

HOT MIX ASPHALT (TYPE HS)

COMPOSITION

The bituminous plant *High Stability* (Type HS) mix shall be composed of a mixture of well graded aggregate, filler if required, and bituminous material. The aggregate constituents shall be sized, handled in separate size groups, and combined in such proportions to that the resulting mixture meets the grading requirements of the job mix formula (JMF).

The Contractor shall submit in writing to the Engineer a complete mix design meeting the requirements of the Special Provisions herein. Mix designs submitted for review shall have been performed within one year from award of contract.

MATERIALS

BITUMINOUS MATERIAL. The asphalt binder shall be steam-refined paving asphalt conforming to the grade specified in the Special Provisions.

Paving Asphalt. The paving asphalt shall be PG 70-10 conforming to the requirements of Caltrans Standard Specifications Section 92. If the Engineer requires a polymer modified binder for use, the paving asphalt shall be either PG 64-28PM or PG 76-22PM (as specified by the Engineer) conforming to the requirements of the Caltrans Standard Specifications Section 92. Maximum mix temperature during HMA production shall not exceed 325 degrees F.

AGGREGATE. Aggregates shall consist of crushed stone or crushed gravel with or without sand or other inert finely divided mineral aggregate. The portion of the material retained on the No. 4 sieve is course aggregate, the portion passing the No. 4 sieve and retained on the No. 200 sieve is fine aggregate, and the portion passing the No. 200 sieve is mineral filler.

Coarse Aggregate. Coarse aggregate shall consist of sound, durable particles, free from adherent films of matter that would prevent thorough coating and bonding with bituminous material and be free of organic matter and other deleterious substances.

Coarse aggregate shall meet the Aggregate Physical Properties Requirements of Table 1.

TABLE 1. COARSE AGGREGATE PHYSICAL PROPERTIES		
Property	Test Method	Design Criteria
LA Abrasion (500 Revs)	CT 211	35 % max.
Two Fractured Faces	CT 205	90 % min.
Flat and Elongated Particles (1 to 3 ratio)	ASTM D-4791*	20 % max.

* Based on 3/8" sieve and above

Fine Aggregate. Fine aggregate shall consist of clean sound, durable, angular shaped particles, produced by crushing stone or gravel. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter and shall contain no clay balls.

Natural (non-manufactured) washed sand may be used as a portion of the fine aggregate to obtain the gradation of the JMF or to improve workability of the mix.

Fine aggregate shall meet the Aggregate Physical Properties Requirements of Table 2.

TABLE 2. FINE AGGREGATE PHYSICAL PROPERTIES		
Property	Test Method	Design Criteria
Plasticity Index	ASTM D-4318	Non Plastic
Sand Equivalent	CT 217	50 min.
Fine Aggregate Angularity	AASHTO T304 Method A	45

RAP

Allow the use of 15% maximum at the Contractor's option. This usage does not require a change in the asphalt binder grade.

JOB MIX FORMULA

LABORATORY MIX DESIGN CRITERIA. The job mix formula will indicate the percentages of each sieve fraction of aggregate, percentage of bitumen by dry weight of aggregate, mix temperature, compaction temperature and physical properties.

The bituminous mixture shall be designed in accordance with the Hveem mix design procedures and shall meet the requirements of Table 3. Laboratory compaction of the mix shall be accomplished at two levels. The temperature of the mix for Level 1 compaction shall be 275 ± 5 degrees F. (for modified binders consult supplier for mixing and compaction temperature). The temperature of the mix for Level 2 compaction shall be 140 ± 5 degrees F. Stability and air void values shall be based on the average of three specimens.

TABLE 3. MIX DESIGN CRITERIA	
Test Property	Design Criteria
Level 1 Stabilometer Value, minimum HVEEM Stability (150 tamps) (CT 366)	40
Level 2 Stabilometer Value, minimum HVEEM Stability of (650 total tamps)* (CT 366)	35
Asphalt Pavement Analyzer (APA)	ODOT TM 320 Report Only**
Percent Air Voids, Level 1 (ASTM D 2041)	4 - 5
Percent Air Voids, Level 2 (ASTM D 2041)	Report Only**
Percent Voids in Mineral Aggregates***	13 Minimum
Dust / Effective Asphalt Ratio***	NV: 0.8 to 1.6

*Specimens to be fabricated per level 1, cooled to 140 ± 5 degrees F. and compacted with 500 tamps prior to testing. ** Data not required for mix design approval *** Calculated in accordance with Asphalt Institute MS-2 All "Report Only" criteria will be reported to the California Asphalt Pavement Association; PO Box 2798, Sacramento, CA 95812 or HSReport@californiapavements.org

GRADATION AND BINDER CONTENT. The combined mineral aggregate gradation and binder content target values shall conform to the requirements specified in Table 5. During production deviations from the approved target values for aggregate gradation and AC content shall remain within the job mix formula tolerances for individual measurements.

TABLE 5. AGGREGATE GRADATIONS AND ASPHALT CONTENT TARGET VALUES		
Sieve Size	Limits of Proposed Gradation	JMF Tolerance
3/4"	100	0
1/2"	86 - 98	± 5
3/8"	64 - 84	± 6
No. 4	42 - 52	±7
No. 8	29 - 37	±5
No. 16	17 - 25	± 5
No. 30	13 - 19	± 4
No. 200	3 - 8	± 2
Binder Content		± 0.5

For each asphalt concrete mix that is proposed for use the Contractor shall submit a plot of the gradation on a Federal Highway Administration 0.45 power gradation chart. The proposed aggregate gradation shall be free of any "sand hump." "Sand hump" shall be defined as a hump in the grading curve on the No. 8 and/or the No. 30 sieve lines that is 3-percent or more above a straight line drawn from the origin of a 0.45-power gradation chart to the point at which the gradation line crosses the No. 4 sieve.

CONSTRUCTION

COMPACTION.

The density of the in-place pavement shall be determined by the use of a non-destructive density device or cores. If using a non-destructive density device, the device needs to be correlated to cores and the density will be determined by the average of 10 tests (minimum) per 500 tons. If using cores, the density will be determined by using the average of 2 cores (minimum) per 500 ton lot. All test locations shall be determined by an appropriate random sampling method.

If specifying the relative compaction of the pavement, specify a minimum 96% of the laboratory-compacted reference density determined on a daily basis.

If specifying the density of the pavement, specify a minimum of 91% of theoretical (Rice) maximum density determined on a daily basis.