

POROUS ASPHALT PAVEMENT SURFACE COURSE

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PAPS.01 Description. This work shall consist of constructing a Porous Asphalt Pavement Surface (PAPS) course comprised of aggregate, polymer-modified asphalt binder and fiber stabilizer mixed in a central plant and spread and compacted on a prepared surface.

All numbered specification references in this document refer to Ohio Department of Transportation (ODOT), Construction and Material Specifications

Provide a Field Quality Control Supervisor (FQCS), holding Supplement 1041 Field Quality Control Supervisor approval with endorsement for porous asphalt construction and who is a company employee, who is at the paving site during placement of any non-temporary porous asphalt concrete pavement. Ensure personnel obtaining and handling cores at the project site are approved Level 2 technicians, FQCS or personnel approved by OMM.

Comply with the requirements of Item 401 except as modified below.

PAPS.02 Composition. Use a mixture formulation (Job Mix Formula) conforming to the materials requirements provided below.

Furnish materials conforming to:

- Asphalt binder702.01, PG 64-22 Modified with 5-percent SBR
 Latex¹, or PG76-22M(ER80) (ER80 denotes Elastic Recovery to be 80 min.)
- Aggregates703.05
 Coarse aggregate angularity, percent fractured (two or more faces), ASTM D5821.....100%
- Mineral filler703.07
- Rubber compound702.14

Notes:

1. Provide a quantity of asphalt binder and Styrene Butadiene Rubber (SBR) in latex form as required to produce a composition of 95 ±0.3 percent asphalt binder to 5±0.3 percent by weight SBR solids and meeting the requirements of PG 76-22.

Fiber Stabilizer: Use cellulose fiber in loose or pellet form meeting the properties shown in Table 1. Provide the fiber manufacturer's most recent actual test data and a certification of compliance with the JMF submittal. Protect the fiber stabilizer from moisture or other contamination. Add the fiber at a dosage rate of 0.3 - 0.4% by weight of the total mix to control draindown in production.

Table 1

Property Description	Specification
Fiber length (max):	0.25 inch (6.35 mm)
Sieve Analysis - Alpine Sieve Method	
• Passing No. 100 (150 µm) sieve	60-80%
Sieve Analysis - Ro-Tap Sieve Method	
• Passing No. 20 (850 µm) sieve:	80-95%
• Passing No. 40 (425 µm) sieve:	45-85%
• Passing No. 100 (150 µm) sieve:	5-40%
Ash Content:	18% non-volatiles (5%)
pH:	7.5 (1.0)
Oil Absorption:(times fiber weight)	5.0 (1.0)
Moisture Content (max):	5.0%

Cellulose Pellets - Cellulose pellets consist of cellulose fiber and may be blended with 0 - 20% asphalt binder. Meet the cellulose fiber requirements in Table 1. If no asphalt binder is used, add the pellet at a dosage rate of 0.3 - 0.4% by weight of the total mix to control draindown in production. Adjust the fiber dosage to maintain the desired fiber amount when fiber is pre-blended with binder.

1. Pellet size: 1/4 cubic inch (maximum)
2. Binder: 25 - 80 pen.

Do not use reclaimed asphalt concrete.

Proportion the materials such that the resulting blend is within the following limits:

Table 2

Sieve	Total Percent Passing
1/2 inch (12.5 mm)	100
3/8 inch (9.5 mm)	85 - 96
No. 4 (4.75 mm)	28 - 45
No. 8 (2.36 mm)	9 - 17
No. 200 (75 µm)	2 - 5
Asphalt binder (percent by weight of total mix)	6.0 - 12.0
Fiber Stabilizer (percent by weight of total mix)	0.3 - 0.4

Determine the mixture proportions using the design procedure outlined in FHWA Technical Advisory (TA) T5040.31, December 26, 1990 (available from Flexible Pavements of Ohio), or by the National Center for Asphalt Technology (NCAT) mix design procedure (Report 99-3, *Design of New Generation Open Graded Friction Courses*, available at www.ncat.us).

Determining the maximum specific gravity (G_{mm}) for Mix Design:

- Determine G_{mm} of the mixture at binder contents: P_b=5.0, P_b=5.5
- Determine G_{se} at P_b=5.0 and P_b=5.5 If the difference of the G_{se} values is within ± 0.012 use the average value. If the difference exceeds 0.012 repeat the process. [Note: hand mixing the “Rice” mixtures in a heated glass Pyrex bowl for 5 to 8 minutes generally gives a more reproducible G_{se} value than mechanical mixing.
- Back-calculate G_{mm} using the average G_{se}.

Compose the mixture to assure 16 to 22 percent air voids in the compacted pavement.

Ensure Volume Increase Ratio (VIR) = 11.5% minimum. $VIR\% = \{[(P_{be}/G_b)/(P_s/G_{sb})] \times 100\}$

Use an approved ODOT Level 3 Asphalt Laboratory and Level 3, Asphalt Concrete Technician to determine the job mix formula (JMF).

PAPS.03 Design Verification. A minimum of 3 weeks before the production of the mixture, submit for approval a computed blend of aggregate and asphalt binder, and production temperature range. Use ODOT JMF forms for this submittal. Final design acceptance is subject to field verification and actual performance. Field verification may include additional testing by the owner.

PAPS.04 Mixing. Mix the aggregate, asphalt binder material and fiber stabilizer within the established temperature range until all the aggregate is coated. Establish the mixing temperature at a binder viscosity of 800 ± 100 cSt. Provide a mixture that shows desired draindown when tested according to the FHWA Technical Advisory T5040.31, Section 6.0, Figure 5. Ensure Volume Increase Ratio (VIR) of the field produced mix has a minimum value of 11.5%.

PAPS.05 Confirmation of Constructability. Prior to placement of porous asphalt surface course on the project confirm the following by constructing a test section off site: mix composition, placement and rolling pattern needed to meet the material properties in Table 4, section PAPS.10, and the pavement air void content, same section. Construct the test section by compacting the mixture using a ballasted static tandem steel wheel roller having a minimum weight of 8 tons. Make the initial rolling using two passes, a pass being coverage of the area in one direction. Initiate rolling immediately upon placement while the mat surface is at the compaction temperature. The compaction temperature is established at a binder viscosity of 1400 ± 200 cSt. [Note: Porous asphalt mixtures cool rapidly. Failure to roll the mixture at the compaction temperature compromises the asphalt mixture cohesiveness and places the pavement at risk of raveling.] Monitor the pavement surface temperature by taking measurements just prior to each pass of the roller. Furnish all test information to the owner. Obtain permission from the owner to proceed with placement of porous asphalt surface course on the project.

PAPS.06 Weather Limitations. Spread the mixture when the surface temperature is at least 60 degrees F and rising or raveling may result. Do not place the mixture when rain is imminent. Cease all operations if rain occurs during placement. Do not place the mixture during any weather conditions that would cause its degradation, segregation, or contamination.

PAPS.07 Spreading and Compacting. Spread the mixture in a method that produces a smooth, uniform layer before compacting. Take measures to ensure the surface over which the PAPS is being placed is not displaced or damaged during the paving process.

Using a rubber-tired paver is permitted unless it displaces or damages the underlying layer; otherwise, use a track-mounted paver. Compact the mixture using the equipment and procedures established by the test section. Initiate rolling immediately upon placement while the mat surface is at the compaction temperature. Failure to initiate rolling at the compaction temperature is cause for rejecting the pavement installation. Begin finish rolling (to remove roller marks) when the pavement temperature reaches 160 degrees F. Static steel wheel rollers lighter than 8 tons may be used to finish roll. Avoid pavement blinding. Check pavement permeability immediately following initial rolling. Use a Simple infiltration test (SIT) as described in below. Perform this test approximately each 1,000 square feet of pavement placed. Ensure that the average infiltration rate (IR) of all tests is at least 100 inches per hour and that no individual test is less than 10 inches per hour. If blinding is evident verify the pavement is being compacted as established by the test section and the mixture properties comply with the job mix formulation. Cease paving operations if pavement blinding continues. Remove and replace any areas having an initial IR less than 10 inches per hour.

Simple Infiltration test - Construct a square frame from a standard 8 ft. - 2 by 4 having an inside dimension of 22.5 inches square. Affix a soft closed cell foam or other seal material to the bottom of the frame that will serve to substantially seal the frame to the porous asphalt surface to be tested. Pour approximately 5 gallons of water into the frame as quickly as possible. Record the time in seconds from when the water starts to be poured into the frame until no water remains on the pavement surface. Calculate the approximate infiltration rate (in inches/hour) by dividing 8280 inch-seconds/hour by the time in seconds measured. Record the infiltration rate observed and calculated.

PAPS.08 Protection of the PAPS. Do not haul over the mixture. Protect the mixture at all times from contamination by soil or other fine material.

PAPS.09 Quality Control Testing. Perform quality control testing according to 441.09 at the frequency shown in Table 3.

Table 3

Quality Control Testing Schedule		
Daily Frequency	Tests	Sample Type
Within first 100 tons	binder content, gradation, air voids, VIR	completed mix
Each 400 tons thereafter	binder content, gradation, air voids, VIR	completed mix
Once per day	(MSG) maximum specific gravity (ASTM D2041)	completed mix

Control the mixture production as follows:

- A. If during production a single asphalt binder content is more than ± 0.30 percent beyond the JMF, obtain a sample from the next haul vehicle and test as a verification sample. Stop production and verify the mix design if the average of the original and verification tests exceeds JMF asphalt binder content by ± 0.2 percent. Verification will include an evaluation of on-site aggregate gradations, specific gravities, and mix proportions.
- B. Validate the minimum VIR is being met; if not, take immediate corrective action to ensure the minimum VIR requirement is being satisfied.
- C. If the Range difference in any three consecutive asphalt binder content tests is greater than 0.4 percent immediately notify the owner's representative. Range is defined as the difference between the largest and the smallest acceptance test result within a production day.
- D. If the Range difference in any three consecutive gradation tests for the No. 4 (4.75 mm) sieve is greater than 10.0 percent, immediately notify the owner's representative.
- E. Cease production if range deviations continue.

PAPS.10 Acceptance. The pavement is acceptable if quality control test data indicates the mixture conforms to the tolerances shown in Table 4, air void measurements of cores taken from the finished pavement are within the range of 16 to 22 percent as determined by ASTM D3203, and VIR of cores is greater than or equal to 11.5%. When calculating air void content, use the MSG for the production day in which the material was placed. Determine pavement air voids and VIR by coring at a testing frequency of one core per 2,250 square foot lots. The owner will designate the location of the core sample. Fill core holes by the next working day. Use a hot asphalt paving mixture for this purpose and thoroughly compact.

Removal and Replacement - Remove and replace all lots where cores indicate air void measurement or VIR exceed the acceptance parameter. Remove and replace all lots where core results indicate the pavement thickness is deficient by greater than 0.25 inches of the plan thickness.

Table 4

Mix Characteristic	Deviation of the Mean from the Design	Range
Binder content	±0.3 percent	0.4
3/8 inch (9.5 mm) sieve	±5 percent	5
No. 4 (4.75 mm) sieve	±5 percent	5
No. 8 (2.36 mm) sieve	±4 percent	5
No. 200 (75 µm) sieve	±2 percent	5

PAPS.11 Method of Measurement. The conversion factor (lbs. per cubic yard) will be based on the unit weight of the material as determined by the job mix formula.

PAPS.12 Basis of Payment. Payment will be made for accepted quantities, complete in place, at the contract price as follows:

	Unit	Description
PAPS	Cubic Yard	Porous Asphalt Pavement Surface Course