
POROUS HOT MIX ASPHALT (HMA) PAVEMENT

These specifications compliment the porous HMA pavement design portion of the Iowa Stormwater Management Manual in Chapter 2, Section 2J-3.

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.
- National Asphalt Pavement Association's Information Series 131.
- 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 Porous HMA Pavement
- E. Testing of Porous HMA Pavement

1.02 DESCRIPTION OF WORK

Construct porous HMA pavement for treatment of stormwater runoff.

1.03 SUBMITTALS**A. Porous HMA Materials:**

1. A statement from the polymer-modified asphalt supplier certifying that the polymer-modified asphalt complies with these specifications and indicating the following:
 - a. Type of elastomer polymer used to modify the asphalt.
 - b. Quality control sampling and testing procedures used to certify the polymer modified asphalt prior to shipping to the contractor's asphalt plant.

1.03 SUBMITTALS (Continued)

- c. Information on storage and stability of the polymer modified asphalt.
 - d. Recommended mixing and compaction temperatures.
2. Aggregate types, sources, and gradations from a qualified testing agency.
 3. Results of proposed asphalt mix testing for resistance to stripping and draindown.
 4. Depending on the type of aggregates used, submit binder content determination results.

B. Filter and Storage Aggregates: Including aggregate type, source, gradation, and void content.

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.

1.08 MEASUREMENT AND PAYMENT (Continued)**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.
- 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. Porous HMA Pavement:

- 1. Measurement:** Measurement will be in square yards for each thickness of porous HMA pavement. 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 for each thickness of porous HMA pavement.
- 3. Includes:** Unit price includes, but is not limited to, testing, asphalt binder, final trimming of subbase, pavement protection, and safety fencing.

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 TYPE 1 FILTER AGGREGATE

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 POROUS HOT MIX ASPHALT**A. Asphalt Binder:**

- 1. Provide polymer-modified asphalt binder complying with PG 76-22 or 82-22.
- 2. Modify asphalt binder with a styrene-butadiene-styrene (SBS) elastomeric polymer.
 - a. Ensure polymer-modified asphalt binder is heat and storage stable.
 - b. Apply elastomeric polymer at a rate of 3% by total weight of binder.
 - c. Thoroughly blend binder materials at asphalt refinery or terminal prior to being loaded into transport vehicle.

B. Aggregate:

- 1. Provide aggregate with a minimum of 90% crushed particles.

2.05 POROUS HOT MIX ASPHALT (Continued)

2. Provide an aggregate gradation as required to develop a mixture with a 13 to 18% void ratio. The following gradation is recommended but must be verified:

Sieve Size	Percent Passing	
	Min.	Max.
3/4"	100	---
1/2"	85	100
3/8"	55	75
No. 4	10	25
No. 8	5	10
No. 200	2	4

C. Porous HMA Mixture:

1. Provide a binder content between 5 to 6.5% by weight of dry aggregate.
2. If more absorptive aggregates, such as crushed limestone, are used, determine the required binder content according to the testing procedures in the National Asphalt Pavement Association's Information Series 131.
3. Perform testing of proposed mixture as follows:
 - a. Test draindown of mixture according to ASTM D 6390. Ensure draindown of binder is no greater than 0.3%.
 - b. Test mixture for resistance to stripping by water according to ASTM D 3625. If estimated coating area is not above 95%, add anti-stripping agents to the asphalt.
 - c. Test mixture for air void content by dimension according to ASTM D 3203 or ASTM D 6857. Do not determine the density using saturated surface dry procedures.

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

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

3.02 SUBGRADE PREPARATION FOR POROUS HMA

- A. Do not compact or subject subgrade area under porous HMA pavement 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 in the contract documents.
- 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 up grade.
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 material 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 POROUS HMA PAVEMENT**A. Transporting Porous HMA:**

1. Transport the mixture to the site in vehicles with smooth, clean dump beds that have been sprayed with a non-petroleum release agent.
2. Cover mixture during transport to control cooling.

B. Placing Porous HMA:

1. The use of a polymer-modified binder requires higher placement temperatures than normal HMA. Ensure mix temperature is between 300°F and 350°F during placement.
2. The use of a remixing material transfer device between trucks and the paver to eliminate cold lumps in the mix is highly recommended but not required.
3. The polymer-modified asphalt is difficult to rake. Ensure a well heated screed is utilized to minimize the need for raking.
4. Place porous HMA pavement in a single lift directly over the granular subbase.
5. Begin compaction when the pavement surface is cool enough to resist a 10 ton roller. One or two passes are all that is normally required to achieve proper compaction.

3.08 PROTECTION OF PAVEMENT

- A. After final rolling, protect pavement from all vehicular traffic for at least 48 hours.
- B. Protect pavement from heavy construction traffic, including trucks, skid steers, loaders, and all tracked vehicles.
- C. Provide barriers and protection as necessary.
- D. Do not place soil, mulch, sand, or aggregate, or stockpile other materials that may contaminate the pavement and plug the porous surface, on or near the pavement surface.