SP- 150466
(New)

SPECIAL PROVISIONS
FOR
CONCRETE PAVERS

Marshall County
NHSN-014-5(78)--2R-64

Effective Date
December 18, 2018

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.

150466.01 DESCRIPTION.

A. Summary.

1. This section of specifications shall include all equipment, materials, labor and supervision required for the furnishing and installation of concrete pavers as specified in the contract documents.

2. This special provision includes the specifications for the materials and installation of concrete pavers, setting bed sand, polymeric joint sand, concrete subbase and preparation, and geotextile.

B. References.

1. ASTM International, latest edition:
- **a.** C 33, Standard Specification for Concrete Aggregates.
- **b.** C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8, Freezing and Thawing.
- **c.** C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- **d.** C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
- **e.** C 144 Standard Specifications for Aggregate for Masonry Mortar.
- **f.** D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
- **g.** C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
- **h.** C 979, Standard Specification for Pigments for Integrally Colored Concrete.
- **i.** 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.
- **j.** 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.

k. C1645 Standard Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units.
l. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
m. D 2940 Graded Aggregate Material for Bases or Subbases for Highways or Airports.
n. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
o. D 5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
p. D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
q. D 4533, Standard Test Method for Index Trapezoidal Tearing Strength of Geotextiles.
r. D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
s. D 4491, Standard Test Method for Water Permeability of Geotextiles by Permittivity.
t. D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
u. D 4354, Standard Practice for Sampling of Geosynthetics for Testing.
v. D 4759, Standard Practice for Determining the Specifications Conformance of Geosynthetics.

C. Submittals.

1. Concrete Pavers.

a. Samples for verification: Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
b. Contractor shall provide color samples of the pavers to the Engineer for approval prior to ordering and installation.
c. Accepted samples become the standard of acceptance for the product produced.
d. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.
e. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

2. Setting Bed Sand.

a. Provide three representative 1 pound samples in containers of setting bed sand materials.
b. Test results from an independent testing laboratory for sieve analysis per ASTM C 136 conforming to the grading requirements of ASTM C 144.

3. Polymeric Joint Sand.

a. Test results from an independent testing laboratory for sieve analysis per ASTM C 136 conforming to the grading requirements of ASTM C 144.
b. Samples for Initial Selection: Provide three representative samples in containers of setting bed sand material, cured and dried, for color selection.
c. Samples for Verification: Provide three 1 pound samples in containers of polymeric joint sand.

4. Paving Installation Contractor.

a. Every manufacturer and installer shall demonstrate that they have supplied and/or installed pavers for projects of a similar nature, with regard to installation and production capacity of at least 300,000 square feet. Qualifications shall be submitted at the time of bid, without exception.
b. Paver Manufacturer's Qualifications.
1) The manufacturer shall demonstrate a minimum of 10 years successful experience in the manufacture of interlocking concrete block 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 documents and as specified herein.

c. Paver Installer's Qualifications.

1) Installer shall provide installation history, including three references in writing with contact information, demonstrating to the satisfaction of the Engineer their ability to perform the paver installation and related work indicated in the contract documents.

2) The installer shall have suitably experienced personnel and a management capability sufficient to execute the work shown on the contract documents and specified herein.

3) The installer's foreman shall demonstrate, including references, a minimum of 5 years experience in the installation of unit paver systems similar in size and nature to this project.

D. Quality Assurance.

1. Utilize a manufacturer having at least 10 years of experience manufacturing concrete pavers on projects of similar nature or project size.

2. Source Limitations.

a. Obtain concrete pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties. Paver shall have a continuous, uniform look, free from variations in color.

b. Obtain joint and setting bed sands from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.

c. Obtain polymeric joint sand from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.

3. Paving Contractor Qualifications.

Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.

4. Mockups.

a. Install a 5 foot by 5 foot paver area per each paving pattern.

b. Use this area to determine surcharge of the setting bed sand layer, joint sizes, lines, laying pattern(s) and levelness. This area will serve as the standard by which the quality will be judged.

c. Subject to acceptance by Engineer, mock-up may be retained as part of finished work.

d. If mock-up is not retained, remove and dispose legally.

E. Delivery, Handling, and Storage.

1. Deliver concrete pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.

a. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.

b. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.

c. Unload concrete pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.

2. Store and protect materials free from mud, dirt and other foreign materials.

3. Prevent joint and setting bed sand from exposure to rainfall or removal by wind with secure, waterproof covering.

4. Store polymeric joint sand on elevated platforms, under a cover and/or in a dry location.

F. Project Site Conditions.

1. Environmental Requirements.
- **a.** Install concrete pavers only on unfrozen and dry setting bed sand.
- **b.** Install concrete pavers only on unfrozen and dry base or subbase aggregate materials.
- **c.** Install base or subbase aggregates only over unfrozen subgrade.
- **d.** Install setting bed sand or concrete pavers only when there is no heavy rain or snowfall.
- **e.** Install polymeric joint sand only when ambient temperature is above 40°F, under dry conditions with no rain forecast for 24 hours and when surface of pavement is completely dry.

2. Take precautions to ensure equipment and vehicles do not disturb or damage existing site grading, walks, drives, utilities, plants, etc.

3. Repair and/or return to original condition any damage caused by Contractor's negligence at no cost to Contracting Authority.

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

G. Concrete Paver Overage and Attic Stock.

1. Provide a minimum of 5% additional material for overage to be used during construction.

2. Contractor to provide 100 square feet of each product and size used to the City of Marshalltown for maintenance and repair. Furnish Pavers from the same production run as installed materials.

3. Manufacture to supply maintenance and reinstatement manuals for concrete paver units.

150466.02 MATERIALS.

A. Concrete Pavers

1. Concrete Pavers as manufactured by one of the following:

- **a. Unilock.**
  301 E. Sullivan Road, Aurora, IL 60505
  Brad Punke 630.892.9191 Ext. 253
  Holland Premier
  Red
  4 inches by 8 inches by 2 3/8 inches
- **b. Belgard Hardscapes.**
  480 South 16th Street, West Des Moines, IA 50265
  Chris Boyd 515.202.2404
  Holland Stone
  Red
  4 inches by 8 inches by 2 3/8 inches
- **c. Borgert.**
  8646 Ridgewood Road, St. Joseph, MN 56374
  Mike Buckley 608.495.3855
  Holland Stone
  Red
  4 inches by 8 inches by 2 3/8 inches
- **d. Hanover Architectural Products.**
  5000 Hanover Road, Hanover PA 17331
  717.637.0500

Traditional Prest Brick with Natural Finish
Red 15
4 inches by 8 inches by 2 3/8 inches

e. Approved Equal.
The specified products establish minimum requirements that substitutions must meet to be considered acceptable. To obtain acceptance of unspecified products, submit written requests at least 7 days before the Bid Date.

2. 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.
- **a.** Average compressive strength 8000 psi with no individual unit under 7200 psi.
- **b.** Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
- **c.** 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.

3. Accept only pigments in concrete pavers conforming to ASTM C 979.
Note: ACI Report No. 212.3R provides guidance on the use of pigments.

4. Maximum allowable breakage of product is 5%.

B. Joint Sand.

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 joint sand material that does not conform to conform to the grading requirements of ASTM C 33.

3. Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.

4. Gradation as shown in Table 1 below:

TABLE 1 – GRADATION REQUIREMENTS FOR JOINT SAND

ASTM C 144		
Sieve Size	**Natural Sand Percent Passing**	**Manufactured Sand 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 75
No. 50	10 to 30	20 to 40
No. 100	2 to 15	10 to 25
No. 200	0 to 1	0 to 10

C. Polymeric Joint Sand.

1. Provide polymeric joint sand as manufactured by:

a. G2 GatorMaxx Sand.
Product Type: Dry mix, contains polymeric binding agent, activated with water.
Color: Ivory

b. Techniseal RG+.
Product Type: Dry mix, contains polymeric binding agent, activated with water.
Color: Tan

c. Unicare HP Polymeric Max Sand.
Product Type: Dry mix, contains polymeric binding agent, activated with water.
Color: Tan

2. Provide polymeric joint sand meeting the minimum material and physical properties as follows:
a. Compression Strength: proven resistance to compression of 550 PSI after drying for 7 days under controlled conditions (73°F at 50% humidity). Test sand sample shape: cylinder (2 inch diameter by 4 inches high).
b. Gradation as shown Table 1 above.

D. Setting Bed Sand

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 material that does not conform to the grading requirements of ASTM C 33.

3. Do not use mason sand or sand conforming to ASTM C 144.

4. Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.

5. Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 2 below:

TABLE 2 – GRADATION REQUIREMENTS FOR SETTING BED SAND

ASTM C 33	
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

E. Geotextile

1. Provide Geotextile material conforming to the following performance characteristics, measured per the test methods referenced:

a. 4 ounce, nonwoven needle punched geotextile composed of 100% polypropylene staple fibers that are inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.
b. Grab Tensile Strength: ASTM D 4632: 115 pounds
c. Grab Tensile Elongation: ASTM D 4632: 50%
d. Trapezoidal Tear: ASTM D4533: 50 pounds
e. Puncture: ASTM D4833: 65 pounds
f. Apparent Opening Size: ASTM D 4751: 70 U.S. Sieve
g. Permittivity: ASTM D 4491: 2.0 sec -1
h. Flow Rate: ASTM D 4491: 140 gal/min/s.f.

2. As supplied by:
a. Carthage Mills – FX-40HS.
b. U.S. Fabrics – US 115NW.
c. Mirafi – 140N.

150466.03 CONSTRUCTION.

A. Examination.

1. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following before placing the concrete pavers.
a. Verify that geotextiles, if applicable, have been placed according to the contract documents.
b. Verify the concrete underlayment has cured.
c. Verify the concrete underlayment thickness, strengths, surface tolerances and elevations conform to specified requirements.
d. Provide written density test results for soil subgrade, concrete underlayment PSI testing to the Engineer.
e. Verify location, type, and elevations of concrete curbing, concrete collars around utility structures, and drainage inlets.

2. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of bedding sand and concrete paver installation signifies acceptance of base and edges/restraints.

B. Preparation.

1. Prior to construction of concrete base (included in a separate specification), confirm all dimensions of the actual pavers with the design pattern to confirm configuration, patterns, and dimensions of all material. Contractor shall notify the Engineer if there are any conflicts between the material and the design.

2. Verify the Concrete Underlayment is clean and dry, certified by Contractor as meeting material, installation and grade specifications.

3. Verify elevation different between PCC subslab and adjacent finished PCC curb surface to confirm concrete pavers can be installed flush with bordering curb.

4. Stockpile Setting Bed Sand and Joint Sand such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.

5. Verify that base and Geotextile is ready to support sand and pavers and imposed loads.

6. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all geotextile, joint sand and setting bed sand materials contaminated with sediment with clean materials.

C. Installation.

1. Setting Bed Sand.

a. Provide and spread setting bed sand evenly over the concrete underlayment with geotextile and screed to a nominal thickness of 1 inch.
  1) Protect screeded setting bed sand from being disturbed by either pedestrian or vehicular traffic.
  2) Screed only the area which can be covered by pavers in one day.
  3) Do not use setting bed sand material to fill depressions greater in the base surface.

b. Keep moisture content constant and density loose and constant until concrete pavers are set and compacted.

c. Screed the setting bed sand using either an approved mechanical spreader (e.g.: an asphalt paver) or by the use of screed rails and boards.

d. Carefully maintain spread setting bed sand in a loose condition, and protected against incidental compaction, both prior to and following screeding. Loosen any incidentally compacted sand or screeded sand left overnight before further paving units are placed.

e. Provide lightly screeded setting bed sand in a loose condition to the predetermined depth, only slightly ahead of the paving units.

f. Fully protect screed setting bed sand against incidental compaction, including compaction by rain. Remove any screeded setting bed sand that is incidentally compacted prior to laying of the paving units. Do not permit either pedestrian or vehicular traffic on the screeded setting bed sand.

g. Inspect the setting bed sand course prior to commencing the placement of the concrete pavers. Acceptance of the setting bed sand occurs with the initiation of concrete paver placement.

2. Concrete Pavers.

a. Replace concrete pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

b. Mix concrete 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).

c. Exercise care in handling concrete pavers to prevent surfaces from contacting backs or edges of other units.

d. Provide Concrete 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-third of a whole paver.

e. Use string lines or chalk lines on setting bed sand to hold all pattern lines true.

f. Set surface elevation of pavers 1/8 inch above adjacent drainage inlets, concrete collars or channels.

g. 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.

h. Provide space between paver units of 1/32 inches wide to achieve straight bond lines.

i. Prevent joint (bond) lines from shifting more than ±1/2 inch over 50 feet from string lines.

j. Fill gaps between units or at edges of the paved area that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.

k. Prevent all traffic on installed concrete pavers until joint sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid concrete pavers that have not received initial compaction and joint sand material.

l. Vibrate concrete pavers into leveling course with a low-amplitude plate vibrator capable of a 5000 pound compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:

1) After edge pavers are installed and there is a completed surface or before surface is exposed to rain.

2) Compact installed concrete pavers to within 6 feet of the laying face before ending each day's work. Cover concrete pavers that have not been compacted and leveling course on which pavers have not been placed, with non-staining plastic sheets to prevent Setting Bed Sand from becoming disturbed.

m. Protect Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.

n. Remove any cracked or structurally damaged concrete pavers and replace with new units prior to installing joint sand material.

3. Joint Sand.

a. Provide, spread and sweep dry Joint Sand into joints immediately after vibrating pavers into setting bed sand course until full. Vibrate pavers and add Joint Sand material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.

b. Leave all work to within 3 feet of the laying face fully compacted with sand-filled joints at the completion of each day.

c. Remove excess joint sand broom clean from surface when installation is complete.

d. Polymeric Joint Sand: Install polymeric joint sand per manufacturers recommended instructions.

D. Field Quality Control.

1. Verify final elevations for conformance to the plans after sweeping the surface clean. Prevent final Concrete Paver finished grade elevations from deviating more than ±3/8 inch under a 10 foot straightedge or indicated slope, for finished surface of paving.

2. Lippage: No greater than 1/32 inch difference in height between Concrete Pavers and adjacent paved surfaces.

E. Repairing, Cleaning and Sealing.

1. 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.

2. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean. Clean concrete pavers in accordance with the manufacturer’s written recommendations.

F. Protection.

Protect completed work from damage due to subsequent construction activity on the site.

150466.04 METHOD OF MEASUREMENT.

The Engineer will measure the square yard surface area of the installed Concrete Pavers.

150466.05 BASIS OF PAYMENT.

Payment for Concrete Pavers includes all labor, materials, equipment, and supervision required to furnish and install Concrete Pavers, complete. Unit Price for Concrete Pavers will include subgrade preparation, concrete base, material cutting and installation of concrete pavers, setting bed sand, polymeric joint sand, and geotextile.