

***** INVITATION TO BIDDERS *****

NOTICE IS HEREBY GIVEN THAT THE BOARD OF PUBLIC WORKS OF THE CITY OF BLOOMINGTON, INDIANA WILL RECEIVE SEALED BIDS FOR THE FOLLOWING:

BITUMINOUS MATERIALS (per INDOT specification included for reference)

Separate sealed bids(s) for the above product(s), will be received in the Office of the Department of Public Works in the Showers Center, 401 N. Morton Street, Bloomington, Indiana, at or before 10:00 a.m. (local time) on Tuesday, April 15, 2014. Any bids received after this designated time will be returned unopened. Sealed bids will be opened and read aloud at the Board of Public Works Meeting on Tuesday, April 22, 2014, at 5:30 p.m. (local time) in the Council Chambers in the Showers Center. The Bids will be reviewed, and the award may be made at a subsequent Board of Public Works meeting

Specifications and all necessary bid forms may be obtained at the following location;

http://bloomington.in.gov/sections/viewSection.php?section_id=537

Each bidder shall file with his or her sealed proposal a bond equal to 5 percent of the bid, and all documents required by the City of Bloomington and the State of Indiana, as set forth in the Instructions to Bidders.

Each bidder for contracts over \$10,000 must submit their written Affirmative Action Plan to the City **AT LEAST TWENTY-FOUR HOURS BEFORE THE BIDDING DEADLINE**. Each bidder must insure that all employees and applicants for employment are not discriminated against because of any race, religion, color, sex, national origin, ancestry, or handicap. All the protected classes must be included in your Affirmative Action Plan for it to be acceptable. In addition to other requirements, your plan **MUST** include a workforce breakdown, an internal grievance procedure, for implementation of the Plan, specific plans for recruitment from minorities, equal access to training programs, a non-retaliation statement, and an explanation of your methods of communicating the operations of your Affirmative Action Plan to your employees and prospective recruits.

You should submit your plan **SEPARATELY** from the sealed bid. The Contract Compliance Officer for the City of Bloomington is Barbara McKinney. **EACH BIDDER MUST REVIEW HIS OR HER AFFIRMATIVE ACTION PLAN WITH BARBARA MCKINNEY IN ADVANCE OF THE BIDDING DEADLINE**. Her telephone number is (812) 349-3429. Her office hours are from 8:00 a.m. to 5:00 p.m. Monday through Friday. **EACH BIDDER'S WORKFORCE BREAKDOWN FIGURES MUST BE UPDATED EVERY SIX MONTHS**. BIDDERS WHO FAIL TO SUBMIT ACCEPTABLE PLANS ARE SUBJECT TO DISQUALIFICATION.

The Board of Public Works reserves the right to waive any informality and to accept or reject any or all bids submitted.

Bids may be held by the Board of Works for a period not-to-exceed sixty (60) days, from the date of the opening of bids for the purpose of reviewing the bids and investigating the qualifications of the bidder prior to awarding the contract.

BOARD OF PUBLIC WORKS
CITY OF BLOOMINGTON
Charlotte Zietlow, President

INSTRUCTION TO BIDDERS
Hot Asphaltic Concrete
Mixed Winter Stockpile Material

1. Bidders shall examine and satisfy all conditions and qualifications set forth in the Bid package. Bidders shall explain and fully describe any and all exceptions to the bid specifications. Please note that the taking of an exception may result in the bid being deemed non-responsive if it is determined by the Board of Public Works to be material variance from the specifications.
2. Bidders shall list any and all sub-contractors on the bid summary.
3. Specify the location of the plant(s) for all items to be picked up by City trucks.
4. A responsible Bidder shall have the financial resources, technical qualifications, experience, organization and facilities, adequate to carry out this agreement, or the demonstrated ability to obtain these. A responsible Bidder shall also have the resources to meet the completion schedule, if applicable, and to demonstrate a satisfactory performance record for completion of contracts.
5. All bids shall be held for sixty (60) calendar days after bid opening.
6. The term of this bid is from the date of award by the Board of Public Works through January 31, 2015. The contract to supply materials or supplies may be renewed beyond the expiration date to another term, not to exceed one additional year, by agreement of both the City and the Bidder.
7. The Bidder certifies to the City that he/she possess or can provide the necessary equipment, facilities and personnel to fulfill the terms of the bid at time of submission, contract award and all times thereafter. Should the Bidder be unable to supply the necessary material needed by the City, or to supply the City within an acceptable timeframe, to be determined by the City, the City may select to obtain said necessary material from another source during those times.
8. No minimum or maximum number of tons or cubic yards of material to be purchased under the agreement is stated or implied herein. The amounts listed in the specifications are estimated maximum quantities.
9. The bases for bid evaluation shall include, but not be limited to, such factors as reliability, life cycle costs, past performance, conveniences to the City and bid prices.
10. Bid prices received from the bidder shall be firm for the term of the annual contractual supply agreement and be available for purchases by all City of Bloomington departments and available for contractors performing work for the City of Bloomington on projects awarded by the Board of Public Works.

11. The City of Bloomington is interested in a trial usage of 'Glassphalt' and may work with awarded supplier to determine the possibility of use of alternative aggregate mixture including 10% crushed glass. Should this trial usage not be an available option with the awarded supplier, the City of Bloomington reserves the right to coordinate this specific effort with other suppliers. This effort will not effect the awarding of asphalt material for 2014.
12. Please acknowledge whether you are willing to work with the City on a glassphalt pilot project.
13. The City reserves the right to reject any and all bids and to waive to the extent permitted by law any of the terms, conditions and provisions contained in the Invitation for Bids, any informality, irregularity of omission in any bid provided that such waiver shall be, in the discretion of the City, to the advantage of the City and its best interest.
14. The Board of Public Works shall award the agreement to the lowest responsive and responsible Bidder.

BID, OFFER OR PROPOSAL FOR SALE OR LEASE OF MATERIALS

BITUMINOUS MATERIALS

(PLEASE TYPE OR PRINT MATERIAL NAME)

(DATE)

- 1. Governmental Unit: City of Bloomington Board of Public Works
- 2. County: Monroe
- 3. Bidder (Firm): _____
 Address: _____
 City/State/Zip Code: _____
- 4. Telephone Number: _____
- 5. Agent of Bidder (if applicable): _____

Pursuant to notices given, the undersigned offers bid(s) City of Bloomington Board of Public Works. In Accordance with the following attachment(s) which specify the class or item number or description, quantity, unit price and total amount.

The Contract will be awarded by classes or items, in accordance with specifications. Any changes or alterations in the items specified will render such bid void as to that class or item. Bidder promises that he/she has not offered nor received a less price than that price stated in his/her bid for the materials included in said bid. Bidder further agrees that he/she will not withdraw his/her bid from the office in which it is filed. A certified check or bond will be filed with each bid if required, and liability for breach shall be enforceable upon the contract, the bond or certified check or both as case may be.

SIGNATURE OF BIDDER OR AGENT

BID OFFER OR PROPOSAL

Attach separate sheet listing each item bid based on specifications published by governing body. The following is an example of this bid format:

CLASS OR ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT

NON-COLLUSION AFFIDAVIT

STATE OF INDIANA)
) SS:
_____ COUNTY)

The undersigned bidder or agent, being duly sworn on oath, says that he/she has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership representative represented by him/her, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to induce anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He/She further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such sale.

BIDDER (FIRM)

SIGNATURE OF BIDDER OR AGENT

Subscribed and sworn to me this _____ day of _____ 20 _____

My Commission Expires: _____ Notary Public
County of Residence: _____

ACCEPTANCE

There now being sufficient unobligated appropriated funds available, the contracting authority of City of Bloomington Board of Public Works hereby accepts the terms of the attached bid for classes or items numbered and promises to pay the undersigned bidder upon delivery of the price quoted for the materials stipulated in said bid.

BOARD OF PUBLIC WORKS MEMBERS:

JAMES MCNAMARA, MEMBER

CHARLOTTE ZIETLOW, PRESIDENT

DR. FRANK N. HRISOMALOS, MEMBER

BID, OFFER OR PROPOSAL FOR SALE OR LEASE OF MATERIALS

BITUMINOUS MATERIALS

	CLASS OR ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
1.	MIXED WINTER STOCKPILE COLD MIX (B.C.A.)	+/- 200	TONS	BITUMINOUS MATERIAL COLD MIX*		
2.	HOT ASPHALTIC SURFACE MIX #9 OR #11	+/- 20,000	TONS	BITUMINOUS MATERIAL HOT MIX*		
3.	HOT ASPHALTIC INTERMEDIATE MIX #8 OR #9	+/- 200	TONS	BITUMINOUS MATERIAL HOT MIX*		
4.	HOT ASPHALTIC BASE MIX #5	+/- 200	TONS	BITUMINOUS MATERIAL HOT MIX*		

*Per INDOT Specifications. Section 400 attached for reference. Other sections may be applicable for conformance to complete specifications. It is the responsibility of the supplier to ensure they familiarize and understand all requirements for material bidding, and disqualification may occur at the discretion of the Board of Public Works should a supplier or their material not meet the requirements.



**City of Bloomington
Human Rights Commission**

2014

RE: Affirmative Action and Living Wage Ordinance

To Prospective Bidders:

Affirmative Action: All bidders with the City of Bloomington for projects in excess of \$10,000.00 must submit an affirmative action plan to my office. This plan must insure that applicants are employed and that employees are treated in a manner that provides equal employment opportunity and tends to eliminate inequality based upon race, religion, color, sex, national origin, ancestry or disability.

In addition, pursuant to the **Responsible Bidders Ordinance**, all bidders with the City of Bloomington for public work bids of \$150,000 or more must include two additional protected categories in their affirmative action plan: sexual orientation and gender identity.

Even if your company already has a plan on file with the City, you must check with me to make sure that it complies with our current requirements. If you already have a plan, but it does not cover all of the City's current requirements, you may submit a separate supplement with your plan to fill any gaps.

You must submit your written affirmative action plan (or supplement) to me at least twenty-four hours before the bid deadline. You must submit your plan to me separately from your bid. The twenty-four hours will give me sufficient time to review your and the other bidders' plans. I recommend that you submit your affirmative action plan to me earlier, if possible, so that you and I will have time to work out any problems that may be in your plan. Bidders who fail to submit acceptable plans by the deadline are subject to disqualification.

I strongly advise you to confirm with me that I have received your plan and that it meets our requirements well before the bid deadline. We will make every effort to work with you to clear up problems. But it remains your responsibility to confirm that I received your plan and that it complies with our requirements. If you fail to confirm that I received and approved your plan, you risk losing your eligibility to bid. We will be glad to provide a receipt upon request. Please let us know if you want a receipt when you submit your plan.

You must insure that all the protected classes listed above are included in your plan. In addition to other requirements, your plan **MUST** include a workforce breakdown, an internal grievance procedure, a non-retaliation statement, designation of a person by name or position who is responsible for implementing the plan, applicability to both applicants and employees,

recruitment of minorities, equal access to training programs, and an explanation of your methods of communicating the operations of your affirmative action plan to your employees and prospective applicants.

Accompanying this letter you will find the following materials:

- (1) A workforce breakdown form. You MUST submit a workforce breakdown (sometimes called a "utilization report") with your Affirmative Action plan. This form is provided for your convenience. If you already have a current form you have completed for another jurisdiction that includes the same type of information, you may substitute a copy of that form instead of using our form. Your workforce breakdown figures must be updated every six months. Even if you already have an acceptable affirmative action plan on file with my office, you should submit a new workforce breakdown each time you bid for a City Contract, to be sure we have up-to-date figures.
- (2) An affirmative action plan checklist. I will use this checklist to review your affirmative action plan. If you compare your plan with this list, you should be able to tell whether your plan fulfills the City's requirements. If you omit any of the elements on the checklist, your plan will not be approved.
- (3) Two sample affirmative action plans: one for bidders covered by the Responsible Bidders Ordinance and one for all other bidders. These may be useful if your company has never designed an affirmative action plan before. Feel free to adopt one of these plans as your own or to amend them to meet your needs.

Additional materials, such as the City of Bloomington's Contract Compliance Regulations, are available from my office upon request.

Living Wage: Also, please be aware that you may be required to comply with the Bloomington Living Wage Ordinance. Whether the LWO applies to your project depends upon the size and type of your project and the number of people you employ. If you have questions about the applicability of the LWO, click on the LWO flow chart at www.bloomington.in.gov/livingwage or call me. For 2014, the living wage for covered employees is \$12.06 an hour.

If you have any questions, contact me at (812) 349-3429 or e-mail me at mckinneb@bloomington.in.gov. My office hours are Monday through Friday, 8-5. Thank you.

Barbara E. McKinney, Human Rights Director/Contract Compliance Officer

BLOOMINGTON HUMAN RIGHTS COMMISSION
Model Affirmative Action Plan
for
Bidders Covered by Responsible Bidder Ordinance

Policy Statement

_____, Inc., declares its policy to provide equal opportunity in employment, training and advancement, and to administer its employment practices without regard to race, color, religion, sex, national origin, ancestry, disability, sexual orientation or gender identity. Our policy of nondiscrimination will prevail throughout every aspect of our employment practices, including recruitment, hiring, training and all other terms and conditions of employment. We shall implement an affirmative action plan to make it widely known that equal employment opportunities are available on the basis of individual merit. We shall survey and analyze our employment workforce annually to determine what steps, if any, are needed to conform effectively with this equal employment policy.

Responsible Officer

Mr. or Ms. _____ (or the _____ officer) is the equal employment opportunity officer for our company and is responsible for implementing this affirmative action policy.

Publication of Policy

Our employees will be made aware of our commitment to affirmative action through the following procedures:

- posting notices on employee bulletin boards,
- including our policy statement and plan in our personnel manual,
- regularly sending out notice of our policy in paycheck envelopes,
- and training supervisors to recognize discriminatory practices.

We will make potential employees aware of our policy through the following procedures:

- including the words "Equal Opportunity Employer" in all of our advertisements and notices for job openings,
- notifying employment agencies about our commitment, and
- sending notice of our policy to unions.

Implementing Our Policy

Our affirmative action plan will be implemented by widening our recruitment sources. We shall advertise in newspapers and other media that reach people in protected classes. We shall send job notices to schools with large percentages of students in the protected classes and to local groups that serve these classes.

We shall examine our hiring practices periodically to insure that we consider only job-related qualifications in filling our positions. We shall discard irrelevant educational requirements and unnecessary physical requirements. We shall retain only job-related questions on our employment application.

We shall keep affirmative action information on each applicant, but separate from his or her application. We shall keep records on our hiring decisions to evaluate the success of our affirmative action measures. We shall decide placement, duties, benefits, wages, training prospects, promotions, layoffs and terminations without regard to race, sex, religion, color, national origin, ancestry, disability, sexual orientation or gender identity.

Grievance Procedure

If an employee feels he or she has been discriminated against on the basis of race, sex, religion, color, national origin, ancestry, disability, sexual orientation or gender identity he or she may bring the complaint to his or her immediate supervisor. If the complaint is not resolved readily at that level, he or she may submit it to _____ (personnel officer, corporate president, other) who will make a final decision on its validity. This grievance process does not preclude his or her complaining to local, state or federal civil rights agencies. We will not retaliate against an employee or applicant for voicing a grievance or for filing a complaint with the appropriate agency.

Our current workforce breakdown is shown on the attached form.

Corporate President

Date

BLOOMINGTON HUMAN RIGHTS COMMISSION

MODEL AFFIRMATIVE ACTION PLAN

POLICY STATEMENT

_____, Inc., declares its policy to provide equal opportunity in employment, training and advancement, and to administer its employment practices without regard to race, color, religion, sex, national origin, ancestry or disability. Our policy of non-discrimination will prevail throughout every aspect of our employment practices, including recruitment, hiring, training and all other terms and conditions of employment. We shall implement an affirmative action plan to make it widely known that equal employment opportunities are available on the basis of individual merit. We shall survey and analyze our employment workforce annually to determine what steps, if any, are needed to conform effectively with this equal employment policy.

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IMPLEMENTING OUR POLICY

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We shall examine our hiring practices periodically to insure that we consider only job-related qualifications in filling our positions. We shall discard irrelevant educational requirements and unnecessary physical requirements. We shall retain only job-related questions on our employment application.

We shall keep affirmative action information on each applicant, but separate from his or her application. We shall keep records on our hiring decisions to evaluate the success of our affirmative action measures. We shall decide placement, duties, benefits, wages, training prospects, promotions, layoffs and terminations without regard to race, sex, religion, color, national origin, ancestry, or disability.

GRIEVANCE PROCEEDURE

If an employee feels he or she has been discriminated against on the basis of race, sex, religion, color, national origin, ancestry or disability he or she may bring the complaint to his or her immediate supervisor. If the complaint is not resolved readily at that level, he or she may submit it to _____ (personnel officer, corporate president, other) who will make a final decision on its validity. This grievance process does not preclude his or her complaining to local, state, or federal civil rights agencies. We will not retaliate against an employee or applicant for voicing a grievance or for filing a complaint with the appropriate agency.

Our current workforce breakdown is shown on the attached form.

Corporate President

Date

AFFIRMATIVE ACTION PLAN CHECKLIST

NOTE: This is **not** an Affirmative Action Plan

Effective Date: _____

Contractor: Plan MUST Include:	Yes	No	Comments:
Policy statement of equal employment opportunity	<input type="checkbox"/>	<input type="checkbox"/>	
Covers: Applicants for employment	<input type="checkbox"/>	<input type="checkbox"/>	
Employees	<input type="checkbox"/>	<input type="checkbox"/>	
On basis of: Race	<input type="checkbox"/>	<input type="checkbox"/>	
Religion	<input type="checkbox"/>	<input type="checkbox"/>	
Color	<input type="checkbox"/>	<input type="checkbox"/>	
Sex	<input type="checkbox"/>	<input type="checkbox"/>	
National Origin	<input type="checkbox"/>	<input type="checkbox"/>	
Ancestry	<input type="checkbox"/>	<input type="checkbox"/>	
Disability	<input type="checkbox"/>	<input type="checkbox"/>	
Sexual Orientation*	<input type="checkbox"/>	<input type="checkbox"/>	
Gender Identity*	<input type="checkbox"/>	<input type="checkbox"/>	
Designates a person responsible for implementation of the Plan	<input type="checkbox"/>	<input type="checkbox"/>	
Provides for communication of the policy:			
Within the Organization	<input type="checkbox"/>	<input type="checkbox"/>	
Outside the Organization (e.g., recruitment sources, unions)	<input type="checkbox"/>	<input type="checkbox"/>	
Applies to all terms and conditions of employment (e.g., hiring, placement, promotion, duties, wages, benefits, use of facilities, layoff, discipline, termination)	<input type="checkbox"/>	<input type="checkbox"/>	
Provision for: Recruitment from minority groups	<input type="checkbox"/>	<input type="checkbox"/>	
Provision for: Equal access to training programs	<input type="checkbox"/>	<input type="checkbox"/>	
Grievance Procedure	<input type="checkbox"/>	<input type="checkbox"/>	
Prohibits retaliation for filing grievances	<input type="checkbox"/>	<input type="checkbox"/>	
Workforce Breakdown (figures up to date within 6 months)	<input type="checkbox"/>	<input type="checkbox"/>	

Additional Contract Clause Attachment

The following clause is added and incorporated as an additional contract term.

Liquidated Damages. The City and Bidder recognize that time is of the essence in Bidder's providing Bituminous Materials for pick up by City vehicles at Bidder's site(s). The City will suffer financial loss if the bituminous materials are not available at the time needed by the City. The City and Bidder also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the materials are not available when needed by the City. Accordingly, instead of requiring any such proof, the City and Bidder agree that as liquidated damages for delay (but not as a penalty), Bidder shall pay the City the following amount each time that bituminous materials are not available for pick up by City vehicles at Bidder's site. If Bidder shall neglect, refuse, or fail to provide the bituminous materials when needed by the City, Bidder shall pay City the following amount for each instance in which Bidder neglects, refuses or fails to provide bituminous materials to the City.

<u>Item</u>	<u>Liquidated Damages</u>
Neglect, Refusal or Failure to Provide Bituminous Materials for Pick Up by City Vehicle(s) at Bidder's Site(s)	Any and all costs, above the Bidder's contract rate, for the City to purchase bituminous materials from another source

The City shall have the right to deduct the liquidated damages from any money in its hands, otherwise due, or to become due, to Bidder, or to initiate applicable dispute resolution procedures and recover liquidated damages for nonperformance of this Contract within the time stipulated.

Acceptance. Signed _____

Printed Name _____

Title _____

Date _____

**CITY OF BLOOMINGTON STREET DEPARTMENT
SPECIFICATIONS
ASPHALT FOR PATCHING AND RESURFACING BY CITY CREWS**

Bituminous Material – Cold Mix (B.C.A)

200 tons or less of Mixed Winter Stockpile Material
Picked up by City trucks at the plant

Bituminous Material – Hot Mix (H.A.C.)

20,000 tons or less of Hot Asphaltic Concrete Surface, #11 or #9
Picked up by City trucks at the plant

200 tons or less of Hot Asphaltic Concrete Intermediate, #8 or #9
Picked up by City trucks at the plant

200 tons or less of Hot Asphaltic Concrete Base, #5
Picked up by City trucks at the plant

It shall be the responsibility of the vendor to provide itemized monthly billings. Prices quoted shall hold for one year from the date of award by the Board of Public Works.

Specify the location of the plant(s) for all items to be picked up City trucks.

All material shall meet the specifications as described in the Current Indiana Department of Transportation Standard Specifications and any supplements to those specifications.

Supplier must agree to honor prices as quoted in bid to all City of Bloomington Departments and to invoice each department separately.

SECTION 400 – ASPHALT PAVEMENTS

SECTION 401 – QUALITY CONTROL/QUALITY ASSURANCE, QC/QA, HOT MIX ASPHALT, HMA, PAVEMENT

401.01 Description

This work shall consist of 1 or more courses of QC/QA HMA base, intermediate, or surface mixtures constructed on prepared foundations in accordance with 105.03.

401.02 Quality Control

10 The HMA shall be supplied from a certified HMA plant in accordance with ITM 583; Certified Hot Mix Asphalt Producer Program. The HMA shall be transported and placed according to a Quality Control Plan, QCP, prepared and submitted by the Contractor in accordance with ITM 803; Contractor Quality Control Plans for Hot Mix Asphalt Pavements. The QCP shall be submitted to the Engineer at least 15 days prior to commencing HMA paving operations.

MATERIALS

401.03 Materials

20 Materials shall be in accordance with the following:

Asphalt Materials	
PG Binder	902.01(a)
Coarse Aggregates.....	904
Base Mixtures – Class D or Higher	
Intermediate Mixtures – Class C or Higher	
*Surface Mixtures – Class B or Higher	
Fibers.....	AASHTO M 325
Fine Aggregates.....	904
*Surface aggregate requirements are listed in 904.03(d).	

30

401.04 Design Mix Formula

A design mix formula, DMF, shall be prepared in accordance with 401.05 and submitted in a format acceptable to the Engineer 1 week prior to use. The DMF shall state the maximum particle size in the mixture. The DMF shall state the calibration factor, test temperature, and absorption factors to be used for the determination of binder content using the ignition oven in accordance with ITM 586, the binder content by extraction in accordance with ITM 571, and a Mixture Adjustment Factor, MAF. The DMF shall state the source, type, and dosage rate of any stabilizing additives. Approval of the DMF will be based on the ESAL and mixture designation. A mixture number will be assigned by the Engineer. No mixture will be accepted until the DMF has been approved.

The ESAL category identified in the pay item correlates to the following ESAL ranges.

ESAL CATEGORY	ESAL
1	< 300,000
2	300,000 to < 3,000,000
3	3,000,000 to < 10,000,000
4	10,000,000 to < 30,000,000
5	≥ 30,000,000

50 QC/QA HMA may be produced as warm-mix asphalt, WMA, by using a water-injection foaming device for ESAL category 1, 2 and 3 mixtures. The DMF shall list the minimum plant discharge temperature for HMA and WMA as applicable to the mixture.

401.05 Volumetric Mix Design

The DMF shall be determined for each mixture from a volumetric mix design by a design laboratory selected from the Department's list of approved Mix Design Laboratories. A volumetric mixture shall be designed in accordance with AASHTO R 35 and the respective AASHTO reference as listed below.

60 Bulk Specific Gravity and Density of Compacted Asphalt
Mixtures Using Automatic Vacuum Sealing AASHTO T 331

The single percentage of aggregate passing each required sieve shall be within the limits of the following gradation tables:

Dense Graded, Mixture Designation – Control Point (Percent Passing)					
	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm
Sieve Size					
50.0 mm					
37.5 mm	100.0				
25.0 mm	90.0 - 100.0	100.0			
19.0 mm	< 90.0	90.0 - 100.0	100.0		
12.5 mm		< 90.0	90.0 - 100.0	100.0	100.0
9.5 mm			< 90.0	90.0 - 100.0	95.0 - 100.0
4.75 mm				< 90.0	90.0 - 100.0
2.36 mm	19.0 - 45.0	23.0 - 49.0	28.0 - 58.0	32.0 - 67.0*	
1.18 mm					30.0 - 60.0
600 μm					
300 μm					
75 μm	1.0 - 7.0	2.0 - 8.0	2.0 - 10.0	2.0 - 10.0	6.0 - 12.0
* The mix design gradation shall be less than or equal to the PCS control point for 9.5 mm category 4 and 5 surface mixtures.					

PCS Control Point for Mixture Designation (Percent Passing)					
Mixture Designation	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm
Primary Control Sieve	4.75 mm	4.75 mm	2.36 mm	2.36 mm	NA
PCS Control Point	40	47	39	47	NA

Open Graded, Mixture Designation – Control Point (Percent Passing)		
	OG19.0	OG25.0
Sieve Size		
37.5 mm		100.0
25.0 mm	100.0	70.0 – 98.0
19.0 mm	70.0 – 98.0	50.0 – 85.0
12.5 mm	40.0 – 68.0	28.0 – 62.0
9.5 mm	20.0 – 52.0	15.0 – 50.0
4.75 mm	10.0 – 30.0	6.0 – 30.0
2.36 mm	15.0 ± 8.0	15.0 ± 8.0
1.18 mm	2.0 – 18.0	2.0 – 18.0
600 µm	1.0 – 13.0	1.0 – 13.0
300 µm	0.0 – 10.0	0.0 – 10.0
150 µm	0.0 – 9.0	0.0 – 9.0
75 µm	0.0 – 8.0	0.0 – 8.0
% of Binder	> 3.0	> 3.0

70 Dust/Calculated Effective Binder Ratio shall be taken from 0.6 to 1.2, when the aggregate gradation passes above the primary control sieve, PCS, control point and 0.8 to 1.6 when the aggregate gradation is less than or equal to the PCS. The Dust/Calculated Effective Binder Ratio for 4.75 mm mixtures shall be 0.9 to 2.0.

80 The optimum binder content for dense graded mixtures shall produce 4.0% air voids at N_{des} and for open graded mixtures shall produce 15.0% – 20.0% air voids at N_{des} . The design for dense graded mixtures shall have at least 4 points, including a minimum of 2 points above and 1 point below the optimum. A 1 point design may be used for open graded mixtures. The maximum specific gravity shall be mass determined in water in accordance with AASHTO T 209. The bulk specific gravity of the gyratory specimens shall be determined in accordance with AASHTO T 166, Method A for dense graded mixtures and AASHTO T 331 for open graded mixtures.

The percent draindown of open graded mixtures shall not exceed 0.30% in accordance with AASHTO T 305. Open graded mixtures may incorporate fibers. The binder for open graded mixtures containing fibers may be reduced by 1 temperature classification, 6°C, for the upper temperature classification. The fiber type and minimum dosage rate shall be in accordance with AASHTO M 325.

90 Dense graded mixture shall be tested for moisture susceptibility in accordance with AASHTO T 283 except that the loose mixture curing shall be replaced by mixture conditioning for 2 h in accordance with AASHTO R 30. The minimum tensile strength ratio, TSR, shall be 80%. The 6 in. (150 mm) mixture specimens

shall be compacted in accordance with AASHTO T 312. If anti-stripping additives are added to the mixture to be in accordance with the minimum TSR requirements, the dosage rate shall be submitted with the DMF.

- 100 A PG binder grade or source change will not require a new mix design. If the upper temperature classification of the PG binder is lower than the original PG grade, a new TSR value is required. A new DMF shall be submitted for a binder grade change and shall reference the originating DMF/JMF number.

The MAF equals the Gmm from the mixture design divided by the following: 2.465 for 9.5 mm mixtures and 2.500 for 12.5 mm, 19.0 mm, and 25.0 mm mixtures. If the MAF calculation results in a value where $0.980 \leq \text{MAF} \leq 1.020$, then the MAF shall be considered to be 1.000. If the MAF is greater than 1.020, the calculated MAF value shall have 0.020 subtracted from the value. If the MAF is less than 0.980, the calculated MAF value shall have 0.020 added to the value. The MAF does not apply to OG mixtures.

- 110 Changes in the source or types of aggregates shall require a new DMF. A new DMF shall be submitted to the District Testing Engineer for approval 1 week prior to use.

The mixture design compaction temperature for the specimens shall be $300 \pm 9^\circ\text{F}$ ($150 \pm 5^\circ\text{C}$) for dense graded mixtures and 260°F (125°C) for open graded mixtures.

Design criteria for each mixture shall be based on the ESAL shown in the contract documents and shall be as follows:

120

GYRATORY COMPACTION EFFORT					
ESAL	N_{ini}^*	N_{des}^*	N_{max}^*	Max. % Gmm @ N_{ini}	Max. % Gmm @ N_{max}
DENSE GRADED					
< 300,000	6	50	75	91.5	98.0
300,000 to < 3,000,000	7	75	115	90.5	98.0
3,000,000 to < 10,000,000	8	100	160	89.0	98.0
10,000,000 to < 30,000,000	8	100	160	89.0	98.0
$\geq 30,000,000$	9	125	205	89.0	98.0
OPEN GRADED					
All ESAL	NA	20	NA	NA	NA
* N_{ini} , N_{des} , N_{max} , - definitions are included in AASHTO PP 28					

VOIDS IN MINERAL AGGREGATE, VMA, CRITERIA @ N _{des}	
Mixture Designation	Minimum VMA, %
4.75 mm	16.0
9.5 mm	15.0
12.5 mm	14.0
19.0 mm	13.0
25.0 mm	12.0
OG19.0 mm	NA
OG25.0 mm	NA

VOIDS FILLED WITH ASPHALT, VFA, CRITERIA @ N _{des}	
ESAL	VFA, %
< 300,000	70 – 80
300,000 to < 3,000,000	65 – 78
3,000,000 to < 10,000,000	65 – 75
10,000,000 to < 30,000,000	65 – 75
≥ 30,000,000	65 – 75
Note 1: For 9.5 mm mixtures, the specified VFA range shall be 73% to 76% for design traffic levels ≥ 3 million ESALs.	
Note 2: For 25.0 mm mixtures, the specified lower limit of the VFA shall be 67% for design traffic levels < 0.3 million ESALs.	
Note 3: For 4.75 mm mixtures, the specified VFA range shall be 75% to 78% for design traffic levels ≥ 3 million ESALs.	
Note 4: For OG19.0 mm and OG25.0 mm mixtures, VFA is not applicable.	

401.06 Recycled Materials

130 Recycled materials may consist of reclaimed asphalt pavement, RAP, or reclaimed asphalt shingles, RAS, or a blend of both. RAP shall be the product resulting from the cold milling or crushing of an existing HMA pavement. The RAP shall be processed so that 100% will pass the 2 in. (50 mm) sieve when entering the HMA plant. The RAP coarse aggregate shall pass the maximum size sieve for the mixture being produced and the RAS shall be 100% passing the 1/2 in. (12.5 mm) sieve. RAP for the ESAL category 3, 4 and 5 surface mixtures shall be 100% passing the 3/8 in. (9.5 mm) sieve and 95 to 100% passing the No. 4 (4.75 mm) sieve.

Recycled materials may be used as a substitute for a portion of the new materials required to produce HMA mixtures. The amount of total binder replaced by binder in the recycled material shall be computed as follows:

$$\text{Binder Replacement, \%} = \frac{(A \times B) + (C \times D)}{E} \times 100\%$$

140 where:

A = RAP, % Binder Content

B = RAP, % in Mixture

C = RAS, % Binder Content

D = RAS, % in Mixture

E = Total, % Binder Content in Mixture

150 RAS may be obtained from either pre-consumer or post-consumer asphalt shingles. Post-consumer asphalt shingles shall be in accordance with AASHTO MP 15 and prepared by a processing company with an IDEM Legitimate Use Approval letter. A copy of this letter shall be submitted to the Engineer. Deleterious material present in post-consumer asphalt shingles shall be limited to the percentages stated in AASHTO MP 15. Pre-consumer and post-consumer asphalt shingles shall not be blended for use in HMA mixtures and shall be stockpiled separately from other materials.

160 The recycled material percentages shall be as specified on the DMF. HMA mixtures utilizing recycled materials shall be limited to the binder replacement percentages in the following table:

HMA mixtures utilizing RAP or RAS or a blend of RAP and RAS

MAXIMUM BINDER REPLACEMENT, %									
Mixture Category	Base and Intermediate					Surface			
	Dense Graded				Open Graded		Dense Graded		
	25.0 mm	19.0 mm	12.5 mm	9.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm
1	40.0*				25.0		40.0*		
2	40.0*				25.0		40.0*		
3	40.0*				25.0		15.0		
4	40.0*				25.0		15.0		
5	40.0*				25.0		15.0		

*RAS materials shall not contribute more than 25% by weight (mass) of the total binder content for any HMA mixture.

The combined aggregate properties shall be in accordance with 904. The combined aggregate bulk specific gravity shall be determined in accordance with ITM 584 and the combined aggregate gradation shall be in accordance with 401.05 for the HMA mixture specified.

170 HMA mixtures with a binder replacement less than or equal to 25.0% by weight (mass) of the total binder content by utilizing RAP or RAS or a blend of RAP and RAS materials shall use the specified binder grade.

HMA mixtures with a binder replacement greater than 25.0% and less than or equal to 40.0% by weight (mass) of the total binder content by utilizing RAP or a blend of RAP and RAS shall use a binder grade with upper and lower temperature classifications reduced by 6°C from the specified binder grade. RAS materials shall not contribute more than 25.0% by weight (mass) of the total binder content for any HMA mixture.

180

401.07 Lots and Sublots

Lots will be defined as 5,000 t (5,000 Mg) of base or intermediate mixtures or 3,000 t (3,000 Mg) of surface mixture. Lots will be further sub-divided into sublots not to exceed 1,000 t (1,000 Mg) of base or intermediate mixtures or 600 t (600 Mg) of surface mixture. Partial sublots of 100 t (100 Mg) or less will be added to the previous sublot. Partial sublots greater than 100 t (100 Mg) constitute a full sublot. Partial lots of 4 sublots or less will be added to the previous lot, if available.

401.08 Job Mix Formula

190 A job mix formula, JMF, shall be developed by a certified HMA producer. A JMF used in the current or previous calendar year that was developed to N_{des} will be allowed. The mixture compaction temperature shall be $300 \pm 9^{\circ}\text{F}$ ($150 \pm 5^{\circ}\text{C}$) for dense graded mixtures and $260 \pm 9^{\circ}\text{F}$ ($125 \pm 5^{\circ}\text{C}$) for open graded mixtures. The JMF shall list the minimum plant discharge temperature for HMA and WMA as applicable to the mixture. The JMF for each mixture shall be submitted to the Engineer and shall use the same MAF as the DMF.

401.09 Acceptance of Mixtures

200 Acceptance of mixtures for binder content, VMA at N_{des} , and air voids at N_{des} for each lot will be based on tests performed by the Engineer. The Engineer will randomly select the location(s) within each sublot for sampling in accordance with ITM 802. The 1st 300 t (300 Mg) of the 1st sublot of the 1st lot for each DMF/JMF will not be sampled. An acceptance sample will consist of 2 plate samples with the 1st being at the random location and the 2nd 2 ft (0.6 m) ahead station. A backup sample consisting of 2 plate samples shall be located 2 ft (0.6 m) towards the center of the mat from the acceptance sample.

210 Samples from each location shall be obtained from each sublot from the pavement in accordance with ITM 580. The Engineer will take immediate possession of the samples.

The binder content will be determined in accordance with ITM 586 or ITM 571 as directed by the Engineer. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209. The air voids will be determined in accordance with AASHTO PP 28 based on the average bulk specific gravity from 2 gyratory specimens and the MSG for the sublot. The VMA will be determined in accordance with AASHTO PP 28 based on the average bulk specific gravity from 2 gyratory specimens, the percent aggregate in the mixture from the sublot and the BSG of the aggregate blend from the DMF/JMF as applicable. The gyratory pills
220 will be prepared in accordance with AASHTO T 312.

The bulk specific gravity of gyratory specimens for dense graded mixtures will be determined in accordance with AASHTO T 166, Method A except samples are not required to be dried overnight. The bulk specific gravity of gyratory specimens

for open graded mixtures, OG19.0, OG25.0 will be determined in accordance with AASHTO T 331.

230 A binder draindown test in accordance with AASHTO T 305 for open graded mixtures shall be completed once per lot in accordance with 401.07 and shall not exceed 0.50%.

The Engineer's acceptance test results for each subplot will be available after the subplot and testing are complete.

Air voids, binder content and VMA values will be reported to the nearest 0.01%. Draindown test results will be rounded to the nearest 0.01%. Rounding will be in accordance with 109.01(a).

240 Pay factors for dense graded mixtures with original contract pay item quantities greater than or equal to 1 lot will be determined in accordance with 401.19(a). Partial lots of 4 sublots or less will have pay factors determined in accordance with 401.19(b) if the previous lot is not available.

Pay factors for dense graded mixtures with original contract pay item quantities less than 1 lot and open graded mixtures will be determined in accordance with 401.19(b).

250 The Contractor may request an appeal of the Engineer's test results in accordance with 401.20.

Fibers incorporated into the mixture will be accepted on the basis of a type A certification for the specified material properties for each shipment of fibers. Fibers from different manufacturers and different types of fibers shall not be intermixed.

In the event that an acceptance sample is not available to represent a subplot, all test results of the previous subplot will be used for acceptance. If the previous subplot is not available, the subsequent subplot will be used for acceptance.

CONSTRUCTION REQUIRMENTS

260

401.10 General

Equipment for HMA operations shall be in accordance with 409. The Contractor shall submit to the Engineer written documentation that includes the manufacturer's make, model, serial number, manufactured year, and the manufacturer's literature with pictures. The documentation shall be submitted prior to use and shall certify that the paving equipment proposed for the project is new and includes the modifications or have been modified in accordance with the following.

270 The paver shall be equipped with means of preventing the segregation of the coarse aggregate particles when moving the mixture from the paver hopper to the

paver augers. The means and methods used shall be in accordance with the paver manufacturer's instructions and may consist of chain curtains, deflector plates, or other such devices, or any combination of these.

The following specific requirements shall also apply to identified HMA pavers:

1. Blaw-Knox HMA pavers shall be equipped with the Blaw-Knox Materials Management Kit, MMK.
- 280 2. Cedarrapids HMA pavers shall be those that were manufactured in 1989 or later.
3. Barber-Green/Caterpillar HMA pavers shall be equipped with deflector plates as identified in the December, 2000 Service Magazine entitled "New Asphalt Deflector Kit {6630-DFL, 6631-DFL, or 6640-DFL}".

290 The Contractor is also required to demonstrate to the Engineer prior to use, that the modifications to the paving equipment have been implemented on all pavers to be used on the project.

Fuel oil, kerosene, or solvents shall not be transported in open containers on equipment. Cleaning of equipment and small tools shall not be accomplished on the pavement or shoulder areas.

300 Segregation or flushing or bleeding of HMA mixtures will not be permitted. Corrective action shall be taken to prevent continuation of these conditions. Segregated or flushed or bleeding HMA mixtures shall be removed if directed. All areas showing an excess or deficiency of binder shall be removed and replaced.

All mixtures that become loose and broken, mixed with dirt, or is in any way defective shall be removed and replaced.

401.11 Preparation of Surfaces to be Overlaid

310 The subgrade shall be shaped to the required grade and sections, free from all ruts, corrugations, or other irregularities, and uniformly compacted and approved in accordance with 207. Milling of an existing pavement surface shall be in accordance with 306. Surfaces on which a mixture is placed shall be free from objectionable or foreign materials at the time of placement.

Rubblized concrete pavements shall be primed in accordance with 405. PCCP, milled asphalt surfaces, and asphalt surfaces shall be tacked in accordance with 406. Contact surfaces of curbing, gutters, manholes, and other structures shall be tacked in accordance with 406.

401.12 Process Control

The Engineer and Contractor will jointly review the operations to ensure compliance with the QCP. Continuous violations of compliance with the QCP will result in suspension of paving operations.

320

401.13 Weather Limitations

HMA courses of less than 138 lb/sq yd (75 kg/m²) shall be placed when the ambient temperature and the temperature of the surface on which it is to be placed is 45°F (7°C) or above. No mixture shall be placed on a frozen subgrade.

401.14 Spreading and Finishing

The mixture shall be placed upon an approved surface by means of laydown equipment in accordance with 409.03(c). Prior to paving, both the planned quantity and lay rate shall be adjusted by multiplying by the MAF. When mixture is produced from more than one DMF or JMF for a given pay item, the MAF will be applied to the applicable portion of the mixture for each. The temperature of each mixture at the time of spreading shall not be more than 18°F (10°C) below the minimum mixing temperature as shown on the JMF for mixtures compacted in accordance with 402.15.

330

340

Planned HMA courses greater than 220 lb/sq yd (120 kg/m²) placed under traffic, shall be brought up even with each adjacent lane at the end of each work day. Planned HMA courses less than or equal to 220 lb/sq yd (120 kg/m²) shall be brought forward concurrently, within practical limits, limiting the work in 1 lane to not more than 1 work day of production before moving back to bring forward the adjacent lane. Traffic shall not be allowed on open graded mixtures.

Hydraulic extensions on the paver will not be permitted for continuous paving operations. Fixed extensions or extendable screeds shall be used on courses greater than the nominal width of the paver except in areas where the paving width varies. Hydraulic extensions may be used in tapers and added lanes less than 250 ft (75 m) in length.

350

Automatic slope and grade controls shall be used as outlined in the QCP.

HMA mainline and HMA shoulders which are 8 ft (2.4 m) or more in width shall be placed with paving equipment in accordance with 409.03(c)1.

When laying mixtures with density not controlled by cores, the speed of the paver shall not exceed 50 ft (15 m) per min. Rollers shall be operated to avoid shoving of the HMA and at speeds not to exceed 3 mph (4.8 km/h). However, vibratory rollers will be limited to 2.5 mph (4 km/h).

360

The finished thickness of any course shall be at least 2 times but not more than 4 times the maximum particle size as shown on the DMF.

401.15

401.15 Joints

Longitudinal joints in the surface shall be at the lane lines of the pavement. Longitudinal joints below the surface shall be offset from previously constructed joints by approximately 6 in. (150 mm), and be located within 12 in. (300 mm) of the lane line.

370 Transverse joints shall be constructed by exposing a near vertical full depth face of the previous course. For areas inaccessible to rollers, other mechanical devices shall be used to achieve the required density.

If constructed under traffic, temporary transverse joints shall be feathered to provide a smooth transition to the driving surface.

401.16 Density

Acceptance will be based on lots and sublots in accordance with 401.07.

380 Density of the compacted dense graded mixture will be determined from cores except where:

- (a) the total planned lay rate to be placed over a shoulder existing prior to the contract award is less than 385 lb/sq yd (210 kg/m²); or
- (b) the 1st lift of material placed at less than 385 lb/sq yd (210 kg/m²) over a shoulder existing prior to the contract award.

Density of any random core location(s) in these areas will be assigned a value of 92.0 %MSG and compaction shall be in accordance with 402.15.

390 Open graded mixtures shall be compacted with 6 passes of a static tandem roller and will be assigned a value of 84.0 %MSG. Vibratory rollers shall not be used on open graded mixtures.

400 Density acceptance by cores will be based on samples obtained from 2 random locations selected by the Engineer within each subplot in accordance with ITM 802. One core shall be cut at each random location in accordance with ITM 580. The transverse core location will be located so that the edge of the core will be no closer than 3 in. (75 mm) from a confined edge or 6 in. (150 mm) from a non-confined edge of the course being placed. The maximum specific gravity will be determined from the samples obtained in 401.09.

The Contractor shall obtain cores in the presence of the Engineer with a device that shall produce a uniform 6 in. (150 mm) diameter pavement sample. Coring shall be completed prior to the random location being covered by the next course. Surface courses shall be cored within 2 work days of placement. Damaged core shall be discarded and replaced with a core from a location selected by adding 1 ft (0.3 m) to the longitudinal location of the damaged core using the same transverse offset.

410 The Contractor and the Engineer shall mark the core to define the course to be tested. If the core indicates a course thickness of less than 2 times the maximum particle size, the core will be discarded and a core from a new random location will be selected for testing.

The Engineer will take immediate possession of the cores. If the Engineer's cores are subsequently damaged, additional coring will be the responsibility of the Department. Subsequent core locations will be determined by subtracting 1 ft (0.3 m) from the random location using the same transverse offset.

420 The density for the mixture will be expressed as the percentage of maximum specific gravity, %MSG, obtained by dividing the average bulk specific gravity by the maximum specific gravity for the subplot, times 100. Samples for the bulk specific gravity and maximum specific gravity will be dried in accordance with ITM 572. The Engineer will determine the bulk specific gravity of the cores in accordance with AASHTO T 166, Method A. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209.

Within 1 work day of coring operations the Contractor shall clean, dry, and refill the core holes with HMA of similar or smaller size particles.

430 The Engineer's acceptance test results for each subplot will be available when the subplot testing is complete. Acceptance of the pavement for density (%MSG) will be reported to the nearest 0.01%. Rounding will be in accordance with 109.01(a).

401.17 Shoulder Corrugations

Shoulder corrugations shall be in accordance with 606.

401.18 Pavement Smoothness

440 Pavement smoothness will be accepted by means of a profilograph, a 16 ft (4.9 m) long straightedge, or a 10 ft (3 m) long straightedge as described below.

(a) Profilograph

When a pay item for Profilograph, HMA is included in the contract, the Contractor shall furnish, calibrate, and operate an approved profilograph in accordance with ITM 912 on the mainline traveled way and ramps, including adjacent acceleration or deceleration lane, where all of the following conditions are met:

1. The design speed is greater than 45 mph (70 km/h).
- 450 2. The traveled way or ramp lane width is constant and is 0.1 mi (0.16 km) in length or longer.

3. The HMA is placed on a milled surface or the total combined planned lay rate of surface, intermediate, and base courses is 385 lb/sq yd (210 kg/m²) or greater.

The profilograph produced shall become the property of the Department. The profilograph shall remain the property of the Contractor.

- 460 The project area, less paving exceptions and areas exempt from profilograph operation in accordance with ITM 912, will be divided into individual smoothness sections measuring 0.1 mi (0.16 km) in length for each lane. Partial length smoothness sections adjacent to project limits, paving exceptions, or areas exempt from profilograph operation will be considered in accordance with ITM 912.

If the posted speed limit for an entire smoothness section is less than or equal to 45 mph (70 km/h), the section will be exempt from profilograph operation and the smoothness within the section will be accepted by a 16 ft (4.9 m) straightedge.

- 470 If the posted speed limit is greater than 45 mph (70 km/h) for a portion of a smoothness section and is less than or equal to 45 mph (70 km/h) for the remainder, the section smoothness acceptance will be as follows:

1. By profilograph for the portion of the section with a posted speed limit greater than 45 mph (70 km/h).
2. By 16 ft (4.9 m) straightedge for the portion of the section with a posted speed limit less than or equal to 45 mph (70 km/h).

- 480 At locations where the profilograph is required, it shall be used on the surface course and on any dense graded intermediate course immediately below the surface course.

(b) 16 ft (4.9 m) Straightedge and 10 ft (3 m) Straightedge

The Department will furnish and operate 16 ft (4.9 m) and 10 ft (3 m) straightedges as described below. The 16 ft (4.9 m) straightedge is used to accept smoothness along the direction of mainline traffic and the 10 ft (3 m) straightedge is used to accept smoothness transverse to the direction of mainline traffic. This includes longitudinal smoothness on public road approaches and median crossovers.

- 490 For contracts which include the Profilograph, HMA pay item, the 16 ft (4.9 m) long straightedge will be used to accept longitudinal smoothness on surface courses at the following locations:

1. All mainline traveled way lanes shorter than 0.1 mi (0.16 km).

- 500
2. All mainline traveled way lanes within smoothness sections with posted speed limits less than or equal to 45 mph (70 km/h) throughout the entire section length.
 3. All mainline traveled way lanes at locations exempted from profilograph operation in accordance with ITM 912.
 4. All tapers.
 5. All turn lanes, including bi-directional left turn lanes.
 6. All ramps with design speeds of 45 mph (70 km/h) or less.
- 510
7. All acceleration and deceleration lanes associated with ramps with design speeds of 45 mph (70 km/h) or less.
 8. All shoulders.

520 For contracts where the profilograph is not used for smoothness acceptance, the 16 ft (4.9 m) straightedge will be used to accept longitudinal smoothness on all dense graded courses at the above locations as well as all mainline travel way lanes and ramps with design speeds of greater than 45 mph (70 km/h). Smoothness acceptance on ramp acceleration or deceleration lanes will also be based on operation of the 16 ft (4.9 m) straightedge.

The 10 ft (3 m) long straightedge shall be used to check transverse slopes, across travel lanes and shoulders, approaches, and crossovers.

(c) Smoothness Correction

530 At locations where the profilograph is being used on an intermediate course, all areas having a high or low point deviation in excess of 0.3 in. (8 mm) shall be corrected. After corrective action is taken on an intermediate course, a 16 ft (4.9 m) straightedge may be used to verify the adequacy of the corrective action.

At locations where the profilograph is being used on a surface course, all areas having a high or low point deviation in excess of 0.3 in. (8 mm) shall be corrected. All smoothness sections with a deficient profile index in accordance with 401.19(d) shall be corrected. Underlying courses that are exposed by corrective action shall be milled to a depth of 1 1/2 in (38 mm) and replaced with surface course. After the corrective action is taken on a surface course, the profilograph shall be operated throughout the entire affected smoothness section to verify the adequacy of the corrective action.

540 At locations where the 16 ft (4.9 m) straightedge is used, the pavement variations shall be corrected to 1/4 in. (6 mm) or less. When the 10 ft (3 m)

straightedge is used, the pavement variations shall be corrected to 1/8 in. (3 mm) or less.

If grinding of an intermediate course is used for pavement smoothness corrections, the grinding shall not precede the surface placement by more than 30 calendar days if open to traffic.

401.19 Pay Factors

550

(a) Dense Graded Mixture \geq One Lot

Pay factors, PF, are calculated for binder content, air voids at N_{des} , VMA at N_{des} and in-place density, %Gmm. The Percent Within Limits, PWL, for each lot will be determined in accordance with ITM 588. The appropriate pay factor for each property is calculated as follows:

Estimated PWL greater than 90:

$$PF = (105.00 - 0.50 \times (100.00 - PWL)) / 100$$

560

Estimated PWL greater than or equal to 50 and equal to or less than 90:

$$PF = (100.00 - 0.000020072 \times (100.00 - PWL)^{3.5877}) / 100$$

If the Lot PWL for any one of the properties is less than 50 or a subplot has an air void content less than 1.0% or greater than 7.0%, the lot will be referred to the Office of Materials Management for adjudication as a failed material in accordance with normal Department practice as listed in 105.03.

570

Binder content, air voids, VMA, and in-place density, %Gmm, PF values will be reported to the nearest 0.01. Rounding will be in accordance with 109.01(a).

A composite pay factor for each lot based on test results for mixture properties and density is determined by a weighted formula as follows:

$$\text{Lot PF} = 0.20(PF_{\text{BINDER}}) + 0.35(PF_{\text{VOIDS}}) + 0.10(PF_{\text{VMA}}) + 0.35(PF_{\text{DENSITY}})$$

where:

580

Lot PF = Lot Composite Pay Factor for Mixture and Density

PF_{BINDER} = Lot Pay Factor for Binder Content

PF_{VOIDS} = Lot Pay Factor for Air Voids at N_{des}

PF_{VMA} = Lot Pay Factor for VMA at N_{des}

PF_{DENSITY} = Lot Pay Factor for In-Place Density, %Gmm

The lot quality assurance adjustment for mixture properties and density is calculated as follows:

$$q = L \times U \times (\text{Lot PF} - 1.00) / \text{MAF}$$

590 where:

q = quality assurance adjustment for mixture properties and density of the lot

L = Lot quantity

U = Unit price for the material, \$/ton (\$/Mg)

Lot PF = Lot Pay Factor

Lot test results for binder content, air voids, VMA, and density will be used to determine the Lot Pay Factors.

600 The specification limits for binder content, air voids at N_{des} , VMA at N_{des} , and density will be as follows:

SPECIFICATION LIMITS				
MIXTURE				
	LSL*		USL**	
Binder Content, %	- 0.40 from JMF		+ 0.40 from JMF	
Air Voids at N_{des} , %	2.60		5.40	
Voids In Mineral Aggregate at N_{des} , %	Greater of		Lesser of	
	Spec-0.50	JMF-1.20	Spec +2.00	JMF+ 1.20
DENSITY				
	LSL*		USL**	
Roadway Core Density (%Gmm), %	91.00		NA	
* LSL, Lower Specification Limit				
** USL, Upper Specification Limit				

(b) Dense Graded Mixture < One Lot and Open Graded Mixture

A composite pay factor for each subplot based on test results for mixture properties and density is determined in a weighted formula as follows:

$$\text{SCPF} = 0.20(\text{PF}_{\text{BINDER}}) + 0.35(\text{PF}_{\text{VOIDS}}) + 0.10(\text{PF}_{\text{VMA}}) + 0.35(\text{PF}_{\text{DENSITY}})$$

where:

610 SCPF = Sublot Composite Pay Factor for Mixture and Density

$\text{PF}_{\text{BINDER}}$ = Sublot Pay Factor for Binder Content

PF_{VOIDS} = Sublot Pay Factor for Air Voids at N_{des}

PF_{VMA} = Sublot Pay Factor for VMA at N_{des}

$\text{PF}_{\text{DENSITY}}$ = Sublot Pay Factor for Density

If the SCPF for a subplot is less than 0.85, the Office of Materials Management will evaluate the pavement. If the Contractor is not required to remove the mixture, quality assurance adjustments of the lot will be assessed or other corrective actions taken as determined by the Office of Materials Management.

620

The subplot quality assurance adjustment for mixture properties and density is calculated as follows:

$$q = L \times U \times (\text{SCPF} - 1.00) / \text{MAF}$$

where:

q = quality assurance adjustment for the subplot

L = subplot quantity

U = unit price for the material \$/ton (\$/Mg)

SCPF = subplot composite pay factor

630 Sublot test results for mixture properties will be assigned pay factors in accordance with the following:

BINDER CONTENT		
Dense Graded	Open Graded	Pay Factor
Deviation from JMF (± %)	Deviation from JMF (± %)	Pay Factor
≤ 0.2	≤ 0.2	1.05
0.3	0.3	1.04
0.4	0.4	1.02
0.5	0.5	1.00
0.6	0.6	0.90
0.7	0.7	0.80
0.8	0.8	0.60
0.9	0.9	0.30
1.0	1.0	0.00
> 1.0	> 1.0	Submitted to the Office of Materials Management*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.		

VMA		
Dense Graded	Open Graded	Pay Factor
Deviation from JMF (± %)	Deviation from JMF (± %)	Pay Factor
≤ 0.5		1.05
> 0.5 and ≤ 1.0	All	1.00
> 1.0 and ≤ 1.5		0.90
> 1.5 and ≤ 2.0		0.70
> 2.0 and ≤ 2.5		0.30
> 2.5		Submitted to the Office of Materials Management*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.		

AIR VOIDS		
Dense Graded	Open Graded	Pay Factor
Deviation from JMF (± %)	Deviation from JMF (± %)	Pay Factor
≤ 0.5	≤ 1.0	1.05
> 0.5 and ≤ 1.0	> 1.0 and ≤ 3.0	1.00
1.1	3.1	0.98
1.2	3.2	0.96
1.3	3.3	0.94
1.4	3.4	0.92
1.5	3.5	0.90
1.6	3.6	0.84
1.7	3.7	0.78
1.8	3.8	0.72
1.9	3.9	0.66
2.0	4.0	0.60
> 2.0	> 4.0	Submitted to the Office of Materials Management*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.		

For mixtures produced during a plant's adjustment period, pay factors based on the JMF with the above tolerances will be used to compute quality assurance adjustments.

640

Sublot test results for density will be assigned pay factors in accordance with the following:

DENSITY		
Percentages are based on %MSG		Pay Factors, %
Dense Graded	Open Graded	
≥ 97.0		Submitted to the Office of Materials Management*
95.6 - 96.9		1.05 - 0.01 for each 0.1% above 95.5
94.0 - 95.5		1.05
93.1 - 93.9		1.00 + 0.005 for each 0.1% above 93.0
92.0 - 93.0	84.0	1.00
91.0 - 91.9		1.00 - 0.005 for each 0.1% below 92.0
90.0 - 90.9		0.95 - 0.010 for each 0.1% below 91.0

89.0 - 89.9		0.85 - 0.030 for each 0.1% below 90.0
≤ 88.9		Submitted to the Office of Materials Management*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.		

The pay factors will be rounded to the nearest 0.01.

(c) Smoothness

650 Smoothness pay adjustments will only be applied when the smoothness is measured by a profilograph. The pay adjustment will be based on the profile index generated on the surface course only.

At locations where a profilograph is used to accept smoothness, a quality assurance adjustment will be determined for each 0.1 mi (0.16 km) section of each lane. This adjustment will be applied to all QC/QA HMA pay items within the pavement section. The adjustment for each section will be calculated using the following formula:

$$q_s = (PF_s - 1.00) \sum_{i=1}^n \left(A \times \frac{S}{T} \times U \right)$$

660

where:

q_s = quality assurance adjustment for smoothness for 1 section

PF_s = pay factor for smoothness

n = number of layers

A = area of the section, sq yd (m^2)

S = planned spread rate for material, lb/sq yd (kg/m^2)

T = conversion factor: 2,000 lb/ton (1,000 kg/Mg)

U = unit price for the material, \$/ton ($$/Mg)$

670

For smoothness sections that are less than 0.1 mi (0.16 km) in length or require profilograph operation along both lane edges, the profile index used to obtain the smoothness pay factor used in the above formula will be determined in accordance with ITM 912.

The quality assurance adjustment for smoothness, Q_s , for the contract will be the total of the quality assurance adjustments for smoothness, q_s , on each section by the following formula:

680

$$Q_s = \sum q_s$$

When smoothness is measured by a profilograph, payment adjustments will be made based on a zero blanking band on the final profile index in accordance with the

following table. Regardless of the tabulated value, the maximum pay factor for a smoothness section where corrective action has been performed will be 1.00.

PAY FACTORS FOR SMOOTHNESS (PI_{0.0}) ZERO BLANKING BAND	
Design Speed Greater than 45 mph (70 km/h)	
Profile Index in./0.1 mi. (mm per 0.16 km)	Pay Factor, PFs
Over 0.00 to 1.20 in. (Over 0 to 30 mm)	1.06
Over 1.20 to 1.40 in. (Over 30 to 35 mm)	1.05
Over 1.40 to 1.60 in. (Over 35 to 40 mm)	1.04
Over 1.60 to 1.80 in. (Over 40 to 45 mm)	1.03
Over 1.80 to 2.00 in. (Over 45 to 50 mm)	1.02
Over 2.00 to 2.40 in. (Over 50 to 60 mm)	1.01
Over 2.40 to 3.20 in. (Over 60 to 80 mm)	1.00
Over 3.20 to 3.40 in. (Over 80 to 85 mm)	0.96
All pavement with a profile index (PI _{0.0}) greater than 3.40 in. (85 mm) shall be corrected to a profile index less than or equal to 3.40 in. (85 mm).	

The total quality assurance adjustment is calculated as follows:

690

$$Q = Q_s + (\sum q)$$

where:

Q = total quality assurance adjustment

Q_s = quality assurance adjustment for smoothness

q = lot or subplot quality assurance adjustment

401.20 Appeals

700 If the QC test results do not agree with the acceptance test results, a request, along with the QC test results, may be made in writing for additional testing. The appeal sample will be analyzed in a lab different than the lab that analyzed the original sample when requested by the Contractor. Additional testing may be requested for 1 or more of the following tests: MSG, BSG of the gyratory specimens,

401.21

binder content, or BSG of the density cores. The request for the appeal for MSG, BSG of gyratory specimens, binder content or BSG of the density cores shall be submitted within 7 calendar days of receipt of the Department's written results for the lot accepted under 401.19(a) or the subplot accepted under 401.19(b). The subplot and specific test(s) shall be specified at the time of the appeal request. Only 1 appeal request per lot for mixture accepted under 401.19(a) or subplot for mixture accepted under 401.19(b) is permitted. Upon approval of the appeal, the Engineer will perform additional testing as follows.

The backup or new sample(s) will be tested in accordance with the applicable test method for the test requested.

(a) MSG

The backup MSG will be dried in accordance with ITM 572 and mass determined in water in accordance with AASHTO T 209.

(b) BSG of the Gyratory Specimen

New gyratory specimens will be prepared and tested in accordance with AASHTO T 312 from the backup sample.

(c) Binder Content

The backup binder content sample will be prepared and tested in accordance with the test method that was used for acceptance or as directed by the Engineer.

(d) BSG of the Density Core

Additional cores shall be taken within 7 calendar days unless otherwise directed. Additional core locations will be determined by adding 1 ft (0.3 m) longitudinally of the cores tested using the same transverse offset. The appeal density cores will be dried in accordance with ITM 572 and tested in accordance with AASHTO T 166, Method A.

The appeal results will replace all previous test result(s) for acceptance of mixture in accordance with 401.09 and density in accordance with 401.16. The results will be furnished to the Contractor.

401.21 Method of Measurement

HMA mixtures will be measured by the ton (megagram) of the type specified, in accordance with 109.01(b). The measured quantity will be divided by the MAF to determine the pay quantity.

Milled shoulder corrugations will be measured in accordance with 606.02.

401.22 Basis of Payment

The accepted quantities for this work will be paid for at the contract unit price per ton (megagram) for QC/QA-HMA, of the type specified, complete in place.

750 Payment for furnishing, calibrating, and operating the profilograph, and furnishing profile information will be made at the contract lump sum price for profilograph, HMA.

Adjustments to the contract payment with respect to mixture, density, and smoothness for mixture produced will be included in a quality assurance adjustment pay item in accordance with 109.05.1.

Milled shoulder corrugations will be paid for in accordance with 606.03.

760 Payment will be made under:

Pay Item	Pay Unit Symbol
Profilograph, HMA.....	LS
QC/QA-HMA, _____, _____, _____ mm.....	TON (Mg)
(ESAL ⁽¹⁾) (PG ⁽²⁾) (Course ⁽³⁾) (Mix ⁽⁴⁾)	

- (1) ESAL Category as defined in 401.04
- (2) Number represents the high temperature binder grade. Low temperature grades are -22
- (3) Surface, Intermediate, or Base
- (4) Mixture Designation

770

Preparation of surfaces to be overlaid shall be included in the cost of other pay items.

Coring and refilling of the core holes shall be included in the cost of other pay items within this section.

780 No payment will be made for additional anti-stripping additives, appeal coring or traffic control expenditures related to coring operations.

Corrections for pavement smoothness shall be included in the cost of other pay items within this section.

The price for Profilograph, HMA will be full compensation regardless of how often the profilograph is used or how many profilograms are produced.

790 If QC/QA-HMA intermediate over QC/QA-HMA base mixtures are specified, QC/QA-HMA intermediate mixture may be permitted as a substitute for the QC/QA-HMA intermediate and QC/QA-HMA base mixtures upon a written request by the Contractor. The request for the substitution shall be prepared in advance of the work. A computation will be made in order to obtain a unit price for the QC/QA-HMA intermediate mixture. The quantity and amount for QC/QA-HMA intermediate mixture shall equal the sum of the contract quantities and amounts shown for QC/QA-HMA intermediate and QC/QA-HMA base mixtures. The unit

402.01

price for QC/QA-HMA intermediate mixture shall be equal to the sum of contract amounts divided by the sum of contract quantities. Payment for the QC/QA-HMA intermediate mixture will be made at the unit price per ton (megagram) for 800 QC/QA-HMA intermediate mixture. No payment will be made for additional work or costs which may result due to this change.

SECTION 402 – HOT MIX ASPHALT, HMA, PAVEMENT

402.01 Description

This work shall consist of 1 or more courses of HMA base, intermediate, or surface mixtures, and miscellaneous courses for rumble strips, and wedge and leveling constructed on prepared foundations in accordance with 105.03.

402.02 Quality Control

10 The HMA shall be supplied from a certified HMA plant in accordance with ITM 583; Certified Hot Mix Asphalt Producer Program. The HMA shall be transported and placed according to a Quality Control Plan, QCP, prepared and submitted by the Contractor in accordance with ITM 803; Contractor Quality Control Plans for Hot Mix Asphalt Pavements. The QCP shall be submitted to the Engineer at least 15 days prior to commencing HMA paving operations.

MATERIALS

402.03 Materials

Materials shall be in accordance with the following:

20

Asphalt Materials

PG Binder	902.01(a)
Coarse Aggregates.....	904
Base Mixtures, – Class D or Higher	
Intermediate Mixtures – Class C or Higher	
Surface Mixtures – Class B or Higher*	
Fine Aggregates.....	904
* Surface aggregate requirements are listed in 904.03(d).	

30

402.04 Design Mix Formula

A DMF shall be prepared in accordance with 402.05 and submitted in a format acceptable to the Engineer 1 week prior to use. The DMF shall state the maximum particle size in the mixture, the calibration factor and test temperature to be used for the determination of binder content using ITM 586 or ITM 571, and a MAF. Approval of the DMF will be based on the ESAL and mixture designation as follows.

Mixture Type	Type A	Type B	Type C	Type D
Design ESAL	200,000	2,000,000	9,000,000	11,000,000
Surface	4.75 mm	4.75 mm	4.75 mm	4.75 mm
	9.5 mm	9.5 mm	9.5 mm	9.5 mm
	12.5 mm	12.5 mm	12.5 mm	12.5 mm
Surface – PG Binder	64-22	64-22	70-22	70-22
Intermediate	9.5 mm	9.5 mm	9.5 mm	9.5 mm
	12.5 mm	12.5 mm	12.5 mm	12.5 mm
	19.0 mm	19.0 mm	19.0 mm	19.0 mm
	25.0 mm	25.0 mm	25.0 mm	25.0 mm
Intermediate – PG Binder	64-22	64-22	64-22	70-22
Base	19.0 mm	19.0 mm	19.0 mm	19.0 mm
	25.0 mm	25.0 mm	25.0 mm	25.0 mm
Base – PG Binder	64-22	64-22	64-22	64-22

40 HMA may be produced as warm-mix asphalt, WMA by using a water-injection foaming device for temporary HMA mixtures and type A, B and C mixtures. The DMF shall list the minimum plant discharge temperature for HMA and WMA as applicable to the mixture.

The Engineer will assign a mixture number. No mixture will be accepted until the DMF has been approved.

402.05 Volumetric Mix Design

The DMF shall be determined for each mixture from a volumetric mix design in accordance with 401.05.

50

A DMF developed for a QC/QA HMA mixture may be used and the source or grade of the binder may be changed; however, the high temperature grade shall meet the minimum requirements of 402.04.

The MAF equals the Gmm from the mixture design divided by the following: 2.465 for 9.5 mm mixtures and 2.500 for 12.5 mm, 19.0 mm, and 25.0 mm mixtures. If the MAF calculation results in a value where $0.980 \leq \text{MAF} \leq 1.020$, then the MAF shall be considered to be 1.000. If the MAF is greater than 1.020, the calculated MAF value shall have 0.020 subtracted from the value. If the MAF is less than

60

402.06 Job Mix Formula

The job mix formula, JMF, shall be an approved JMF in accordance with 401.08 of the same gyratory compaction effort ESAL category or higher, and submitted in a format acceptable to the Engineer and shall use the same MAF as the DMF. The JMF shall state the maximum particle size in the mixture and the calibration factor and test temperature to be used for the determination of binder content using the ignition oven. Approval of the JMF will be based on the ESAL and mixture designation. No mixture will be accepted until the JMF has been approved.

402.07

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All changes in the type or source of aggregate shall require the submittal of a new DMF for approval.

For mixtures containing 0.0% to 15.0% RAP, changes in the source and grade of specified binders will be permitted; however, the high temperature grade shall meet the minimum requirements of 402.04.

402.07 Mix Criteria

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(a) Composition Limits for HMA Rumble Strip Mixtures

Rumble strip mixtures shall be type A surface in accordance with 402.04. A MAF in accordance with 402.05 will not apply. Aggregate requirements of 904.03(d) do not apply.

(b) Composition Limits for HMA Wedge and Leveling Mixtures

The mixture shall consist of surface or intermediate mixtures in accordance with 402.04. Aggregate requirements of 904.03(d) do not apply when the wedge and leveling mixture is covered by a surface or intermediate mixture.

90

(c) Composition Limits for Temporary HMA Mixtures

Temporary HMA mixtures shall be **the type specified** in accordance with 402.04. A MAF in accordance with 402.05 will not apply.

(d) Composition Limits for HMA Curbing Mixes

The mixture shall be HMA surface type A in accordance with 402 except 402.05 shall not apply and RAP shall not be used. The binder content shall be 7.0% and the gradations shall meet the following.

HMA Curbing Gradations	
Sieve Size	Percent Passing Sieves
1/2 in. (12.5 mm)	100.0
3/8 in. (9.5 mm)	80.0 - 100.0
No. 4 (4.75 mm)	73.0 ± 5.0
No. 30 (600 µm)	20.0 - 50.0
No. 200 (75 µm)	6.0 - 12.0

100

A DMF shall be prepared in accordance with the above table and submitted in a format acceptable to the Engineer 1 week prior to use. The DMF shall state the calibration factor and test temperature to be used for the determination of binder content using ITM 586 or ITM 571.

402.08 Recycled Materials

Recycled materials may consist of reclaimed asphalt pavement, RAP, or reclaimed asphalt shingles, RAS or a blend of both. RAP shall be the product resulting from the cold milling or crushing of an existing HMA pavement. The RAP

110 shall be processed so that 100% will pass the 2 in. (50 mm) sieve when entering the HMA plant. The RAP coarse aggregate shall pass the maximum size sieve for the mixture being produced and the RAS shall be 100% passing the 1/2 in. (12.5 mm) sieve. RAP for the type C and D surface mixtures shall be 100% passing the 3/8 in. (9.5 mm) sieve and 95 to 100% passing the No. 4 (4.75 mm) sieve.

Recycled materials may be used as a substitute for a portion of the new materials required to produce HMA mixtures. The amount of total binder replaced by binder in the recycled material shall be computed as follows:

$$\text{Binder Replacement, \%} = \frac{(A \times B) + (C \times D)}{E} \times 100\%$$

120 where:

A = RAP, % Binder Content

B = RAP, % in Mixture

C = RAS, % Binder Content

D = RAS, % in Mixture

E = Total, % Binder Content in Mixture

130 RAS may be obtained from either pre-consumer or post-consumer asphalt shingles. Post-consumer asphalt shingles shall be in accordance with AASHTO MP 15 and prepared by a processing company with an IDEM Legitimate Use Approval letter. A copy of this letter shall be submitted to the Engineer. Deleterious material present in post-consumer asphalt shingles shall be limited to the percentages stated in AASHTO MP 15. Pre-consumer and post-consumer asphalt shingles shall not be blended for use in HMA mixtures and shall be stockpiled separately from other materials.

140 The recycled material percentages shall be as specified on the DMF. HMA mixtures utilizing recycled materials shall be limited to the binder replacement percentages in the following table:

HMA mixtures utilizing RAP or RAS or a blend of RAP and RAS

Mixture Category	Maximum Binder Replacement, %						
	Base and Intermediate				Surface		
	Dense Graded				Dense Graded		
	25.0 mm	19.0 mm	12.5 mm	9.5 mm	12.5 mm	9.5 mm	4.75 mm
A	40.0*				40.0*		
B	40.0*				40.0*		
C	40.0*				15.0		
D	40.0*				15.0		

*RAS materials shall not contribute more than 25% by weight (mass) of the total binder content for any HMA mixture.

The combined aggregate properties shall be in accordance with 904. The combined aggregate bulk specific gravity shall be determined in accordance with ITM 584 and the combined aggregate gradation shall be in accordance with 401.05 for the HMA mixture specified.

150 HMA mixtures with a binder replacement less than or equal to 25.0% by weight (mass) of the total binder content by utilizing RAP or RAS or a blend of RAP and RAS materials shall use the specified binder grade.

HMA mixtures with a binder replacement greater than 25.0% and less than or equal to 40.0% by weight (mass) of the total binder content by utilizing RAP or a blend of RAP and RAS shall use a binder grade with upper and lower temperature classifications reduced by 6°C from the specified binder grade. RAS materials shall not contribute more than 25.0% by weight (mass) of the total binder content for any HMA mixture.

160

402.09 Acceptance of Mixtures

Acceptance of mixtures will be in accordance with the Frequency Manual on the basis of a type D certification in accordance with 916. The test results shown on the certification shall be the quality control tests representing the material supplied and include air voids and binder content. Air voids tolerance shall be $\pm 1.5\%$ and binder content tolerance shall be $\pm 0.7\%$ from DMF or JMF.

Single test values and averages will be reported to the nearest 0.1%. Rounding will be in accordance with 109.01(a).

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Test results exceeding the tolerance limits will be considered as a failed material and adjudicated in accordance with 105.03.

CONSTRUCTION REQUIREMENTS

402.10 General

180 Equipment for HMA operations shall be in accordance with 409. The Contractor shall submit to the Engineer prior to use a written Certificate of Compliance that the proposed paving equipment has been modified in accordance with 401.10 or is new and includes the modifications.

Fuel oil, kerosene, or solvents shall not be transported in open containers on any equipment at any time. Cleaning of equipment and tools shall not be accomplished on the pavement or shoulder areas.

Segregation, flushing or bleeding of HMA mixtures will not be permitted. Corrective action shall be taken to prevent continuation of these conditions. Areas of segregation, flushing or bleeding shall be corrected, if directed. All areas showing an excess or deficiency of asphalt materials shall be removed and replaced.

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All mixtures that become loose and broken, mixed with dirt, or is in any way defective shall be removed and replaced.

Mixture shall not be dispatched from the plant that cannot be spread and compacted before sundown of that day, unless otherwise permitted.

402.11 Preparation of Surfaces to be Overlaid

200 The subgrade shall be shaped to the required grade and sections, free from all ruts, corrugations, or other irregularities, and uniformly compacted and approved in accordance with 207. Milling of an existing surface shall be in accordance with 306. Surfaces on which a mixture is placed shall be free from objectionable or foreign materials at the time of placement.

Compacted aggregate bases and rubblized bases shall be primed in accordance with 405. PCCP, milled asphalt surfaces, and asphalt surfaces shall be tacked in accordance with 406. Contact surfaces of curbing, gutters, manholes, and other structures shall be tacked in accordance with 406.

402.12 Weather Limitations

210 HMA courses less than 110 lb/sq yd (60 kg/m²) are to be placed when the ambient and surface temperatures are 60°F (16°C) or above. HMA courses equal to or greater than 110 lb/sq yd (60 kg/m²) but less than 220 lb/sq yd (120 kg/m²) are to be placed when the ambient and surface temperatures are 45°F (7°C) or above. HMA courses equal to or greater than 220 lb/sq yd (120 kg/m²) and HMA curbing are to be placed when the ambient and surface temperatures are 32°F (0°C) or above. Mixture shall not be placed on a frozen subgrade. However, HMA courses may be placed at lower temperatures, provided the density of the HMA course is in accordance with 402.16.

220 All partially completed sections of roadway that are 8 in. (200 mm) or less in thickness shall be proofrolled prior to the placement of additional materials the following spring. Proofrolling shall be accomplished in accordance with 203.26. The contact pressure shall be 70 to 80 psi (480 to 550 kPa). Soft yielding areas shall be removed and replaced.

402.13 Spreading and Finishing

230 The mixture shall be placed upon an approved surface by means of laydown equipment in accordance with 409.03(c). Prior to paving, both the planned quantity and lay rate shall be adjusted by multiplying by the MAF. When mixture is produced from more than one DMF or JMF for a given pay item, the MAF will be applied to the applicable portion of the mixture for each. Mixtures in areas inaccessible to laydown equipment or mechanical devices may be placed by other methods.

The temperature of each mixture at the time of spreading shall not be more than 18°F (10°C) below the minimum mixing temperature as shown on the DMF or JMF.

Planned HMA courses greater than 220 lb/sq yd (120 kg/m²) placed under traffic shall be brought up even with each adjacent lane at the end of each work day. Planned HMA courses less than or equal to 220 lb/sq yd (120 kg/m²) shall be brought forward concurrently, within practical limits, limiting the work in 1 lane to not more than 1 work day of production before moving back to bring forward the adjacent lane. Traffic shall not be allowed on open graded mixtures.

Hydraulic extensions on the paver will not be permitted for continuous paving operations. Fixed extensions or extendable screeds shall be used on courses greater than the nominal width of the paver except in areas where the paving widths vary. Hydraulic extensions may be used on approaches, tapers, and added lanes less than 250 ft (75 m) in length.

HMA shoulders which are 8 ft (2.4 m) or more in width shall be placed with automatic paving equipment.

HMA mixtures in hauling equipment shall be protected by tarps from adverse weather conditions or foreign materials. Adverse weather conditions include, but will not be limited to, precipitation or temperatures below 45°F (7°C).

The speed of the paver shall not exceed 50 ft (15 m) per min when spreading mixtures.

Automatic slope and grade controls shall be required except when placing mixtures on roadway approaches which are less than 200 ft (60 m) in length or on miscellaneous work. The use of automatic controls on other courses where use is impractical due to project conditions may be waived by the Engineer.

The finished thickness of each course shall be at least 2 times but not more than 4 times the maximum particle size as shown on the DMF or JMF. The finished thickness of wedge and level mixtures shall be at least 1.5 times but not more than 6 times the maximum particle size as shown on the DMF or JMF. Feathering may be less than the minimum thickness requirements.

Rumble strips shall be placed to ensure uniformity of depth, width, texture, and the required spacing between strips. A tack coat in accordance with 406 shall be applied on the pavement surface prior to placing the mixture. The tack coat may be applied with a paint brush or other approved methods.

402.14 Joints

Longitudinal joints in the surface shall be at the lane lines of the pavement. Longitudinal joints below the surface shall be offset from previously constructed joints by approximately 6 in. (150 mm), and be located within 12 in. (300 mm) of the lane line.

Transverse joints shall be constructed by exposing a near vertical full depth face of the previous course.

If constructed under traffic, temporary transverse joints shall be feathered to provide a smooth transition to the driving surface.

402.15 Compaction

290 The HMA mixture shall be compacted with equipment in accordance with 409.03(d) immediately after the mixture has been spread and finished. Rollers shall not cause undue displacement, cracking, or shoving.

A roller application is defined as 1 pass of the roller over the entire mat. Compaction operations shall be completed in accordance with one of the following options.

NUMBER OF ROLLER APPLICATIONS						
Rollers	Courses \leq 440 lb/sq yd (240 kg/m ²)				Courses $>$ 440 lb/sq yd (240 kg/m ²)	
	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2
Three Wheel	2		4		4	
Pneumatic Tire	2	4			4	
Tandem	2	2	2		4	
Vibratory Roller				6		8

A reduced number of applications on a course may be approved if detrimental results are being observed.

300

Compaction equipment shall be operated with the drive roll or wheels nearest the paver and at speeds not to exceed 3 mph (4.8 km/h). However, vibratory rollers will be limited to 2.5 mph (4 km/h). Rolling shall be continued until applications are completed and all roller marks are eliminated.

Compaction operations shall begin at the low side and proceed to the high side of the mat. The heaviest roller wheel shall overlap its previous pass by a minimum of 6 in. (150 mm).

310 Longitudinal joints shall be compacted in accordance with the following:

- (a) For confined edges, the 1st pass adjacent to the confined edge, the compaction equipment shall be entirely on the hot mat 6 in. (150 mm) from the confined edge.
- (b) For unconfined edges, the compaction equipment shall extend 6 in. (150 mm) beyond the edge of the hot mat.

402.16

320 All displacement of the HMA mixture shall be corrected at once by the use of lutes and/or the addition of fresh mixture as required. The line and grade of the edges of the HMA mixture shall not be displaced during rolling.

The wheels shall be kept properly moistened with water or water with detergent to prevent adhesion of the materials to the wheels.

330 Areas inaccessible to rollers shall be compacted thoroughly with hand tampers or other mechanical devices in accordance with 409.03(d)6 to achieve the required compaction. A trench roller, in accordance with 409.03(d)5, may be used to obtain compaction in depressed areas.

The final 2 roller applications shall be completed at the highest temperature where the mixture does not exhibit any tenderness.

Vehicular traffic will not be permitted on a course until the mixture has cooled sufficiently to prevent distortions.

Rumble strips shall be compacted with vibratory compacting equipment in accordance with 409.03(d)6 unless otherwise stated.

340 **402.16 Low Temperature Compaction Requirements**

Compaction for mixtures placed below the temperatures listed in 402.12 shall be controlled by density determined from MSG of the plate samples and cores cut from the compacted pavement placed during a low temperature period. Samples shall be obtained in accordance with ITM 580. Acceptance will be based on a plate sample and 2 cores. The Engineer will randomly select the locations in accordance with ITM 802. The transverse core location will be located so that the edge of the core will be no closer than 3 in. (75 mm) from a confined edge or 6 in. (150 mm) from a non-confined edge of the course being placed.

350 For compaction of HMA during low temperature periods with quantities less than 100 t (100 Mg) per day, acceptance may be visual.

The Contractor shall obtain cores in the presence of the Engineer with a device that shall produce a uniform 6 in. (150 mm) diameter pavement sample. Coring shall be completed prior to the random location being covered. The final HMA course shall be cored within 1 work day of placement. Damaged cores shall be discarded and replaced with a core from a location selected by adding 1 ft (0.3 m) to the longitudinal location of the damaged core using the same transverse offset.

360 The Contractor and the Engineer shall mark the core to define the course to be tested. If the core indicates a course thickness of less than 2 times the maximum particle size, the core will be discarded and a core from a new random location will be selected for testing.

The Engineer will take immediate possession of the cores. If the Engineer's cores are subsequently damaged, additional coring within a specific section will be the responsibility of the Department. Subsequent core locations will be determined by subtracting 1 ft (0.3 m) from the random location using the same transverse offset.

370

The density for the mixture shall be expressed as:

$$\text{Density} = 100 \times \text{BSG/MSG}$$

where:

BSG = average bulk specific gravity

MSG = maximum specific gravity

380

The Engineer will determine the bulk specific gravity of the cores in accordance with AASHTO T 166 Method A. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209. Density shall not be less than 92.0%.

Within 1 work day of coring operations, the Contractor shall clean, dry, refill, and compact the core holes with suitable HMA of similar or smaller size particles.

402.17 Shoulder Corrugations

Shoulder corrugations shall be in accordance with 606.

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402.18 Pavement Smoothness

Pavement smoothness will be in accordance with 401.18 except profilograph requirements will not apply.

402.19 Method of Measurement

HMA mixtures will be measured by the ton (megagram) of the type specified, in accordance with 109.01(b). The measured quantity will be divided by the MAF to determine the pay quantity.

400

HMA rumble strips will be measured by the linear foot (meter) of each transverse strip, complete in place.

Milled shoulder corrugations will be measured in accordance with 606.02.

402.20 Basis of Payment

The accepted quantities for this work will be paid for at the contract unit price per ton (megagram) for HMA, of the type specified complete in place.

HMA rumble strips will be paid for at the contract unit price per linear foot (meter), of each transverse strip complete in place.

410

Milled shoulder corrugations will be paid for in accordance with 606.03.

Payment will be made under:

Pay Item	Pay Unit Symbol
HMA Surface, Type ____*	TON (Mg)
HMA Intermediate, Type ____*	TON (Mg)
420 HMA Base, Type ____*	TON (Mg)
HMA Rumble Strips.....	LFT (m)
HMA for Temporary Pavement, Type ____*	TON (Mg)
HMA Wedge and Level, Type ____*	TON (Mg)
* Mixture type	

Preparation of surfaces to be overlaid shall be included in the cost of other pay items in this section.

430 No payment will be made for additional anti-stripping additives.

The cost of removing and replacing soft yielding areas discovered by proofrolling shall be included in the cost of other pay items in this section.

No payment will be made for coring operations and related traffic control expenditures required in 402.16.

Corrections for pavement smoothness including removal and replacement of pavement, shall be included in the cost of other pay items in this section.

440 If HMA intermediate over HMA base mixtures are specified, HMA intermediate may be permitted as a substitute for the HMA intermediate and HMA base mixtures upon a written request by the Contractor. The request for the substitution shall be prepared in advance of the work. A computation will be made in order to obtain a unit price for the HMA intermediate. The quantity and amount for HMA intermediate shall equal the sum of the contract quantities and amounts shown for HMA intermediate and HMA base mixtures. The unit price for HMA intermediate shall be equal to the sum of contract amounts divided by the sum of contract quantities. Payment for the HMA intermediate will be made at the unit price per ton (megagram) for HMA intermediate. No payment will be made for additional work or
 450 cost which may result due to this change.

SECTION 403 – COLD MIX ASPHALT, CMA, PAVEMENT

403.01 Description

This work shall consist of the construction of 1 or more courses of CMA base, intermediate, or surface for immediate use or stockpiled in accordance with 105.03.

MATERIALS

403.02 Materials

10 Materials shall be in accordance with the following:

	Asphalt Materials	
	For Immediate Use,	
	Asphalt Emulsion AE -150, AE-90.....	902.01(b)
	For Stockpiling,	
	Asphalt Emulsion AE-150	902.01(b)
	Course Aggregates.....	904
	Base, Class D or Higher	
	Intermediate, Class C or Higher	
20	Surface, Class B or Higher	
	Fine Aggregates.....	904

Acceptance of the mixture will be in accordance with the Frequency Manual on the basis of a type D certification in accordance with 916.

CONSTRUCTION REQUIREMENTS

403.03 Weather Limitations

30 CMA pavements shall not be placed on a wet surface, when the ambient temperature is below 40°F (4°C), or when other unsuitable conditions exist, unless approved by the Engineer.

403.04 Equipment

Mixing plant, hauling trucks, pavers, and rollers shall be in accordance with 409.

403.05 Preparation of Mixtures

The size of the aggregate and the grade of asphalt materials shall be as specified. The gradations and percent of asphalt shall be as follows.

COMPOSITION LIMITS FOR CMA MIXTURES						
Sieve Size	Total % of Aggregates Passing Sieves Based on Total Weight (Mass) of Aggregates					
	Size 2	Size 5	Size 8	Size 9	Size 11	Size 5D
2.5 in. (63 mm)	100					
2 in. (50 mm)	95-100					
1.5 in. (37.5 mm)		100				100
1 in. (25 mm)	0-25	85-100	100			80-99
3/4 in. (19.0 mm)	0-10	60-90	75-100	100		68-90
1/2 in. (12.5 mm)	0-7	30-65	40-75	65-90	100	54-76
3/8 in. (9.5 mm)		15-50	20-55	30-65	75-100	45-67
No. 4 (4.75 mm)		0-20	0-20	0-20	10-35	30-50
No. 8 (2.36 mm)		0-15	0-15	0-15	0-15	20-45
No. 30 (600 μm)						7-28
No. 200 (75 μm)	0-5	0-5	0-5	0-6	0-6	0-6
Minimum % Crushed	95	95	95	95	95	95
% of Asphalt*	2.0-3.5	2.5-4.0	3.0-4.5	3.5-5.0	4.0-6.0	3.5-5.0

* Percent of asphalt shall be calculated on the basis of the total weight (mass) of the mixture, exclusive of water or solvent. When slag is used, the asphalt content will be adjusted to compensate for the specific gravity and surface area.

40

The moisture condition of the aggregate shall be such that the aggregate is uniformly coated and satisfactorily retains the required amount of asphalt during the stockpiling, hauling, and spreading operations. Mixtures shall not be produced at temperatures exceeding 180°F (80°C).

403.06 Preparation of Subgrade or Base

Mixtures for CMA base may be placed on an earth subgrade, on an existing pavement surface to be used as a base, or on a previously prepared base or subbase as specified. If such material is to be laid on a newly prepared subgrade, then all applicable requirements of 207 shall apply.

403.07 Spreading Mixture

The CMA mixture shall be spread in accordance with 402.13.

403.08 Curing

All CMA mixtures shall be allowed to cure sufficiently to prevent undue distortions under the roller wheels.

When a CMA mixture is allowed to cure under traffic, the surface shall be maintained and all damaged areas shall be satisfactorily repaired.

60

MATERIALS

404.03 Asphalt Material

The type and grade of asphalt material shall be in accordance with the following:

Asphalt Emulsion, RS-2, AE-90, AE-90S, or HFRS-2 902.01(b)

20

404.04 Cover Aggregate

Aggregate shall be in accordance with the following requirements. When slag is used as an alternate to natural aggregate, adjustments will be made in accordance with 904.01, to compensate for differences in specific gravity.

Coarse Aggregates, Class B or Higher

Size No. 8, 9, 11, or 12 904

Fine Aggregate, Size No. 23 or 24 904

30

The types of seal coats shall be as follows:

Type (see Note 1)	Application	Cover Aggregate Size No. and Course	Rates of Application Per sq yd (m ²)	
			Aggregate lb (kg)	Asphalt Material, Gal. (L) at 60°F (16°C)
1 or 1P (see Note 2)	Single	23, 24	12-15 (5.4-6.8)	0.12-0.16 (0.45-0.61)
2 or 2P	Single	12	14-17 (6.4-7.7)	0.29-0.33 (1.09-1.25)
3 or 3P	Single	11	16-20 (7.3-9.1)	0.36-0.40 (1.36-1.51)
4 or 4P	Single	9	28-32 (12.7-14.5)	0.63-0.68 (2.38-2.57)
5 or 5P	Double	Top – 12	16-19 (7.3-8.6)	0.33-0.37 (1.25-1.40)
		Bottom – 11	16-20 (7.3-9.1)	0.36-0.40 (1.36-1.51)
6 or 6P	Double	Top – 11	18-22 (8.2-10.0)	0.41-0.46 (1.55-1.74)
		Bottom – 9	28-32 (12.7-14.5)	0.63-0.68 (2.38-2.57)
7 or 7P	Double	Top – 11	18-22 (8.2-10.0)	0.41-0.46 (1.55-1.74)
		Bottom – 8	28-32 (12.7-14.5)	0.63-0.68 (2.38-2.57)

Note 1 – AE-90S shall be used for Type P Seal Coats.

Note 2 – HFRS-2 shall not be used with Type 1 Seal Coat.

CONSTRUCTION REQUIREMENTS

404.05 Weather Limitations

Asphalt material shall not be applied on a wet surface, or when other weather conditions would adversely affect the seal coat. Seal coat shall not be placed when the ambient or pavement temperature is below 60°F (15°C). Seal coat shall not be applied to travel lanes or auxiliary lanes before May 1 or after October 1, but may be applied to shoulders within the above temperature range.

404.06 Equipment

A distributor, rotary power broom, pneumatic tire roller, and aggregate spreader in accordance with 409.03 shall be used.

404.07 Preparation of Surface

Surfaces to be sealed shall be patched as shown on the plans or as directed, brought to proper section and grade, and compacted.

The surface shall be cleaned of all loose material prior to seal coat application. Sealing operations may not commence until the surface is approved.

All castings, detector housings, and snowplowable raised pavement markers shall be covered prior to applying the asphalt material to prevent coating with seal coat. These coverings shall be removed prior to opening to unrestricted traffic.

404.08 Applying Asphalt Material

Asphalt material shall be applied in a uniform continuous spread over the section to be treated. The quantity of asphalt material to be applied per square yard (square meter) shall be in accordance with the QCP. During application, minor adjustments to the application rate shall be made in accordance with the QCP.

The asphalt material shall not be spread over a greater area than that which can be covered with the cover aggregate that is in trucks at the site.

The spread of the asphalt material shall be no wider than the width covered by the cover aggregate from the spreading device. Operations shall not proceed such that asphalt material is allowed to chill, set up, dry, or otherwise impair retention of the cover coat.

404.09 Application of Cover Aggregate

Within 1 min of the application of the asphalt material, cover aggregate shall be spread in quantities as required. Spreading shall be accomplished such that the tires of the trucks or aggregate spreader do not contact the uncovered and newly applied asphalt material.

404.10

404.10 Rolling Operation

The aggregate shall be seated with at least 3 roller applications. A roller application is defined as 1 pass of the roller over the width sealed. The 1st roller application shall be completed within 2 min of aggregate application, with the final application completed within 30 min after the cover aggregate is applied. The rollers shall not be operated at speeds that will displace the cover aggregate from the asphalt material.

404.11 Sweeping Operation

Excess cover aggregate shall be removed from the pavement surface by brooming no later than the morning after placement of the seal coat. The brooming shall not displace the imbedded aggregate. A 2nd brooming operation shall be performed prior to opening to unrestricted traffic in accordance with 101.33.

90

404.12 Protection of Surface

Traffic shall not be permitted on the freshly sealed surfaces until final rolling application is complete. The seal coat shall be protected by keeping traffic off of the freshly sealed surface or by controlling traffic speed in accordance with the QCP. Traffic shall not displace the imbedded aggregate.

Any areas with minor bleeding will be covered with fine aggregate or other approved blotting material.

404.13 Method of Measurement

Seal coat will be measured by the square yard (square meter) of the seal coated surface.

100

Patching will be measured in accordance with 304.06.

404.14 Basis of Payment

Seal coat will be paid for at the contract unit price per square yard (square meter) complete in place.

110 Patching will be paid for in accordance with 304.07.

Payment will be made under:

Pay Item	Pay Unit Symbol
Seal Coat, _____ type	SYS (m2)
Seal Coat, _____ P type	SYS (m2)

120

The cost of determination of asphalt material and cover aggregate application rates, sweeping and rolling operations, blotting material, and other incidentals shall be included in the cost of the pay items.

The Contractor shall adjust application rates as required by the Engineer within the limits set out herein. No additional payment will be made for additional materials necessary to meet the required application rates within the specified limits.

SECTION 405 – PRIME COAT

405.01 Description

This work shall consist of preparing and treating a rubblized PCCP with asphalt material in accordance with 105.03.

MATERIALS

405.02 Asphalt Materials

10 The type and grade of asphalt material shall be in accordance with the following:

Asphalt Emulsion, AE-PMP..... 902.01(b)

405.03 Cover Aggregate

Aggregate shall be in accordance with the following:

Coarse Aggregate, Class B or Higher,
 Size No. 12 904
 20 Fine Aggregate, Size No. 23 or 24 904

CONSTRUCTION REQUIREMENTS

405.04 Weather Limitations

Asphalt material shall not be applied on a wet surface, when the ambient temperature is below 50°F (10°C), or when other unsuitable conditions exist, unless approved by the Engineer.

405.05 Equipment

30 A distributor and aggregate spreader in accordance with 409.03 shall be used.

405.06 Preparation of Surface

The existing surface to be treated shall be shaped to the required grade and section, free from all ruts, corrugations, or other irregularities; uniformly compacted; and approved.

405.07 Application of Asphalt Material

AE-PMP shall be uniformly applied at the rate of 0.50 to 0.75 gal./sq yd (2.2 to 3.3 L/m²) placed in a single application. When placing material on a rubblized base, a carpet drag shall be utilized behind the distributor.

When traffic is to be maintained within the limits of the section, approximately 1/2 of the width of the section shall be treated in 1 application. Complete coverage of the section shall be ensured. Treated areas shall not be opened to traffic until the asphalt material has been absorbed.

405.08 Cover Aggregate

If the asphalt material fails to penetrate and the primed surface must be used by traffic, cover aggregate shall be spread to provide a dry surface.

50

405.09 Method of Measurement

Asphalt for prime coat will be measured by the ton (megagram), or by the square yard (square meter). Cover aggregate will be measured by the ton (megagram).

405.10 Basis of Payment

The accepted quantities of prime coat will be paid for at the contract unit price per ton (megagram), or per square yard (square meter) for asphalt for prime coat. The accepted quantities of cover aggregate will be paid for at the contract unit price per ton (megagram), complete in place.

Payment will be made under:

Pay Item	Pay Unit Symbol
Asphalt for Prime Coat.....	TON (Mg) SYS (m2)
Cover Aggregate, Prime Coat.....	TON (Mg)

SECTION 406 – TACK COAT

406.01 Description

This work shall consist of preparing and treating an existing pavement or concrete surface with asphalt material in accordance with 105.03.

MATERIALS

406.02 Materials

The type and grade of asphalt material shall be in accordance with the following:

10

Asphalt Emulsion, AE-T, AE-PMT, SS-1h..... 902.01(b)

PG Asphalt Binder, PG 64-22 902.01(a)

CONSTRUCTION REQUIRMENTS

406.03 Equipment

A distributor in accordance with 409.03(a) shall be used.

20

406.04 Preparation of Surface

The existing surface to be treated shall be free of foreign materials deemed detrimental by the Engineer.

406.05 Application of Asphalt Material

The asphalt material shall be uniformly applied at the rate of from 0.03 to 0.08 gal./sq yd (0.14 to 0.36 L/m²), or as otherwise specified or directed.

30 Tack coat shall not be applied to a wet surface. The rate of application, temperature, and areas to be treated shall be approved prior to application. Excessive tack coat shall be corrected to obtain an even distribution.

406.06 Method of Measurement

Asphalt for tack coat will be measured by the ton (megagram) or by the square yard (square meter).

406.07 Basis of Payment

40 The accepted quantities of tack coat will be paid for at the contract unit price per ton (megagram), or per square yard (square meter) for asphalt for tack coat, complete in place.

Payment will be made under:

Pay Item	Pay Unit Symbol
Asphalt for Tack Coat	TON (Mg) SYS (m2)

SECTION 407 – DUST PALATIVE

407.01 Description

This work shall consist of preparing and treating an existing aggregate surface with asphalt material in accordance with 105.03.

MATERIALS

407.02 Asphalt Material

10 The type and grade of asphalt material shall be in accordance with the following:

Asphalt Emulsion, AE-PL 902.01(b)

CONSTRUCTION REQUIREMENTS

407.03 Weather Limitations

Asphalt material shall not be applied on a wet surface, when the ambient temperature is below 50°F (10°C), or when other unsuitable conditions exist, unless approved by the Engineer.

407.04 Equipment

A distributor in accordance with 409.03(a) shall be used.

407.05 Preparation of Surface

The surface to be treated shall be shaped to the required section and be free from all ruts, corrugations, or other irregularities.

407.06 Application of Asphalt Material

The asphalt material shall be uniformly applied at the rate of 0.25 to 1 gal./sq yd (1.5 to 5 L/m²) in a uniform continuous spread over the section to be treated or as directed.

When traffic is to be maintained within the limits of the section, approximately 1/2 of the width of the section shall be treated in 1 application. Complete coverage of the section shall be ensured. Treated areas shall not be opened to traffic until the asphalt material has been absorbed.

407.07 Method of Measurement

Asphalt for dust palative will be measured by the ton (megagram).

407.08 Basis of Payment

The accepted quantities of this work will be paid for at the contract unit price per ton (megagram) for asphalt for dust palative, complete in place.

Payment will be under:

Pay Item	Pay Unit Symbol
Asphalt for Dust Palative.....	TON (Mg)

SECTION 408 – SEALING CRACKS AND JOINTS

408.01 Description

This work shall consist of sealing longitudinal and transverse cracks and joints in existing asphalt pavement in accordance with 105.03.

MATERIALS

408.02 Materials

10 Materials shall be in accordance with the following:

Asphalt Binder for Crack Sealing, PG 64-22	902.01(a)
Asphalt Emulsion for	
Crack Sealing, AE-90, AE-90S, AE-150.....	902.01(b)
Fine Aggregates, No. 23 or 24.....	904
Joint Sealing Materials	906.02

CONSTRUCTION REQUIREMENTS

20 408.03 Equipment

A distributor in accordance with 409.03 shall be used when crack sealing and an indirect-heat double boiler kettle with mechanical agitator shall be used when routing and filling. Air compressors shall be capable of producing a minimum air pressure of 100 psi (690 kPa).

408.04 Weather Limitations

Sealing or filling operations shall not be conducted on a wet surface, when the ambient temperature is below 40°F (4°C), or when other unsuitable conditions exist, unless approved by the Engineer.

30

408.05 Routing and Filling Cracks and Joints

Cracks and joints shall be routed when specified, with a routing machine capable of cutting a uniform shape to form a reservoir not exceeding 3/4 in. (19 mm) wide with a minimum depth of 3/4 in. (19 mm). The operation shall be coordinated such that routed materials do not encroach on pavement lanes carrying traffic and all routed materials are disposed of in accordance with 104.07. Cracks and joints shall be filled with hot poured joint sealant to within 1/4 in. (6 mm) of the surface in accordance with the manufacturer's recommendations.

40 408.06 Sealing Cracks and Joints

Cracks and joints shall be cleaned by blowing with compressed air or by other suitable means. Asphalt material shall be placed utilizing a “V” shaped wand tip, to allow the penetration of the materials into the cracks and joints. The cracks and joints shall be completely filled or overbanded not to exceed 5 in. (125 mm), or as required. All excess asphalt material shall be removed from the pavement. The sealed cracks and joints shall be covered with sufficient fine aggregate to prevent

408.07

tracking of the asphalt materials. All excess cover material shall be removed from the pavement.

50 Application of asphalt materials shall be completed without covering existing pavement markings. When traffic is to be maintained within the limits of the section, temporary traffic control measures in accordance with 801 shall be used. Treated areas shall not be opened to traffic until the asphalt material has been absorbed.

408.07 Method of Measurement

Sealing and filling of cracks and joints in asphalt pavements will be measured by the ton (megagram) of material used. Routing of cracks and joints will not be measured.

60 Temporary traffic control measures will be measured in accordance with 801.17.

408.08 Basis of Payment

Sealing and filling of cracks and joints in asphalt pavements will be paid for by the ton (megagram) of material used for the type specified.

Temporary traffic control measures will be paid for in accordance with 801.18.

Payment will be made under:

70	Pay Item	Pay Unit Symbol
	Cracks and Joints in Asphalt Pavement, Seal	TON (Mg)
	Cracks and Joints in Asphalt Pavement, Rout and Seal	TON (Mg)

The cost of all materials, cover aggregate, cleaning, and all necessary incidentals shall be included in the cost of the pay items in this section.

SECTION 409 – EQUIPMENT

409.01 Production, Transportation, and Laydown of Asphalt Mixtures

For production of asphalt mixtures, the Contractor shall provide all equipment necessary for the production, transportation, and laydown operations.

409.02 Mixing Plant

The mixing plant shall be capable of producing a uniform mixture.

10 (a) **Certified HMA Plant**

A certified HMA plant shall be in accordance with ITM 583.

(b) **CMA Mixing Plant**

The mixing plant shall be of sufficient capacity and coordination to adequately handle the proposed CMA construction. The mixing unit shall be a twin shaft

pugmill or other approved mixer, including the drum type capable of producing a consistent uniform mixture. The outlet of the mixer shall be such that it prevents segregation of the material when discharged.

- 20 A certified HMA plant in accordance with 409.02(a) may be utilized as a CMA mixing plant.

409.03 HMA Laydown Operations

(a) Distributor

The distributor shall be equipped, maintained, and operated to provide uniform heating and application rates as specified. The distributor shall have a volume measuring device and a thermometer to monitor the asphalt material.

- 30 Distributors shall also be equipped with a power unit for the pump and with a full circulation spray bar with vertical controls.

(b) Hauling Equipment

The mixtures shall be transported to the laydown operation in trucks that have tight, clean, and smooth beds.

- 40 Truck beds may be treated with approved anti-adhesive agents. The truck beds shall be raised after application of non-foaming anti-adhesive agents to drain liquids from the bed prior to HMA being loaded into the truck. The Department will maintain a list of approved Anti-Adhesive Materials.

Hauling equipment shall be equipped with a watertight cover to protect the mixture.

(c) Laydown Equipment

1. Paver

- 50 The paver shall be self-propelled, and equipped with a material receiving system, and equipped with heated and vibrating screeds. The paver may also include automatic slope and grade controls, extendable screeds and extendable augers.

Automatic control devices shall be separated from the paver screeds, paver tracks or wheels and be capable of adjusting both sides of the screeds automatically to maintain a constant angle of attack in relation to the grade leveler device or grade line.

A grade leveling system may be used to activate the control devices on each HMA course, including matching lays. The leveling system shall be attached to the paver and operated parallel to the paver's line of travel.

60

Extendable screeds shall be rigid, heated, and vibrating, and be capable of maintaining the cross slope, and line and grade of the pavement, to produce uniform placement of the materials.

Auger extensions shall be used when required to distribute the HMA uniformly in front of the screed.

2. Widener

70 A device capable of receiving, transferring, spreading, and striking off materials to the proper grade and slope.

3. Other Mechanical Devices

Inaccessible or short sections of HMA may be placed with specialty equipment approved by the Engineer.

(d) Compaction Equipment

80 Compaction equipment shall be self-propelled, steel wheel or pneumatic tire types, in good condition, and capable of reversing direction without backlashing. All roller wheels shall be equipped with scrapers to keep the wheels clean, have water spraying devices on the wheels, and steering devices capable of accurately guiding the roller.

1. Tandem Roller

A roller having 2 axles and a minimum weight (mass) of 10 t (9 Mg).

2. Three Wheel Roller

90 A roller having 3 wheels with a minimum bearing of 300 lb/in. (5.3 kg/mm) on the rear wheels. The crown of the wheels shall not exceed 2.5 in. (63 mm) in 18 ft (5.5 m).

A tandem roller which has a drive wheel bearing of no less than 300 lb/in. (5.3 kg/mm) may be used in lieu of the 3 wheel roller.

3. Pneumatic Tire Roller

100 A pneumatic tire roller shall have a minimum rolling width of 5.5 ft (1.7 m). The roller shall be equipped with compaction tires, minimum size 7:50 by 15, exerting a uniform, average contact pressure from 50 to 90 psi (345 to 620 kPa) uniformly over the pavement by adjusting ballast and tire inflation pressures. The wheels on at least 1 axle shall be fully oscillating vertically, and mounted as to prevent scuffing of the pavements during rolling or turning operations. Charts or tabulations showing the contact areas and pressures for the full range of tire inflation pressures and for the full range of tire loadings for each compactor shall be furnished to the Engineer.

4. Vibratory Roller

A vibratory roller shall be equipped with a variable amplitude system, a speed control device, and have a minimum vibration frequency of 2,000 vibrations per min. A reed tachometer shall be provided for verifying the frequency of vibrations.

5. Trench Roller

- 110 A trench roller shall have a compaction wheel bearing of no less than 300 lb/in. (5.3 kg/mm).

6. Specialty Roller/Compactor

Inaccessible or short sections of HMA may be compacted with specialty equipment approved by the Engineer.

(e) Miscellaneous Equipment

1. Aggregate Spreader

- 120 A spreader shall be a self-propelled, pneumatic tired, motorized unit with a front loading hopper and a transportation system for distributing the aggregates uniformly across the pavement.

2. Rotary Power Broom

A motorized, pneumatic tired unit with rotary bristle broom head.

(f) Smoothness Equipment

1. Profilograph

- 130 The profilograph shall be in accordance with ITM 912.

2. Straightedge – 16 ft (4.9 m)

A 16 ft (4.9 m) straightedge shall be a rigid beam mounted on 2 solid wheels on axles 16 ft (4.9 m) apart. The straightedge has a mounted push bar to facilitate propelling the device along or across the pavement. Tolerance points are located at the 1/4, 1/2, and 3/4 points and may be composed of threaded bolts capable of being adjusted to the tolerance required.

3. Straightedge – 10 ft (3 m)

- 140 A 10 ft (3 m) straightedge is the same as a 16 ft (4.9 m) straightedge except that the wheels are mounted 10 ft (3 m) apart. A handheld rigid beam may be substituted.

**SECTION 410 – QUALITY CONTROL/QUALITY ASSURANCE, QC/QA,
HMA SURFACE – SMA PAVEMENT**

410.01 Description

This work shall consist of 1 course of QC/QA HMA Surface – SMA mixture constructed on prepared foundations in accordance with 105.03.

410.02 Quality Control

10 The SMA mixture shall be supplied from a certified HMA plant in accordance with ITM 583; **Certified Hot Mix Asphalt Producer** Program. The QCP shall be modified to include the requirements for the SMA mixtures. The SMA shall be transported and placed according to a Quality Control Plan, QCP, prepared and submitted by the Contractor in accordance with ITM 803; Contractor Quality Control Plans for Hot Mix Asphalt Pavements. The QCP shall be submitted to the Engineer at least 15 days prior to commencing SMA paving operations.

MATERIAL

410.03 Materials

20 Materials shall be in accordance with the following:

Asphalt Materials	
PG Binder, PG 76-22, PG 70-22	902.01(a)
Coarse Aggregates, Class AS	904
Fibers	AASHTO M 325
Fine Aggregates (sand, mineral filler)	904

410.04 Design Mix Formula

30 A design mix formula, DMF, shall be prepared in accordance with 410.05 and submitted in a format acceptable to the Engineer 1 week prior to use. The DMF shall state the maximum particle size in the mixture. The DMF shall state the calibration factor, test temperature and absorption factors to be used for the determination of binder content using the ignition oven in accordance with ITM 586, the binder content by extraction in accordance with ITM 571, and a Mixture Adjustment Factor, MAF. The DMF shall state the source, type dosage rate of any stabilizing additives. Approval of the DMF will be based on the ESAL and mixture designation. A mixture number will be assigned by the Engineer. No mixture will be accepted until the DMF has been approved.

40 The ESAL category identified in the pay item correlates to the following ESAL ranges:

ESAL CATEGORY	ESAL
1	< 300,000
2	300,000 to < 3,000,000
3	3,000,000 to < 10,000,000
4	10,000,000 to < 30,000,000
5	≥ 30,000,000

410.05 SMA Mix Design

The DMF shall be determined for each mixture from a SMA mix design by a design laboratory selected from the Department's list of approved Mix Design Laboratories. A SMA mixture shall be designed in accordance with AASHTO M 325 and R 46.

- 50 The single percentage of aggregate passing each required sieve shall be within the limits of the following gradation table.

SMA GRADATION CONTROL LIMITS (Percent Passing By Volume)				
Sieve Size	Mixture Designation			
	9.5 mm		12.5 mm	
	Lower	Upper	Lower	Upper
25.0 mm				
19.0 mm			100.0	100.0
12.5 mm	100.0	100.0	90.0	99.0
9.5 mm	70.0	95.0	50.0	85.0
4.75 mm	30.0	50.0	20.0	40.0
2.36 mm	20.0	30.0	16.0	28.0
1.18 mm	---	21.0	---	---
600 μm	---	18.0	---	---
300 μm	---	15.0	---	---
75 μm	8.0	12.0	8.0	11.0

The optimum binder and aggregate gradation content shall produce 4.0% air voids. The maximum specific gravity shall be mass determined in water in accordance with AASHTO T 209. The percent draindown for SMA surface mixture shall not exceed 0.30% in accordance with AASHTO T 305.

- 60 The MAF equals the Gmm from the mixture design divided by the following: 2.465 for 9.5 mm mixtures and 2.500 for 12.5 mm mixtures. If the MAF calculation results in a value where $0.980 \leq \text{MAF} \leq 1.020$, then the MAF shall be considered to be 1.000. If the MAF is greater than 1.020, the calculated MAF value shall have 0.020 subtracted from the value. If the MAF is less than 0.980, the calculated MAF value shall have 0.020 added to the value. The MAF does not apply to OG mixtures.

The mixture shall be tested for moisture susceptibility in accordance with AASHTO T 283 except that the loose mixture curing shall be replaced by mixture conditioning for 2 h in accordance with AASHTO R 30. The minimum tensile strength ratio, TSR, shall be 70%. The 6 in. (150 mm) mixture specimens shall be compacted to $6.0 \pm 1.0\%$ air voids in accordance with AASHTO T 312. Specimens shall be prepared using freeze-thaw preconditioning. If anti-stripping additives are added to the mixture to be in accordance with the minimum TSR requirements, the dosage rate shall be submitted with the DMF.

The fine aggregate portion of the aggregate blend shall be non-plastic as determined in accordance with AASHTO T 90.

A change in the source or types of aggregates, change in source or type of stabilizing additives, or a change in the source of the specified binder shall require a new DMF. A new DMF shall be submitted to the **District Testing Engineer** for approval 1 week prior to use.

The specific gravity of SF and the Gsb of the aggregate blend containing SF may be adjusted once per contract upon notification by the SF source and approval by the **District Testing Engineer**. A new DMF is not required for this adjustment.

The mixture design compaction temperature for the specimens shall be $300 \pm 9^\circ\text{F}$ ($150 \pm 5^\circ\text{C}$).

VOIDS IN MINERAL AGGREGATE (VMA) CRITERIA	
Mixture Designation	Minimum VMA, Percent
12.5 mm	17.0
9.5 mm	17.0

410.06 Recycled Materials

Recycled materials may consist of reclaimed asphalt pavement, RAP, or reclaimed asphalt shingles, RAS or a blend of both. RAP shall be the product resulting from the cold milling or crushing of an existing HMA pavement. The RAP shall be processed so that 100% will pass the 2 in. (50 mm) sieve when entering the HMA plant. RAS shall be 100% passing the 1/2 in. (12.5 mm) sieve. RAP shall be 100% passing the 3/8 in. (9.5 mm) sieve and 95 to 100% passing the No. 4 (4.75 mm) sieve.

Recycled materials may be used as a substitute for a portion of the new materials required to produce SMA mixtures. The amount of total binder replaced by binder in the recycled material shall be computed as follows:

$$\text{Binder Replacement, \%} = \frac{(A \times B) + (C \times D)}{E} \times 100\%$$

where:

110

- A = RAP, % Binder Content
- B = RAP, % in Mixture
- C = RAS, % Binder Content
- D = RAS, % in Mixture
- E = Total, % Binder Content in Mixture

120

RAS may be obtained from either pre-consumer or post-consumer asphalt shingles. Post-consumer asphalt shingles shall be in accordance with AASHTO MP 15 and prepared by a processing company with an IDEM Legitimate Use Approval letter. A copy of this letter shall be submitted to the Engineer. Deleterious material present in post-consumer asphalt shingles shall be limited to the percentages stated in AASHTO MP 15. Pre-consumer and post-consumer asphalt shingles shall not be blended for use in SMA mixtures and shall be stockpiled separately from other materials.

The recycled material percentages shall be as specified on the DMF. SMA mixtures utilizing recycled materials shall be limited to the binder replacement percentages in the following table:

SMA mixtures utilizing RAP or RAS or a blend of RAP and RAS

MAXIMUM BINDER REPLACEMENT, %		
SMA Surface		
Mixture Category	12.5 mm	9.5 mm
1	40.0*	40.0*
2	40.0*	40.0*
3	15.0	15.0
4	15.0	15.0
5	15.0	15.0

* RAS materials shall not contribute more than 25% by weight (mass) of the total binder content for any HMA mixture.

130

The combined aggregate properties shall be in accordance with 904. The combined aggregate bulk specific gravity shall be determined in accordance with ITM 584 and the combined aggregate gradation shall be in accordance with 410.05 for the SMA mixture specified.

SMA mixtures with a binder replacement less than or equal to 25.0% by weight (mass) of the total binder content by utilizing RAP or RAS or a blend of RAP and RAS materials shall use the specified binder grade.

140

SMA mixtures with a binder replacement greater than 25.0% and less than or equal to 40.0% by weight (mass) of the total binder content by utilizing RAP or a blend of RAP and RAS shall use a binder grade with upper and lower temperature classifications reduced by 6°C from the specified binder grade. RAS materials shall

not contribute more than 25.0% by weight (mass) of the total binder content for any SMA mixture.

410.07 Lots and Sublots

150 Lots will be defined as 2,400 t (2,400 Mg) of SMA surface mixture. Lots will be further sub-divided into sublots not to exceed 600 t (600 Mg) of SMA surface mixture. Partial sublots of 100 t (100 Mg) or less will be added to the previous subplot. Partial sublots greater than 100 t (100 Mg) constitute a full subplot.

410.08 Job Mix Formula

A job mix formula, JMF, shall be developed by a certified HMA producer in accordance with ITM 583. A JMF used for SMA mixture the current or previous calendar year will be allowed. The mixture compaction temperature shall be $300 \pm 9^{\circ}\text{F}$ ($150 \pm 5^{\circ}\text{C}$). The JMF for each mixture shall be submitted to the Engineer.

410.09 Acceptance of Mixtures

160 Acceptance of mixtures for binder content and gradation for each lot will be based on tests performed by the Engineer. The Engineer will randomly select the location within each subplot for sampling in accordance with ITM 802. An acceptance sample will consist of 1 plate sample at the random location. A backup sample will consist of 1 plate sample located 2 ft (0.6 m) towards the center of the mat from the acceptance sample.

Samples from each location shall be obtained from each subplot from the pavement in accordance with ITM 580. The Engineer will take immediate possession of the samples.

170

A maximum specific gravity sample and a binder content and gradation sample will be obtained from the plate sample in accordance with ITM 587. The binder content will be determined in accordance with ITM 586 or ITM 571 as directed by the Engineer and the gradation will be determined in accordance with AASHTO T 30. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209. The test results of the sublots will be averaged and shall meet the requirements for tolerances from the JMF for each sieve and binder content.

180 The Engineer's acceptance test results for each subplot will be available after the subplot and testing are complete. During the adjustment period the test results will be made available after testing is complete.

ACCEPTANCE TOLERANCE FOR MIXTURES (Percent Mass)							
Mixture	Number of Tests	Sieve Size					
Surface		*12.5 mm	*9.5 mm	*4.75 mm	2.36 mm	600 μm	75 μm
	1				8.0	4.0	2.5
	2				5.7	2.8	2.1
	3				4.6	2.3	1.8
	4				4.0	2.0	1.5
* The acceptance tolerance for this sieve shall be the applicable composition limits specified in 410.05.							

ACCEPTANCE TOLERANCE FOR BINDER				
Binder Content	Number of Tests			
	1	2	3	4
% Binder	0.7	0.5	0.4	0.3

Acceptance of mixtures for range will be determined using the results of subplot tests performed by the Engineer from each lot. If the range is not in accordance with the requirements, adjustment points will be assessed in accordance with 410.19(a).

ACCEPTANCE TOLERANCE FOR RANGE (\pm Percent Mass)	
Sieve Size and Binder Content	Percentage Points
	Surface
2.36 mm	12.0
600 μm	6.0
75 μm	2.0
% Binder	1.0

190

Acceptance tolerances for binder content and gradation will be as set out above for the number of tests performed. The acceptance tolerance for range will be as set out above for lots of more than 1 subplot. The range of binder shall be the difference between the highest subplot binder content and the lowest subplot binder content in 1 lot. The range of gradation shall be the difference between the highest subplot percent passing and the lowest subplot percent passing each required sieve in 1 lot.

Single test values and averages will be reported to the nearest 0.1%. Rounding will be in accordance with 109.01(a).

200

Lot adjustment points will be assessed in accordance with 410.19(a) when the average or range for binder content or gradation are not met.

The Contractor may request an appeal of the Engineer's test results in accordance with 410.20.

410.10

A binder draindown test in accordance with AASHTO T 305 shall be completed once per lot in accordance with 410.07 and shall not exceed 0.30%.

210 Stabilizing additives incorporated into the mixture will be accepted on the basis of a type A certification for the specified material properties for each shipment of fibers. Stabilizing additives from different manufacturers and different types of additives shall not be intermixed.

In the event than an acceptance sample is not available to represent subplot(s), all test results of the previous subplot will be used for acceptance. If the previous subplot is not available, the subsequent subplot will be used for acceptance.

CONSTRUCTION REQUIREMENTS

220

410.10 General

Equipment for SMA operations shall be in accordance with 409. The Contractor shall submit to the Engineer prior to use a written Certificate of Compliance that the proposed paving equipment has been modified in accordance with 401.10 or is new and includes the modifications.

Fuel oil, kerosene, or solvents shall not be transported in open containers on equipment. Cleaning of equipment and small tools shall not be accomplished on the pavement or shoulder areas.

230

Segregation, flushing or bleeding of SMA mixtures will not be permitted. Corrective action shall be taken to prevent continuation of these conditions. Segregated, flushed or bleeding of SMA mixtures shall be removed if directed. All areas showing an excess or deficiency of binder shall be removed and replaced.

All mixtures that become loose and broken, mixed with dirt, or is in any way defective shall be removed and replaced.

410.11 Preparation of Surfaces to be Overlaid

240

Milling of an existing pavement surface shall be in accordance with 306.05. Surfaces on which a mixture is placed shall be free from objectionable or foreign materials at the time of placement.

Milled asphalt surfaces and asphalt surfaces shall be tacked in accordance with 406. Contact surfaces of curbing, gutters, manholes, and other structures shall be tacked in accordance with 406.

410.12 Process Control

250

The Engineer and Contractor will jointly review the operations to ensure compliance with the QCP. Continuous violations of compliance with the QCP will result in suspension of paving operations.

410.13 Weather Limitations

SMA courses shall be placed when the ambient temperature and the temperature of the surface on which it is to be placed is 45°F (7°C) or above.

410.14 Spreading and Finishing

260 The mixture shall be placed upon an approved surface by means of a paver or other mechanical devices in accordance with 409.03. Mixtures in areas inaccessible to mechanical devices may be placed by other methods.

Prior to paving, both the planned quantity and lay rate shall be adjusted by multiplying by the MAF. When mixture is produced from more than one DMF or JM for a given pay item, the MAF will be applied to the applicable portion of the mixture for each.

270 Planned SMA courses greater than 220 lb/sq yd (120 kg/m²) placed under traffic, shall be brought up even with each adjacent lane at the end of each work day. Planned SMA courses less than or equal to 220 lb/sq yd (120 kg/m²) shall be brought forward concurrently, within practical limits, limiting the work in 1 lane to not more than 1 work day of production before moving back to bring forward the adjacent lane.

Hydraulic extensions on the paver will not be permitted for continuous paving operations. Fixed extensions or extendable screeds shall be used on courses greater than the nominal width of the paver except in areas where the paving widths vary. Hydraulic extensions may be used in tapers and added lanes less than 250 ft (75 m) in length.

280 Automatic slope and grade controls will be required and shall be outlined in the QCP.

SMA mainline and SMA shoulders which are 8 ft (2.4 m) or more in width shall be placed with automatic paving equipment.

290 The rollers shall be operated to avoid shoving of the SMA and at speeds not to exceed 3 mph (4.8 km/h). Rollers shall be in accordance with 409.03(d)1, 2, or 6. Vibratory rollers meeting the requirements of 409.03(d)4 may be used but shall not be operated in vibratory mode, except the vibratory mode may be used on the 1st pass to the paver.

The finished thickness of any course shall be at least 2 times but not more than four times the maximum particle size as shown on the DMF.

410.15 Joints

Longitudinal joints in the surface shall be at the lane lines of the pavement.

410.16

300 Transverse joints shall be constructed by exposing a near vertical full depth face of the previous course. For areas inaccessible to rollers, other mechanical devices shall be used to achieve the required density.

If constructed under traffic, temporary transverse joints shall be feathered to provide a smooth transition to the driving surface.

410.16 Density

Acceptance will be based on lots and sublots in accordance with 410.07.

310 The Engineer's acceptance test results for each subplot will be available after the subplot and testing are complete.

Sublot and lot density values will be reported to the nearest 0.1%. Rounding will be in accordance with 109.01(a).

320 Density acceptance for all SMA mixtures shall be based on cores cut from the compacted pavement and analysis of pavement samples obtained in accordance with ITM 580. Acceptance will be based on lots and sublots in accordance with 410.07. The Engineer will randomly select 2 locations in accordance with ITM 802, within each subplot for coring. The transverse core location will be located so that the edge of the core will be no closer than 3 in. (75 mm) from a confined edge or 6 in. (150 mm) from a non-confined edge of the course being placed. The maximum specific gravity will be determined from the sample obtained in 410.09.

The Contractor shall obtain cores in the presence of the Engineer with a device that shall produce a uniform 6 in. (150 mm) diameter pavement sample. Surface courses shall be cored within 1 work day of placement. Damaged core(s) shall be discarded and replaced with a core from a location selected by adding 1 ft (0.3 m) to the longitudinal location of the damaged core using the same transverse offset.

330 The Contractor and the Engineer shall mark the core to define the course to be tested. If the core indicates a course thickness of less than 2 times the maximum particle size, the core will be discarded and a core from a new random location will be selected for testing.

The Engineer will take immediate possession of the cores. If the Engineer's cores are subsequently damaged, additional coring within a specific subplot or sublots will be the responsibility of the Department. Subsequent core locations will be determined by subtracting 1 ft (0.3 m) from the random location using the same transverse offset.

340 The density of the mixture will be expressed as the percentage of maximum specific gravity, %MSG, obtained by dividing the average bulk specific gravity by the maximum specific gravity for the subplot, times 100. Samples for the bulk specific gravity and maximum specific gravity will be dried in accordance with ITM 572.

The Engineer will determine the BSG of the cores in accordance with AASHTO T 166, Method A. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209. The target value for density of SMA mixtures of each subplot shall be 93.0%.

350 The Engineer will determine the bulk specific gravity of the cores in accordance with AASHTO T 166, Method A. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209. Density shall not be less than 92.0%.

The densities of the sublots will be averaged to determine the density of the lot.

Within 1 work day of coring operations the Contractor shall clean, dry, and refill the core holes with SMA of similar or smaller size particles or other approved materials. The Contractor's plan for refilling core holes shall be outlined in the QCP.

360 **410.17 Shoulder Corrugations**

Shoulder corrugations shall be in accordance with 606.

410.18 Pavement Smoothness

The pavement smoothness will be evaluated and determined in accordance with 401.18.

410.19 Adjusted Points

370 When test results for mixture properties or density exceed the allowable tolerances, adjustment points will be assessed. The adjustment points will be used to calculate a quality assurance adjustment quantity, q, for the lot. Quality assurance adjustment points for smoothness will be in accordance with 401.19(c).

The adjustment for mixture properties and density are calculated as follows:

$$q = 1.00 \times (L \times U \times P/100)/MAF$$

where:

380 q = quality assurance adjustment quantity
 L = lot quantity
 U = unit price for the material, \$/ton (\$/Mg)
 P = total adjustment points

The total quality assurance adjustments is to be calculated as follows:

$$Q = Q_s + \sum (q_m + q_d)$$

where:

410.19

390

- Q = total quality assurance adjustment quantity
- Q_s = quality assurance adjustment for smoothness as calculated in 401.19(c)
- q_m = lot adjustments for mixtures
- q_d = lot adjustments for density

If the total adjustment points for a lot are greater than 15, the pavement will be evaluated by the **Office of Materials Management**. If the Contractor is not required to remove the mixture, quality assurance adjustments of the lot will be assessed or other corrective actions as determined by the **Office of Materials Management**.

400

(a) Mixture

When test results for the mixture furnished exceeded the allowable tolerances, adjustment points will be assessed as follows:

ADJUSTMENT POINTS FOR GRADATION						
Adjustment Points	Sieve Size					
	12.5 mm	9.5 mm	4.75 mm	2.36 mm	600 μm	75 μm
For each 0.1% up to 1.0% Out of Tolerance	0.1	0.1	0.1	0.1	0.2	0.3
For each 0.1% > 1.0% Out of Tolerance	0.1	0.1	0.1	0.2	0.3	0.6

Gradation adjustment points for the lot shall be the sum of points calculated for up to 1% out of tolerance and the points calculated for greater than 1% out of tolerance in accordance with 410.09.

410

Binder content adjustment points for the lot shall be 2 points for each 0.1% above the tolerance or 4 points for each 0.1% below the tolerance in accordance with 410.09.

When test results for the mixture furnished exceed the allowable range in accordance with 410.09, adjustment points will be assessed as follows:

ADJUSTMENT POINTS FOR RANGE	
Sieve Size and Binder Content	Adjustment Points (For each 0.1% Out of Range)
2.36 mm	0.1
600 μm	0.1
75 μm	0.1
% Binder	1.0

For mixtures produced during a certified HMA plant's adjustment period, adjustment points will not be assessed if the mixture produced is in accordance with the following.

420

1. The gradation complies with 410.05 with the allowable tolerance limits shown in 410.09.
2. The range for the binder content and gradation do not exceed the limits shown in 410.09.
3. The binder content is within the tolerance requirements of 410.09.

430 If the mixture is not in accordance with these requirements, adjustment points will be assessed in accordance with 410.09 for variations exceeding the requirements shown above.

(b) Density

When the density of the lot is outside the allowable tolerances, adjustment points will be assessed as follows:

DENSITY	
Percentages are based on %MSG	Pay Adjustments – Percent
> 97.0	Submitted to the Office of Materials Management*
93.0 – 97.0	0.00
92.0 – 92.9	0.20 points for each 0.10% below 93.0
91.0 – 91.9	2.00 + 0.40 points for each 0.10% below 92.0
89.0 – 90.9	6.00 + 1.00 points for each 0.10% below 91.0
≤ 89.0	Submitted to the Office of Materials Management*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.	

410.20 Appeals

440 If the QC test results do not agree with the acceptance test results, a request, along with the QC test results, may be made in writing for additional testing. Additional testing may be requested for one or more of the following tests: binder content, gradation, or MSG of the mixture samples and bulk specific gravity of the density cores. The appeal request shall be submitted within 7 calendar days of receipt of the Department's written results for that subplot. The request for the appeal for MSG, BSG of the density cores or binder content and gradation shall be submitted within 7 calendar days of receipt of the Department's written results for that subplot. The subplot and specific tests shall be specified at the time of the appeal request. Only 1 appeal request per subplot is permitted. Upon approval of the appeal, the Engineer will perform additional testing.

450

The appeal results will replace all previous test results for acceptance of mixture in accordance with 410.09 and density in accordance with 410.16. The results will be furnished to the Contractor. The backup mixture samples or density cores will be tested in accordance with the following:

(a) MSG

The backup MSG will be dried in accordance with ITM 572 and mass determined in water in accordance with AASHTO T 209.

460

(b) Binder Content and Gradation

The backup binder content and gradation sample will be prepared and tested in accordance with the test methods that were used for acceptance.

(c) BSG of the Density Core

Cores shall be taken within 7 calendar days unless otherwise directed. Additional core locations will be determined by adding 1 ft (0.3 m) longitudinally of the cores tested using the same transverse offset. The cores will be dried in accordance with ITM 572 and tested in accordance with AASHTO T 166, Method A.

470

The Contractor shall clean, dry, and refill the core holes with SMA or HMA surface materials within 1 work day of the coring operations.

410.21 Method of Measurement

SMA mixtures will be measured by the ton (megagram) of the type specified, in accordance with 109.01(b). The measured quantity will be divided by the MAF to determine the pay quantity.

410.22 Basis of Payment

480

The accepted quantities for this work will be paid for at the contract unit price per ton (megagram) for QC/QA-HMA, of the type specified, – SMA, complete in place.

Payment for furnishing, calibrating, and operating the profilograph, and furnishing profile information will be made in accordance with 401.22.

490

Adjustments to the contract payment with respect to mixture, density, and smoothness for mixture produced will be included in a quality assurance adjustment pay item. The unit price for this pay item will be \$1.00 and the quantity will be in units of dollars. The quantity is the total calculated in accordance with 410.19. A change order developed in accordance with 109.05 will be prepared to reflect contract adjustments.

Payment will be made under:

Pay Item	Pay Unit Symbol
QC/QA-HMA, _____, _____, _____, _____ mm TON (Mg)
(ESAL ⁽¹⁾) (PG ⁽²⁾) (Course ⁽³⁾) (Mix ⁽⁴⁾)	
Quality Assurance Adjustment.....	DOL

500

(1) ESAL Category as defined in 410.04

- (2) Number represents the high temperature binder grade. Low temperature grades are -22
- (3) Surface
- (4) Mixture Designation

Preparation of surfaces to be overlaid shall be included in the cost of other pay items within this section.

510 Coring and refilling of the pavement holes shall be included in the cost of other pay items within this section.

No payment will be made for additional anti-stripping additives, appeal coring or related traffic control expenditures for coring operations.

Corrections for pavement smoothness shall be included in the cost of other pay items within this section.

520 The price for profilograph, HMA will be full compensation regardless of how often the profilograph is used or how many profilograms are produced.