

PERMEABLE INTERLOCKING CONCRETE PAVERS

These specifications compliment the permeable pavers design portion of the Iowa Stormwater Management Manual in Chapter 2, Section 2J-4.

Sections of the following documents, as referenced within these specifications, are hereby made a part of these specifications:

- **SUDAS Standard Specifications:** The standard specifications issued by the Iowa Statewide Urban Design and Specifications Program effective at the date of publication of the Notice to Bidders, unless a different effective date is identified in the contract documents.
- **Iowa DOT Standard Specifications for Highway and Bridge Construction:** The Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction and the General Supplemental Specifications effective at the date of publication of the Notice to Bidders unless a different effective date is identified in the contract documents.
- **American Society for Testing and Materials (ASTM) standards.**
- **American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Transportation Materials and Methods of Sampling and Testing.**

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Subgrade Preparation
- B. Placement of Storage Aggregate
- C. Placement of Filter Aggregate
- D. Placement of Bedding Course
- E. Placement of Permeable Interlocking Concrete Pavers

1.02 DESCRIPTION OF WORK

Construct permeable interlocking concrete pavers for treatment of stormwater runoff.

1.03 SUBMITTALS

- A. Sample pavers:** Representative of the type and color proposed for the project.
- B. Installation instructions:** Manufacturer's published installation instructions.
- C. Material Certification:** Submit certification letter from paver manufacturer indicating compliance with the ASTM specifications and the contract documents.
- D. Bedding, Filter, and Storage Aggregates:** Include aggregate type, source, gradation, and compacted void content.

1.03 SUBMITTALS (Continued)

E. Project Details: Include schedule, construction procedures, and quality control plan.

F. Involved Parties: Submit a list of all subcontractors, material suppliers, and testing laboratories.

1.04 SUBSTITUTIONS

Comply with the requirements of the contract documents.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with the requirements of the contract documents.

1.06 SCHEDULING AND CONFLICTS

Comply with the requirements of the contract documents.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT

A. Class 10, Class 12, or Class 13 Excavation: Refer to SUDAS Section 2010, 1.08, E for measurement and payment information for Class 10, Class 12, or Class 13 Excavation.

B. Engineering Fabric:

- 1. Measurement:** Measurement will be in square yards for the surface area covered with engineering fabric. Both horizontal and vertical areas covered with engineering fabric will be measured.
- 2. Payment:** Payment will be made at the unit price per square yard of engineering fabric.
- 3. Includes:** Unit price includes, but is not limited to, placing and securing filter fabric and any overlapped areas.

C. Underdrain:

- 1. Measurement:** Measurement will be in linear feet for each type and size of pipe installed. Pipe will be measured from end of pipe to end of pipe along the centerline of pipe, exclusive of outlets. The vertical height of cleanouts and observation wells will be included in the length of pipe measured. Lengths of elbows, tees, wyes and other fittings will be included in length of pipe measured.
- 2. Payment:** Payment will be made at the unit price per linear foot for each type and size of pipe.

1.08 MEASUREMENT AND PAYMENT (Continued)

3. **Includes:** Unit price includes, but is not limited to, furnishing and placing pipe, cleanouts, observation wells, and pipe fittings.

D. Storage Aggregate:

1. **Measurement:** Measurement will be in tons based upon scale tickets for the material delivered and incorporated into the project.
2. **Payment:** Payment will be made at the unit price per ton of storage aggregate.
3. **Includes:** Unit price includes, but is not limited to, furnishing, hauling, and placing storage aggregate.

E. Filter Aggregate:

1. **Measurement:** Measurement will be in tons based upon scale tickets for the material delivered and incorporated into the project.
2. **Payment:** Payment will be made at the unit price per ton of filter aggregate.
3. **Includes:** Unit price includes, but is not limited to, furnishing, hauling, and placing filter aggregate.

F. Permeable Interlocking Concrete Pavers with Bedding Course:

1. **Measurement:** Measurement will be in square yards for the area of permeable interlocking concrete pavers. The area of manholes, intakes, or other fixtures in the pavement will not be deducted from the measured pavement area.
2. **Payment:** Payment will be made at the unit price per square yard of permeable interlocking concrete pavers.
3. **Includes:** Unit price includes, but is not limited to, testing, placement of bedding course, installing permeable interlocking concrete pavers, and pavement protection.

PART 2 - PRODUCTS**2.01 ENGINEERING FABRIC**

Comply with Iowa DOT Section 4196, requirements for subsurface drainage.

2.02 UNDERDRAIN

- A. Provide slotted pipe(s) complying with the requirements for Type 1 Subdrain in SUDAS Section 4040.
- B. Provide 6 inch diameter collector pipes unless otherwise specified in the contract documents.
- C. Provide 4 inch diameter lateral pipes unless otherwise specified in the contract documents.

2.03 STORAGE AGGREGATE

Aggregate complying with Iowa DOT Section 4122, Gradation No. 13, Class 2 durability gravel or crushed stone (AASHTO M 43/ASTM D 448, Size 2).

2.04 FILTER AGGREGATE

Provide aggregate complying with Iowa DOT Section 4115, Gradation No. 3, Class 2 durability gravel or crushed stone (AASHTO M 43/ASTM D 448, Size 57).

2.05 BEDDING AGGREGATE

Provide crushed stone complying with Iowa DOT Section 4125, Gradation No. 21 (AASHTO M 43/ASTM D 448, Size 8).

2.06 PERMEABLE INTERLOCKING CONCRETE PAVERS (PICP)

- A. Comply with ASTM C 936.
- B. Provide PICP system from list of approved products specified in the contract documents.

2.07 PAVER EDGE RESTRAINTS

Provide paver manufacturer's recommended edge restraint system.

2.08 PERMEABLE PAVER VOID FILLER

If required by the contract documents or the PICP system manufacturer, provide void filler complying with Iowa DOT Section 4125, Gradation No. 21 (AASHTO M 43/ASTM D 448, Size 8) or other aggregate, as recommended by the paver manufacturer. Do not add cement to void filler.

PART 3 - EXECUTION**3.01 PRE-INSTALLATION PROTECTION**

- A. Complete grading, utility installation, and other earth disturbing operations prior to excavating for the permeable paver system.
- B. Prior to placing permeable interlocking concrete pavers, install sediment control practices upstream to protect the area from sediment in stormwater runoff from disturbed soil.

3.02 SUBGRADE PREPARATION FOR PERMEABLE INTERLOCKING CONCRETE PAVERS

- A. Do not compact or subject subgrade area under proposed permeable paving area to excessive construction equipment prior to placement of the storage aggregate.
- B. Excavate area to the elevations and grades specified in the contract documents.
- C. When underdrain is specified, excavate a minimum 12 inch wide by 8 inch deep trench at locations specified in the contract documents.
- D. In areas where cuts are required, do not compact surface. After final elevation is achieved, scarify surface to a minimum depth of 3 inches to reduce compaction caused by construction equipment.
- E. Where fill materials are required, compact materials to 92% of maximum Standard Proctor Density. Do not over-compact.
- F. Fill and lightly re-grade any areas damaged by erosion, ponding, or traffic compaction prior to placing the engineering fabric.

3.03 ENGINEERING FABRIC

- A. Install engineering fabric over completed subgrade, including trench for underdrain when specified.
- B. Overlap adjacent strips of fabric a minimum of 6 inches.
- C. Extend fabric up the sides of the subbase trench to the bottom of the proposed pavement.

3.04 UNDERDRAIN**A. Underdrain Collector Pipes:**

1. Place 2 inches of filter aggregate in the bottom of the underdrain trench over engineering fabric.
2. Begin underdrain collector installation at the outlet and continue upgrade.
3. Lay underdrain collector pipe to the proper line and grade. Place pipe with perforations down.

3.04 UNDERDRAIN (Continued)

4. Place filter aggregate over installed pipe in layers not more than 6 inches thick. Thoroughly tamp each layer with mechanical tampers.
5. Provide cleanouts where specified in the contract documents. Comply with SUDAS Figure 4040.232.
6. Connect underdrain collector to outlet. Comply with SUDAS Figure 4040.233. Install rodent guard on all underdrain pipe 6 inches or smaller.
7. Install underdrain cleanout pipes and observation wells as specified in the contract documents.

B. Underdrain Lateral Pipes:

1. Place 2 inches of filter aggregate over the bottom of the prepared subgrade at lateral pipe locations specified in the contract documents.
2. Lay underdrain lateral over filter aggregate to the proper line and grade. Place pipe with perforations down.
3. Connect underdrain laterals to underdrain collector with wye or tee fitting.
4. Install plug or cap on upstream end of lateral pipe.
5. Place additional filter aggregate along each side of the lateral pipe to the springline of the pipe.

3.05 STORAGE AGGREGATE

- A. Place storage aggregate in 6 inch maximum lifts. If underdrain system is specified, take care not to damage or displace pipe during placement of storage aggregate.
- B. Compact each lift with a vibratory drum roller. Do not operate compaction equipment directly over underdrain, until a minimum of 12 inches of storage aggregate is placed over the underdrain.
- C. Install storage aggregate to the elevation specified in the contract documents.

3.06 FILTER AGGREGATE

- A. Place filter aggregate directly over storage aggregate.
- B. Install aggregate in a single lift with a thickness of 4 inches.
- C. Lightly compact filter aggregate with one or two passes from a vibratory plate compactor or vibratory roller.

3.07 BEDDING AGGREGATE

- A. Place bedding aggregate directly over filter aggregate.
- B. Install aggregate in a single lift with a thickness of 1 1/2 inches to 2 inches.
- C. Lightly compact bedding aggregate with one or two passes from a vibratory plate compactor or vibratory roller. Ensure surface is even, smooth, and at the proper elevation to accommodate permeable pavers.

3.08 INSTALLING INTERLOCKING PERMEABLE CONCRETE PAVER SYSTEM

Place and install pavers according to paver manufacturer's published installation specifications and the following:

- A. Where pavers are placed against a curb and gutter or other pavement, installation of an edge course or soldier course is required if the pavement edge is not straight. Trim pavers as required to compensate for deviations in the adjacent pavement edge.
- B. Where pavers are placed against an unrestrained edge, install edge restraint system.
- C. Place chalk lines on the bedding course to maintain straight joint lines.
- D. After pavers have been installed on the bedding course, and all cut pavers have been inserted to provide a full and complete surface, inspect pavers for damaged units and irregular joint lines. Remove and replace pavers as required.
- E. After inspection and replacement of damaged pavers, install void filler if required by paver manufacturer or contract documents. Place filter aggregate to the bottom of the chamfer on the paver and sweep the surface clean.
- F. Compact pavement surface with two passes of a vibratory plate compactor. Do not operate plate compactor within 3 feet of an unrestrained pavement edge.
- G. Re-inspect pavers, and remove and replace all damaged units.

3.09 PROTECTION OF PAVEMENT

- A. Protect pavement from heavy construction traffic, including trucks, skid steers, loaders, and all tracked vehicles.
- B. Provide barriers and protection as necessary.
- C. Do not place soil, mulch, sand, aggregate, or stockpile other materials on the pavement surface that may contaminate the pavement and plug the porous surface.