SPECIAL CONDITIONS SPECIFICATIONS

HIGH DENSITY MINERAL BOND

Part 1 GENERAL

1.1 SECTION INCLUDES

A. Mineral aggregate and asphalt binder surface treatment installed as a High Density Mineral Bond over a roadway surface.

1.2 REFERENCES

A. AASHTO R 9: Standard Recommended Practice for Acceptance Sampling Plans for Highway Construction

B. ANSI B74.8: Procedure to Ball Mill Test for Friability of Abrasive Grain

C. ASTM C 128: Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate

D. ASTM C 170: Standard Test Method for Compressive Strength of Dimension Stone

E. ASTM C 1326: Standard Test Method for Knoop Indentation Hardness of Advanced Ceramics

F. ASTM D 1644: Standard Test Method for Nonvolatile Content (Solids by Weight)

G. ASTM D 2172: Standard Test Methods for Quantitative Extraction of Bitumen From Bituminous Paving Mixtures

H. ASTM D 2196: Standard Test Method for Rheological Properties of Non-Newtonian materials by Rotational (Brookfield type) Viscometer

I. ASTM D 2486: Standard Test Method for determining wear resistance in cycles

J. ASTM D 2939: Standard Test Method for Emulsified Bitumens used as Protective Coatings

K. ASTM D 3960: Standard Practice for Determining Volatile Organic Compound Content of Paints and Related Coatings

L. ASTM E 70: Standard Test Method for pH of Aqueous solutions with the Glass Electrode

M. AASHTO T 59: Standard Test Method for Testing Emulsified Asphalts

N. AASHTO T 111: Standard Test Method for Mineral Matter or Ash in Asphalt Materials

1.3 DEFINITIONS

A. Lot – Lot size is one lane mile of installed HDMB.

1.4 SUBMITTALS

A. Results of wear resistance test current within one calendar year.

B. Traffic control and notification strategy.

C. Mix Design: 10 days prior to use.

D. Equipment: List of construction equipment to be used.

E. Certification from emulsion manufacturer stating the base emulsion meets the requirements of the High Density Mineral Bond base emulsion in section 2.1 of this specification.

F. Certification from the manufacturer stating the completed High Density Mineral Bond meets the requirements of section 2.3 of this specification.

G. Warranty.

1.5 QUALITY ASSURANCE

A. Contractor has successfully completed at least five (5) projects of similar size and nature, using the same mix design as described in section 2. Provide a list of five (5) projects which used the mix design in section 2 and have demonstrated a five year minimum proven performance on a bituminous surface. Acceptable performance after five year period is no less than 70% residual coverage in the treated surface area.

> An alternative to the contractor required experience is an HDMB supplier representative providing support and inspection of the project. The supplier representative must have the same experience required of the contractor with five projects of similar size and nature using the mix design specified in section 2 that have a five-year performance history.

B. Foreman of the crew has completed at least three (3) projects of similar size and nature.

C. Do not change the source of the emulsified asphalt or aggregate without supporting changes in the mix design.

D. Reject asphalt emulsion that does not meet requirements of this section.

E. Repair defective areas subject to Section 1.9

1.6 WEATHER

A. Temperature:
1. Surface treatment material may be applied when air and roadbed temperatures in the shade are 45° Fahrenheit (°F) and rising.
2. Do not apply surface treatment material if pavement or air temperature is below 45° Fahrenheit (°F) and falling, if the finished product will freeze before 48 hours, or as per recommendation of the manufacturer.

B. Moisture: Do not apply surface treatment material during rain or unsuitable weather.

1.7 NOTICE

A. Follow Laws and Regulations concerning when and to whom notices are to be given. Give written notices at least two days prior to applying surface treatment material.

B. Indicate application time and when the surface can be used. Include a map signifying the specific area to be closed providing detailed directions.

C. Provide a minimum of two contacts that represent the Contractor with phone numbers which can be reached at any time during the project.

D. Should work not occur on specified day, impacted residents will be notified of updated schedule.

1.8 ACCEPTANCE

A. General:
1. Acceptance is by Lot.
2. If non-complying material has been installed and no price for the material is specified, apply price adjustment against cost of work requiring complying material as part of its installation.
3. Opening HDMB to vehicular traffic does not constitute acceptance.
4. Observation of Contractor's field quality control testing does not constitute acceptance. Such testing; however, may be used by Engineer for acceptance.

B. Surface Treatment Material:
1. Paving Asphalt: Acceptance is not specified in this Section.

2. Aggregate Source: Verify suitability of aggregated source.
3. Mixture, Ready to Install: Lot size is one lane mile of installed HDMB.

C. Placement
1. Lot size is one lane mile. Sub-lot size is 0.1 lane mile.
2. Mat Appearance:
   a. No runoff onto concrete curbs and shoulders
   b. No Light spots

D. Price Adjustment: Mat appearance defects may be accepted if a 2.5 percent price reduction is applied against the Lot for each condition not met. Maximum price reduction for the Lot is 5 percent. Engineer may waive price adjustment if Contractor corrects deficiencies at no additional cost to the department.

1.9 WARRANTY

A. The surface treatment material must carry a warranty from both the Contractor and the manufacturer for a period of five (5) years when applied to pavement in appropriate condition. Acceptable performance after 5 years is defined as, no less than 70% residual inter-aggregate coverage in the treated surface area. The warranty includes coverage for peeling and delamination. Mechanical disturbances by construction equipment, snow plow chatter, studded tires, etc. are excluded from warranty.

PART 2 MATERIAL

2.1 HIGH DENSITY MINERAL BOND BASE EMULSIFIED ASPHALT

A. Non-ionic base emulsion used in High Density Mineral Bond, at 77 Deg. F., must meet the requirements of Table 1 below. Base emulsion is defined as the emulsion immediately after being milled and prior to anything being added.

Table 1

Non-Ionic Emulsion – Emulsifier Type: Inorganic*			
Criteria	**ASTM/AASHTO METHOD**	**Specification**	**Unit**
Initial Brookfield Viscosity at 77 °F (RV-5, 20 rpm)	D2196	11,000 – 20,000	cPs
pH	E70	5.0 – 7.5	pH
Density	T59	8.5 – 9.0	lbs/gal
Solids Content	T59	50.0 - 54.0	%, by weight
Ash Content of emulsion	T111	4.0 – 6.0	%, by weight
*Inorganic is defined as a non-carbon-based emulsifier			

2.2 AGGREGATE

A. Slate:

Table 2

Slate			
Criteria	**ASTM Method**	**Specification**	**Unit**
Specific gravity	C128	>2.6	--
Compression	C170	*11,000 min*	psi

B. Refined Corundum

Table 3

Refined Corundum		
Criteria	**ASTM Method**	**Specification**
Specific Gravity	C128	> 3.9
Knoop 100 Hardness	C1326	> 2,000
Ball Mill Fiability	ANSI B74.8	50 (14 grit)

2.3 COMPLETED HIGH DENSITY MINERAL BOND MIX DESIGN

A. Completed High Density Mineral Bond material, prior to being loaded for install must meet the requirements in Table 4 below:

Table 4

Criterion	**ASTM/AASHTO Method**	**Specification**	**Unit**
Asphalt Content	D2172[1]	17.0 – 20.0	%, by weight
Solids Content	D1644	55.0 – 63.0	%, by weight
Initial Brookfield Viscosity at 77°F (RV-4, 20 rpm)	D2196	5,500 – 15,000	cPs
Ash Content of wet mix	C2939	> 38.0	%, by weight
Ash Content of Solids	T111[2]	> 63.0	%, by weight
Density	T59	> 11.0	lbs/gal
pH	E70	6.0 – 8.0	
Total Inorganic Aggregate Content	T111[3]	> 34.0	%, by weight
Total Sand Content		< 6.0	%, by weight
Maximum VOC	D3960	< 5.0	g/l
Resistance to Re-emulsification	D2939	No Re-emulsification	--
Wear Resistance	D2486 Modified[4]	< 4.0 %	% loss, by weight

1. Report Asphalt Content of Mixture prior to being loaded for install as % Solids minus % Ash.
2. Ash Content as a percentage of Solids Content.
3. Ash Content of completed HDMB minus Ash Content of HDMB Base Non-Ionic Emulsion. Total Inorganic Aggregate Content defined as slate, refined corundum, and sand.
4. ASTM D2486 (Modified): Prepare samples at 48 Wet Mils on glass panel. Dry at 77 °F for 3 days. Immerse in water for 24 hours at 77 °F. Test scrub resistance with 1,000 gram brass brush for 12,000 cycles. Report % of dry film lost.

Part 3 Execution

3.1 CONSTRUCTION EQUIPMENT

A. Paver: Continuous flow mixing unit.

1. Capable of applying at least 15,000 square yards of material per day.

2. Equipped with full sweep helical mixer to assure proper suspension of fine aggregates.

3.2 PREPARATION

A. Surface Repair:

1. Severely raveled or porous pavements may require tack coat.
2. Asphalt concrete inlay may be required in rut deformations.
3. Patch any holes, raveled areas, and low areas with asphalt concrete.

Such repairs will either be completed by municipal staff or included as a line item or project.

B. Cleaning:

1. Remove loose material, mud spots, sand, dust, oil, vegetation and other objectionable material.
2. Do not flush water over cracks or apply pressurized water to cracked pavement.
3. Clean the surface prior to installation.

3.3 PROTECTION

A. Implement a traffic control strategy.

B. Protect trees, plants, and other ground cover from damage.

C. Mask off end of streets and intersection to provide straight lines:

1. Make straight lines along lip of gutters and shoulders. Keep same thickness in these areas. No runoff on these areas will be permitted.

D. Protect curb, gutter, and sidewalks from overcoat.

E. Protect surface treatment materials from traffic until it has cured.

3.4 APPLICATION

A. Application Rate: Two separate application coats are required. The total application rate must be a minimum of 0.36 gallons per square yard. No single application coat shall be below 0.16 gallons per square yard. The first application must be thoroughly dry and free of any damp areas before the second application begins.

B Spreading:

1. Keep constant delivery rate of material per square yard of surface.
2. Do not reduce application rate along edges or around manhole covers.
3. Apply both applications right to the edge of the pavement. Do not back away from curbs, manhole covers, and edges on either application.

3.5 AFTER APPLICATION

A. Leave no streaks caused by plugged nozzle or improper spray bar height.

B. Leave no holes, bare spots, or cracks.

C. Expose and clean Manholes, valve boxes, inlets and other service entrances and Street Fixtures.

D. Raise reflective tabs that were covered over.

E. Do not permit traffic on product until surface has cured.

3.6 FIELD QUALITY CONTROL

A. Testing: If density tests (AASHTO T59) show non-compliance, remove the product and halt operations until new material arrives and is shown to be in compliance. Measure the total amounts of material installed, and verify it meets the application rate.

B. Protect surface treatment material from traffic until it has cured.

3.7 REPAIR

A. Remove overcoat from curb and gutter, sidewalk, guard rails and guide posts at no additional cost to the Department.

B. Remove surface treatment material from Street Fixtures

C. Make correction lines straight. Provide good appearance.

D. Leave no bare spots in final surface.

E. Repair collateral damage caused by construction.

3.8 MEASUREMENT & PAYMENT

A. Measurement will be made of the number of square yards of HDMB completed in place.

B. Payment will be made under the High Density Mineral Bond (HDMB) line item and paid per square yard (SY) completed in place.

END OF SECTION