Manufacture the sizes indicated with a maximum tolerance of $\pm 1/16$ in all directions. Paver unit shall be: 3 7/8 inches by 9 7/8 inches by 2 3/4 inches.
3. Unit Paver Type 3: 7 cm Senzo
 - a. Color: Crema
 - b. Laying Pattern: Pattern I
 - c. Size: Manufacture the sizes indicated with a maximum tolerance of $\pm 1/16$ in all directions. Paver unit shall be: 8 inches by 16 inches by 2 3/4 inches.

C. Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.

1. Average compressive strength 8000 psi with no individual unit under 7200 psi.
2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units.

- D. Accept only pigments in unit pavers conforming to ASTM C 979. ACI Report No. 212.3R provides guidance on the use of pigments.
- E. Maximum allowable breakage of product is 5%.

2.02 PAVER EDGE RESTRAINT

- A. Steel edger, galvanized.
 1. Galvanize after holes are drilled for affixing to concrete subslab and after cuts are made to allow the edger to bed along the interior circumference of the roundabout.
 2. Field-apply galvanizing touch-up paint for any cut or holes or scratches.

2.03 BITUMINOUS SETTING BED ON PCC SUBSLAB, JOINT SAND AND CLEANER

- A. Bituminous Setting Bed:
 1. Asphalt primer: ASTM D2028 cut-back asphalt, Type RC, rapid cure.
 2. Asphalt cement: Shall conform to ASTM D946 with a penetration at 77°F, 5 Sec of minimum 85 mm and maximum of 100 mm.
 3. Fine aggregate: ASTM C136, clean hard sand free of adherent coatings, clay alkali salts, and organic matter. Uniformly graded with coarse to fine and 100% passing No. 4 sieve.
 4. Tack coat: 2% neoprene (grade WMI), oxidized asphalt, and 10% long fibered mineral fiber.
 5. Mix: Combine dried fine aggregate with hot asphalt cement. Heat the mix to approximately 300°F at an asphalt plant. The approximate proportion of materials shall be 7.0% asphalt cement and 93.0% fine aggregates. Apportion each ton by weight in the approximate ratio of 145 pounds asphalt to 1855 pounds sand.
- B. Rigid base: Concrete, provided under Section 2301 of the Standard Specifications and as detailed on plans.
- C. Other materials: Other materials, not specifically described, but required for a complete and proper installation of unit pavers, shall be as selected by the Contractor subject to review of the Engineer.

2.04 GRANULAR BASE

- A. Install all unit paving in strict accordance with the recommendations of the manufacturer.
- B. After excavation and prior to installation of granular subbase, compact soils to the maximum density achievable for the soil moisture content.
- C. Install geotextile filter fabric over compacted soil. Ensure fabric is free of wrinkles prior to application of granular subbase.
- D. Granular subbase shall be compacted in multiple lifts to ensure a minimum of 95% standard proctor density.
- E. Compaction shall be tested by a third party, geotechnical technician with a nuclear density gauge.
- F. Aggregate material shall be crushed stone complying with Section 4132 of the Standard Specifications.

2.05 SAND SETTING BED

- A. Install all unit paving in strict accordance with the recommendations of the manufacturer.
- B. Install geotextile filter fabric over compacted granular base. Ensure fabric is free of wrinkles prior to application of setting bed.
- C. Setting bed shall be compacted in multiple lifts to ensure a minimum of 95% standard proctor density.
- D. Compaction shall be tested by a third party, geotechnical technician with a nuclear density gauge.
- E. Aggregate material shall comply with ASTM C 33 and gradation below:

Sieve Size	Percent Passing
3/8 in.	100
No. 4	95 to 100
No. 8	85 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10
No. 200	0 to 1

2.06 JOINT SAND

- A. Provide polymeric joint sand as follows:
 - 1. Shall be polymeric jointing compound sand in color three colors, one for each paver type. Colors shall be standard and shall be selected by the Engineer during the submittal process.
 - 2. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
 - 3. Do not use limestone screenings, stone dust, or sand for the joint sand material that does not conform to the grading requirements of ASTM C 144.
 - 4. Utilize sands that are as hard as practically available where unit pavers are subject to vehicular traffic.
- B. Aggregate material shall comply with ASTM C 144 and gradation below:

	Natural Sand	Manufactured Sand
Sieve Size	Percent Pasasing	Percent Passing
No. 4	100	100
No. 8	95 to 100	95 to 100
No. 16	70 to 100	70 to 100
No. 30	40 to 75	40 to 100
No. 50	10 to 35	20 to 40
No. 100	2 to 15	10 to 25
No. 200	0 to 1	0 to 5

157150.03 CONSTRUCTION.**3.01 EXAMINATION**

Examine surfaces to receive unit pavers, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit pavers. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Verify the concrete underlayment is clean and dry, certified by Contractor as meeting material, installation and grade specifications.
- B. Stockpile joint sand such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
- C. Verify that concrete subbase has been installed to the correct elevation and will accept the appropriate thickness of bituminous setting bed.
- D. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all joint sand materials contaminated with sediment with clean materials.
- E. Vacuum clean concrete substrates to remove dirt, dust, debris and loose particles.
- F. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

3.03 INSTALLATION

- A. Unit Pavers on Bituminous Setting Bed on PCC Subslab.
 - 1. Install all unit paving in strict accordance with the recommendations of the manufacturer, and the patterns shown on the plans, bonding all units firmly in place for long life under hard use. All joints shall be uniform.
 - 2. Clean existing concrete base. Remove dirt and debris.
 - 3. Apply asphalt prime coat. Allow to dry and cure as required.
 - 4. Install 1 1/2 inch deep control bars directly on base. Adjust control bars to proper elevations. Provide control bars parallel to each other to serve as striking board guides.
 - 5. Place bituminous setting bed between depth control bars. Place setting bed materials and pull with striking board until a smooth, firm, and level setting bed is established. Advance first bar to next position when initial paved is completed. Fill depressions, porous areas and voids with bituminous material as work progresses.
 - 6. Roll the setting bed, while hot, with a power roller to provide a nominal compacted depth of 1 1/2 inches.
 - 7. Adjust the elevation to provide the top surface of the installed unit pavers at the required finish grade.
 - 8. Apply tack coat by mop, squeegee or trowel over the top surface of the bituminous setting bed to provide a paver bond. When troweled, use a serrated trowel with serrations not exceeding 1/16 inch.
 - 9. When the tack coat is dry to the touch, place the unit pavers by hand in straight courses with hand tight joints and uniform top surface. Maintain alignment in the pattern indicated on the plans.

B. Unit Pavers Sand Setting Bed Over Granular Base

1. Level and contour surfaces to elevations and gradients indicated.
2. Mix unit pavers from a minimum of three bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures. (Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing conditions, different aggregates and, most commonly, from different production runs. By installing from a minimum of three bundles simultaneously, variation in color is dispersed and blended throughout the project).
3. Remove any cracked or structurally damaged Unit pavers and replace with new units prior to installing joint sand material.
4. Provide unit pavers using laying pattern as indicated. Adjust laying pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers exposed to vehicular tires no smaller than one-half of a whole paver.
5. Use string lines to hold all pattern lines true.
6. Set surface elevation of pavers a maximum of 1/8 inch above adjacent drainage inlets and concrete curbs.
7. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
8. Provide space between paver units of 1/32 inch wide to achieve straight bond lines.
9. Prevent joint (bond) lines from shifting more than $\pm 1/2$ inch over 50 feet from string lines.
10. Gaps larger than 3/8 inch will not be permitted. To avoid gaps, then internal field of pavers shall be cut (trimmed) in a manner to avoid small slivers of pavers. A paver shall never become less than 50% of its original size.
11. Prevent all traffic on installed unit pavers until joint sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid unit pavers that have not received initial compaction and joint sand material.

C. Joint sand

1. Provide, spread and sweep dry joint sand into joints immediately after vibrating pavers until full. Vibrate pavers and add joint sand material until joints are completely filled, then remove excess material. This will require at least four passes with a plate compactor.
2. Leave all work to within 3 feet of the laying face fully compacted with sand-filled joints at the completion of each day.
3. Remove excess joint sand broom clean from surface when installation is complete.

3.04 FIELD QUALITY CONTROL

- A. Verify final elevations for conformance to the drawings after sweeping the surface clean.
- B. Prevent final concrete paver finished grade elevations from deviating more than $\pm 3/8$ inch under a 10 foot straightedge or indicated slope, for finished surface of paving.
- C. Lippage: No greater than 1/32 inch difference in height between unit pavers and adjacent paved surfaces.

- D. Protect newly laid unit pavers with plywood panels. Advance panels as work progresses. Maintain plywood protection in areas subject to continued movement of materials and equipment. Provide additional leveling if required. Roll with a power roller. Roll prior to filling joints.

3.05 REPAIR, POINTING, CLEANING AND PROTECTION

- A. Remove and replace unit pavers that are loose, chipped, broken, stained or otherwise damaged, or if they do not match adjoining units as intended. Provide new units to match adjoining units, and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with mortar or grout. Point up joints at sealant lines to provide a neat, uniform appearance, properly prepared for application of sealant.
- C. Cleaning: Remove excess sand and dirt from exposed paver surfaces; wash and scrub clean. Use a commercial cleaner as recommended by the unit paver manufacturer to clean the surface.
- D. Provide final protection and maintain conditions in a manner acceptable to Installer that ensures that unit paver work is without damage or deterioration at the time of Substantial Completion.
- E. Sweep excess sand and grit from surfaces and remove from site. Remove all excess materials and debris from site.
- F. Protect completed work from damage due to subsequent construction activity on the site.

3.06 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.

3.07 CLEAN-UP

- A. Sweep excess sand from paved surfaces and remove from site.
- B. Remove all excess materials and debris from site.

157150.04 METHOD OF MEASUREMENT.

Measurement for Unit Pavers shall be made on a per square foot basis measured by the Engineer.

157150.05 BASIS OF PAYMENT.

Payment for Unit Pavers shall be per square foot. Included with item is all labor, equipment, and materials necessary for furnishing and installation the unit pavers.