

KU Design Guidelines
APPENDIX II

PERMEABLE BITUMINOUS PAVEMENT

PART 1: GENERAL

1.01. RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including Special Requirements General Conditions and Division 1 Specifications Sections, apply to this Section.
- B. All excavation under this contract is unclassified and all material encountered, regardless of type and hardness, shall be removed to required lines and depths. Contractor will receive no extra payment because of subsurface conditions encountered.

1.02. SECTION INCLUDES:

- A. The work of this section includes but is not limited to the following: Work under this heading shall include furnishing of all materials, labor equipment, etc., to provide a finished and complete job in place. The items described herein, indicated on the drawings or normally and reasonably required, will be provided: permeable bituminous pavement test strip, water transmission rate testing, permeable bituminous pavement and permeable aggregate base.

1.03. RELATED SECTIONS:

- A. Refer to Section 01010 for Base Bids related to this section.

1.04. REGULATORY REQUIREMENTS:

- A. Conform to all applicable sections of PADOT Specifications Publication 408, 1994 Edition for paving work.
- B. Perform work in accordance with OSHA, state, and local authorities having jurisdiction.
- C. Application and Permits: The Contractor shall notify local authorities in the time required by regulations and shall obtain any permits or approvals necessary and provide copies in triplicate to the authorized University Point of Contact prior to start of work. All costs for permits are to be borne by the Contractor.

1.05. SITE CONDITIONS:

- A. Weather Limitations: Do not apply when base is wet or contains an excess of moisture. Construct asphalt concrete pavements when atmospheric temperature is above 30 deg F

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and when base is dry. Base course may be placed when air temperature is above 30 deg F and rising.

Grade Control: Establish and maintain required lines and elevations. See Section 3.05.

- B. Protection: Immediately after placement, protect pavement as required by the University to include but not limited to installation of a temporary barrier at the parking lot entrance to preclude access by vehicles to the parking lot during the curing process.

1.06 REQUIRED SUBMITTALS:

- A. Materials Safety Data Sheets for all material used and/or incorporated in the job. If any materials are hazardous, provide plan for mitigating the hazard and protecting both the workers and the public.
- B. Materials Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.
 - 1. Permeable wearing course
 - 2. Permeable base course
 - 3. Open graded stone (OGS)
 - 4. Joint and crack sealant: catalog cut
 - 5. Paint: catalog cut

1.07 QUALITY ASSURANCE:

- A. Paving System Installer Qualifications: Installer shall have a minimum of five years specializing in the installation of asphaltic pavement.
- B. Permeable Bituminous Pavement Test Strip: Prior to any permeable bituminous pavement work, the Contractor shall construct an above grade pavement test strip; including the permeable aggregate base, to verify the stability and constructability of the complete pavement section and to determine the rate that water passes through each component section of the pavement as well as the completed pavement section. The test strip may be the work site or may be an off-site location provided by the Contractor as acceptable to the Owner. All work to construct and test the test strip shall be performed by the Contractor and the Contractor shall bear all associated costs of construction and testing. The permeable bituminous pavement test strip shall be a minimum of 12 feet wide and 40 feet long and shall be the complete pavement section as detailed and specified including all aggregate and bituminous layers.

The Contractor shall conduct the required laboratory tests and water transmission rate tests specified below after construction of the aggregate base course(s) and after construction of the bituminous base course. (It is suggested that each of the two permeable bituminous mix lifts be prepared and tested at the laboratory prior to the

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construction of the field test strip). If the tests do not meet the specified requirements, the Contractor shall make necessary changes in the mix and/or construction procedures, as approved, and another test strip constructed and tested. This procedure will be repeated until a satisfactory test strip is achieved.

When the aggregate base course has been accepted, the Contractor shall construct the permeable bituminous base course on it. When the permeable bituminous base course has been accepted, the Contractor shall construct the permeable bituminous wearing course on it. Laboratory and water transmission rate tests shall be performed on the course in the same manner as was required in the paragraph above. The final permeable bituminous base and wearing course mix design shall be approved on the basis of the tests made on the test strip site.

C. Laboratory Testing:

TESTS:

Aggregate Gradation Limits:	AASHTO No. T-27.
Asphalt Content, percent by Weight:	AASHTO No. T-245
Void Content, percent by Volume:	AASHTO T-245
Marshall Flow and Marshall Stability:	AASHTO T-245
Resistance to Stripping by Water:	ASTM D1664

TEST REQUIREMENTS:

Marshall Stability (both mixes):	800 minimum
Marshall Flow:	between 8 and 20
Void content (base):	between 15% and 20%
Void content (wearing):	between 12% and 17%
Estimated Coated:	95% or above

D. Water Transmission Rate Testing: Water transmission rate testing shall be performed at the test strip and also as the pavement is constructed at the site.

The testing procedures shall be as follows: A watertight open-ended steel cylinder approximately 20 inches in height with a diameter of 10 inches and with a 4-inch plate flange welded level with the bottom shall be used. A compressible foam rubber gasket approximately one inch thick shall be affixed to the bottom of the plate flange such that when pressure is applied to the barrel resting on slightly uneven porous material surface, as water tight seal can be achieved. With sufficient pressure applied to establish water tightness, the cylinder shall be rapidly filled with five (5) gallons of water. The time required for the cylinder to completely empty shall be recorded. The time interval required for the water to pass into the porous surface tested shall serve as the basis of acceptability for the vertical water transmission rates specified for the various pavement elements in place as specified elsewhere. The time shall not exceed 40 seconds.

Transmission rate tests shall be performed as follows:

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Test Strip Site: Each component layer of the aggregate and bituminous base courses and the bituminous wearing course shall be tested at least once for each aggregate layer and each change in bituminous mix design.

Parking Area Pavement: One test for each 30 lineal feet along the parking area for each component layer of aggregate and bituminous courses. Any questionable areas shall be retested as ordered by the Owner's representative at the Contractor's cost. Areas failing to transmit water vertically at the required rate shall be removed and replaced at the Contractor's cost.

PART 2: PRODUCTS

2.01. **SOURCE QUALITY CONTROL:** Maintain the quality of the work by using products of qualified producers and qualified plant operating personnel. Use products of a bituminous concrete bulk producer regularly engaged in production of hot-mix, hot-laid bituminous concrete conforming to the standards referenced herein and similarly with cement concrete production. Use materials conforming with requirements PDT Specifications Publication 408, 1994 edition, as supplemented.

2.02. **OPEN GRADED STONE:** In accordance with Sections of PADOT Publication 408, current edition, compacted to 98%.

2.03. **PERMEABLE BITUMINOUS BASE COURSE:**

Asphalt Cement: Grade AC20 or AC30 complying with ASTM Standard D3881.

Aggregate Mix: Aggregate mix for permeable bituminous base shall be Type A crushed angular stone confirming to the following gradation limits.

Permeable Bituminous Base Course:

Sieve Size	Percent Passing by Weight
1"	100
¾"	80-100
½"	55-90
3/8"	44-76
No. 4	8-40
No. 10	0-15
No. 200	0-3
Bitumen	3-4.5

The final permeable bituminous base course mix design shall be approved by the Owner's Representative on the basis of tests made on the test site.

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2.04. PERMEABLE BITUMINOUS WEARING COURSE:

Asphalt Cement: Grade AC20 or AC30 complying with ASTM Standard D3881.

Aggregate Mix: Aggregate mix for permeable bituminous base shall be Type A, crushed angular stone conforming to the following gradation limits:

Permeable Bituminous Wearing Course:

Sieve Size	Percent Passing by Weight
½"	100
3/8"	90-100
No. 4	30-50
No. 10	15-32
No. 200	0-3
Bitumen	4-5

The final permeable bituminous wearing course mix design shall be approved by the Owner's Representative on the basis of tests made on the test site.

2.05. JOINT AND CRACK SEALANT: Single component, hot-applied, resilient adhesive compound composed of asphalt, rubber extender oils, reinforcing fillers, and polymers suitable for sealing longitudinal, transverse, and shoulder joints in portland cement and asphaltic concrete highway pavements; salient characteristics: Meet requirements of ASTM D3405 and AASHTO M301, cone penetration 90 max, resilience 60% min, bond -20°F 50% ext. Pass 3 cycles, compatible with asphalt materials.

2.06. PAINT: Alkyd resin, suitable for marking traffic lanes on streets, highways, warehouses, and other areas where such marking is required; salient characteristics: Lead Free, VOC compliant, ready-mixed, fast drying, compatible with asphalt materials, weight per gallon at least 12 lbs., film thickness wet 12-15 mils, dry 6-8.5 mils, color: white for parking, yellow for restricted parking areas; as manufactured by: Duron, Inc., Beltsville, MD (301-937-4700) Duraclad Series 31, Coronado Paint Co., Edgewater, FL (904-428-6461) Product Line 71-101 Super Kote 5000, MA Bruder & Sons, Inc., Philadelphia, PA (610-353-5100) MAB Paints Zone Marking Traffic Paint, Code: 070 Line.

PART 3: EXECUTION

3.01. PLACEMENT AND COMPACTION OF POROUS AGGREGATE BASE: Place and Compact open graded stone (OGS) porous aggregate base course to 98% compaction in accordance with applicable requirements of the Pennsylvania Department of Transportation Specifications, Publication 408, current edition, except as modified herein or approved as a result of the test strip results. No tack course shall be applied to the aggregate base.

3.02. PLACEMENT AND COMPACTION OF POROUS BITUMINOUS PAVEMENT: Place

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And compact porous bituminous paving in accordance with applicable requirements of the Pennsylvania Department of Transportation Specifications, Publication 408, current edition, section 401- Plant- Mixed Bituminous Concrete Courses, except as modified herein or approved as a result of the test strip results.

- 3.03. The permeable bituminous mixture shall be placed at a mix temperature between 260 degrees F and 290 degrees F for air and ground temperatures above 40 degrees F. For lower ambient temperatures, it shall be placed at a mix temperature of 290 degrees F to 325 degrees F.
- 3.04. Bituminous base course shall be compacted according to PADOT specifications, rolling twice non-vibratory with a 10 ton roller and then rolling twice non-vibratory with 5 ton roller. The bituminous wearing course shall be compacted according to PADOT specifications, rolling twice non-vibratory with a 10 ton roller and then rolling twice vibratory with a 10 ton roller. Plate compactors shall be used to remove surface irregularities.
- 3.05. Bituminous wearing and base courses shall be placed in widths of not less than 12 feet. No tack coat shall be used between lifts of permeable bituminous pavement courses. The surface of the base course shall be clean and dry before applying the wearing course. The final elevation of the wearing shall not deviate from the required elevation more than ¼ inch plus or minus. Surface smoothness shall not deviate more than ¼ inch in 10 feet for the base course and 3/16 inch in 10 feet for the wearing courses in any direction.
- 3.06. Hand compaction shall be used only where roller compaction is impossible and then shall be hot hand tampers. Shortly after compaction, the permeability of the system shall be checked as required under water transmission rate testing above.
- 3.07. Finished permeable bituminous pavement shall be smooth and uniform, and at the proper elevation.
- 3.08. Protect finished permeable bituminous surfaces from damage and clean up and remove any spilled or excess material generated under this section and dispose of legally off site.
- 3.09. Use tack coat where the permeable pavement meets existing paving.
- 3.10. Lay out and verify with the University four (4) inch wide white and yellow vehicular parking lines on permeable paving as indicated on the drawing. Sweep and clean surface to eliminate loose material and dust. Apply specified paint with mechanical equipment to produce uniform straight edges at manufacturer's recommended rates to achieve minimum 6-8.5 mil dry thickness.
- 3.11 The University will assume responsibility for reseeding around the edges of the paving surface.

--End of Section--