

400 FLEXIBLE PAVEMENT

ITEM 416 – ASPHALT CONCRETE, CONTRACTOR MIX DESIGN

- 416.01 Description**
- 416.02 Composition**
- 416.03 JMF Field Adjustments (Job Mix Formula)**
- 416.04 Production Quality Control**
- 416.05 Testing Facilities**
- 416.06 Required Quality Control Tests**
- 416.07 Quality Control Deficiencies**

416.01 Description. These specifications include general requirements applicable to all types of plant mix bituminous pavements where the Contractor is responsible for establishing the mix design. Deviations from these general requirements will be covered in the specific requirements for each type mix, with the exception that Section 401.12 "Rollers" does not apply for this Item. Unless otherwise authorized by the Director or the Inspecting Authority, this section will be limited to Main Arterial and Collector Streets.

The general plant mix pavement specifications, 401, shall apply; deviations from these are as follows:

416.02 Composition. Prior to producing bituminous mixtures, the Contractor shall submit a proposed JMF for each combination of aggregates in writing to the Laboratory for review and approval. The optimum percentage of bituminous material selected for each JMF shall be based on the results of the specified tests evaluated, insofar as practicable, as recommended in Section 3.13 of the Asphalt Institute Manual Series No. 2. The optimum percentage of bituminous material shall be that percentage which yields 3 to 5 percent air voids, provided that the other requirements of Table B are met. A 5-point mix design with 2-points above and 2-points below the optimum AC content is required. For each JMF submitted, the Contractor shall include certified test data to demonstrate that mixtures conforming to the proposed JMF will have properties as specified.

The gradation requirements of 703.05 for fine aggregate shall not apply.

The JMF shall propose definite single values for:

1. The percentage (in units of one percent) of aggregate passing each specified sieve, except the No. 200 sieve (75 μ m), based on the dry weight of aggregate.
2. The percentage (in units of one-tenth of one percent) of aggregate passing the No. 200 sieve (75 μ m), based on the dry weight of aggregate.

3. The percentage (in units of one-tenth of one percent) of bituminous material to be added, based on the total weight of mixture.

The following general composition limits are extreme ranges within which the JMF must be established.

**TABLE A
JMF LIMITS**

Sieve	Percent Passing	
	<i>Surface</i>	<i>Intermediate</i>
1-1/2 inch (38 mm)		100
1 inch (25 mm)		95 - 100
3/4inch (19 mm)		85 - 100
1/2 inch (13 mm)	100	65 - 85
3/8 inch (9.5 mm)	90 - 100	
No. 4 (4.75 mm)	50 - 72	35 - 60
No. 8 (2.36 mm)	30 - 55	25 - 48
No. 16 (1.18 mm)	17 - 40	16 - 36
No. 30 (600 μm)	12 - 30	12 - 30
No. 50 (300 μm)	5 - 20	5 - 18
No. 100 (150 μm)	2 - 12	2 - 10
Bitumen (Percent of Total Mix)	5.0 - 10.0	4.0 - 9.0

Mixtures shall have properties as listed in Table B below. Criteria for Medium Traffic Volumes shall be used unless otherwise specified. *In addition to 401.01, the Contractor may use more than 10 percent of reclaimed asphalt concrete pavement or reclaimed bituminous aggregate base, if the reclaimed pavement is included in the mix design process to establish the Job Mix Formula (JMF) in accordance with Item 416.*

**TABLE B
PROPERTIES OF MIXTURES
FOR LIGHT TRAFFIC VOLUMES
TYPE I**

Property	Test Method	Acceptable Range of Values	
		Min.	Max.
Stability, lb. (N)	AASHTO T 245, 35 Blow	750 (3336)	—
Flow, 0.01 in. (0.25 mm)	AASHTO T 245, 35 Blow	8	18

Percent air voids	Supplement 1036 (ODOT)	3.0	5.0
Voids in mineral aggregate (VMA)	Supplement 1037 (ODOT)		
	"Surface"	15.5	
	"Intermediate"	12.5	

FOR MEDIUM TRAFFIC VOLUMES

TYPE II

Property	Test Method	Acceptable Range of Values	
		Min.	Max.
Stability, lb. (N)	AASHTO T 245, 50 Blow	1200 (5338)	—
Flow, 0.01 in. (0.25 mm)	AASHTO T 245, 50 Blow	8	16
Percent air voids	Supplement 1036 (ODOT)	3.0	5.0
VMA	Supplement 1037 (ODOT)		
	"Surface"	15.5	
	"Intermediate"	12.5	

FOR HEAVY TRAFFIC VOLUMES

TYPE III

Property	Test Method	Acceptable Range of Values	
		Min.	Max.
Stability, lb. (N)	AASHTO T 245, 75 Blow	1800 (8006)	
Flow, 0.01 in. (0.25 mm)	AASHTO T 245, 75 Blow	8	14
Percent air voids	Supplement 1036 (ODOT)	3.0	5.0
VMA	Supplement 1037 (ODOT)		
	"Surface"	15.5	
	"Intermediate"	12.5	

416.03 JMF Field Adjustments. It is the intent of this specification that the Contractor produce a mixture of uniform composition closely conforming to the approved JMF to assure that the mixture when compacted will achieve the specified properties in place.

If during production, the city determines from the results of their quality control tests, including daily plant Marshall specimens, that adjustments are necessary to the mix design to achieve the specified properties in place, it will be the sole responsibility of the Contractor to make the necessary adjustments.

Adjustment of the JMF to conform to actual production, without a redesign of the mixture, shall be limited to plus or minus 3 percent passing the No. 4 sieve (4.75 mm), except that the adjusted JMF shall not exceed the limits in Table A.

If adjusting the gradation or bitumen content does not correct the problem, production shall cease and the Contractor shall redesign the mix.

Should a redesign of the mixture become necessary, a new JMF shall be submitted in accordance with the requirements for the initial JMF.

416.04 Production Quality Control. The *Contractor* shall furnish and carry out a Quality Assurance/Quality Control Program prior to the start of production. The primary purpose of the program will be to provide assurance to the Engineer that the mixture delivered to the paving site is in reasonable conformance with the specification requirements and can be incorporated in the work with satisfactory results. *The submittal shall include the names and qualifications of the individuals carrying out the Quality Assurance/Quality Control Program.*

416.05 Testing Facilities. Suitable space shall be provided at the plant site for use by the city's quality control personnel to perform *verification tests in accordance with 401.051.*

416.06 Required Quality Control Tests. The *Contractor* shall determine the bitumen content of a sample of asphalt concrete by performing a minimum of one AC Gauge or Solvent Extraction test every 4 hours of production for all drum mix plants and batch plants. This testing shall be performed in accordance with applicable ASTM or AASHTO specifications.

The gradation of the aggregate in the asphalt concrete shall be controlled by performing one gradation analysis every 4 hours of production on samples obtained in one of the following ways:

1. Hot bin sample from a batch plant.
2. Dry batch from a batch plant
3. Sample of the combined virgin aggregate from the moving cold feed belt on a drum mix plant using a sampling device approved by the Laboratory.
4. Sample of the aggregate remaining after removing the bitumen with a pre-qualified solvent from an asphalt concrete sample.

A minimum of one set of 3 Marshall specimens shall be made per 750 tons (682 metric tons) or fraction thereof. In-place density requirements will be in accordance with Section 401.151.

TABLE C

Mix Characteristic	Specification Limits
Bitumen Content (deviation from JMF)	-0.3% to +0.3%
No. 4 (4.75 mm) sieve (deviation from JMF)	-5.0% to +5.0%
Air Voids (percent of MTD)	3.0% to 5.0%
Additional testing of any type shall be at the city's option.	

416.07 Quality Control Deficiencies. The Quality Assurance Program shall operate to assure the Engineer that the mixture delivered to the paving site is in reasonable conformance with specification requirements and can be incorporated into the work with satisfactory results, as previously stated.

416.08 Basis of Payment. Payment for accepted quantities, complete in place, will be made at the contract price for:

Item	Unit	Description
416	Ton (Metric Ton)	Asphalt Concrete, <i>Contractor Mix Design, Type</i> ____

