

SECTION 36

PENETRATION TREATMENT

Penetration treatment shall conform to Section 36 of the Caltrans Standard Specifications and these City standard specifications.

SECTION 37

BITUMINOUS SEALS

Bituminous seals shall conform to Section 37 of the Caltrans Standard Specifications and these City Standard Specifications.

37-1 SEAL COATS

37-1.01 Description. - Delete paragraph 3 of Subsection 37-1.01.

37-1.02 Materials. - Fog seal coat is specified in Subsection 37-3 of this section. If not designated in the special provisions: Aggregates shall be Medium type (1/4" x No. 10 screenings), and asphaltic emulsion for either single coat or double coat applications shall be Rapid-Setting type, grade CRS2 in accordance with Section 94, "Asphaltic Emulsions" of these City Standard Specifications

Aggregate screenings shall be damp at time of application. Salvaged screenings shall not be used in the work.

37-1.05 Applying Asphaltic Emulsion. - The fifth, sixth, seventh, and eleventh paragraphs of Section 37-1.05 of the Caltrans Standard Specifications shall not apply.

Asphaltic emulsion shall be applied to only one designated traffic lane at a time and the entire width of the lane shall be covered in one operation.

Under no circumstance shall the length of spread of asphaltic emulsion be greater than can be immediately covered by the screenings, nor shall the operations proceed in such a manner that the binder material will be allowed to chill, set up, dry, or otherwise impair retention of the screenings.

Delete 13th paragraph of Subsection 37-1.05.

37-2 SLURRY SEAL

37-2.01 Slurry Seal. - This work shall consist of mixing asphalt emulsion, aggregate, set control additives, and water and spreading the mixture on a surfacing or pavement where shown on the plans, as specified in these special provisions, and as directed by the Engineer. The requirements in Subsections 37-2.01 through 37-2.06 of Section 37-2, "Slurry Seal," of the Caltrans Standard Specifications shall not apply.

37-2.02 Materials. - The materials for slurry seal immediately prior to mixing shall conform to the following requirements.

37-2.02A Asphaltic Emulsion. - Asphaltic emulsion shall be quick-setting Type CQS1h grade conforming to the requirements of these special provisions and Section 94, "Asphaltic Emulsions," of these City Standard Specifications.

37-2.02B Water and Additives. - Water shall be of such quality that the asphalt will not separate from the emulsion before the slurry seal is in place in the work. If necessary for workability, a set-control agent that will not adversely affect the slurry seal, may be used.

37-2.02C Aggregate. - Aggregate shall consist of rock dust and other sands or other sands of similar nature, except that 100 percent of any aggregate or combination of aggregate, larger than the No. 50 sieve size, used in the mix shall be obtained by crushing rock. The material shall be free from vegetable matter and other deleterious substances. All aggregate shall be free of caked lumps and oversized particles.

The aggregate, prior to the addition of emulsion, shall conform to the requirements of this section. Conformance with the grading requirements will be determined by California Test 202, modified by California Test 105 when there is a difference in specific gravity of 0.2 or more between blends of different aggregates.

- (1) Type II Aggregate - The percentage composition by weight of the aggregate shall conform to the following grading:

<u>Sieve Size</u>	<u>Percentage Passing</u>
3/8	100
No. 4	94-100
No. 8	65-90
No. 16	40-70
No. 30	25-50
No. 200	5-15

The aggregate shall conform to the following additional quality requirements:

<u>Test</u>	<u>California Test</u>	<u>Requirement</u>
Sand Equivalent	217	55 minimum
Durability Index	229	55 minimum

- (2) Type III Aggregate - The percentage composition by weight of the aggregate shall conform to the following grading:

<u>Sieve Size</u>	<u>Percentage Passing</u>
3/8"	100
No. 4	70-90
No. 8	45-70
No. 16	28-50
No. 30	19-34
No. 200	5-15

The aggregate shall conform to the following additional quality requirement:

<u>Test</u>	<u>California Test</u>	<u>Requirement</u>
Sand Equivalent	217	60 minimum
Durability Index	229	55 minimum

If the results of the aggregate grading do not meet gradation specified, the slurry seal represented by such test shall be removed. However, if requested in writing by the Contractor and approved by the Engineer, the slurry seal may remain in place and the Contractor shall pay to the City \$1.75 per ton for such aggregate left in place.

If the result of the Sand Equivalent test for aggregate does not meet the requirement specified, the slurry seal represented by such test shall be removed. However, if requested in writing by the Contractor and approved by the Engineer, the slurry seal may remain in place and the Contractor shall pay to the City \$1.75 per ton for such aggregate left in place.

When the results of both the aggregate grading and the Sand Equivalent test do not conform to the requirements specified, both payments to the City shall apply. The Department may deduct these amounts from any monies due, or that may become due, the Contractor under the contract. No single aggregate grading or sand equivalent test shall represent more than 300 tons or one day's production, whichever is smaller.

37-2.03 Mix Design. - At least 7 working days before slurry seal placement commences, the Contractor shall submit to the Engineer for approval a laboratory report of tests and proposed mix design covering the specific materials to be used on the project. The percentage of asphaltic emulsion proposed in the mix design shall be within the percentage range specified in "Proportioning" in this section of the special provisions.

The tests and mix design shall be performed by a laboratory capable of performing the applicable International Slurry Seal Association (ISSA) tests. The proposed slurry seal mixture shall conform to the requirements specified when tested in accordance with the following tests:

<u>Test</u>	<u>Designation</u>	<u>Requirement</u>
Cohesion Test	ASTM D3910	20 Kg -cm within 1 hour (b)
Wet Track Abrasion	ASTM D3910 *	75 grams per square foot maximum

* California Test 355 may be used for Type II Slurry Seal.

- (a) Mixing test must pass at the maximum expected air temperature at the project site during application.

- (b) Using project source aggregate and asphaltic emulsion and set control agents if used.

The original laboratory report shall be signed by the laboratory that performed the tests and mix design and shall show the results of the test on individual materials, comparing their values to those required by the specifications. The report shall clearly show the proportions of aggregate, filler (minimum and maximum), water (minimum and maximum), asphalt solids content based on the dry weight of aggregate and set-control agent usage. Previous laboratory reports covering the same materials may be accepted provided they are made during the same calendar year.

Once the proportions of materials to be used are approved by the Engineer, no substitution of other material will be permitted unless the materials proposed for substitution are first tested and a laboratory report is submitted for the substituted design as specified above. Substituted materials shall not be used until the mix design for those materials is approved by the Engineer.

37-2.04 Proportioning. - Aggregate, asphaltic emulsion, water, and additives, including set-control agent if used, shall be proportioned by volume utilizing the mix design approved by the Engineer. If more than one kind of aggregate is used, the correct amount of each kind of aggregate to produce the required grading shall be proportioned separately, prior to adding the other materials of the mixture, in a manner that will result in a uniform and homogeneous blend.

The completed mixture, after addition of water and any set-control agent used, shall be such that the slurry seal mixture has proper workability and (a) will permit a traffic flow, without pilot-car-assisted traffic control, on the slurry seal within 1 hour after placement without the occurrence of bleeding, raveling, separation or other distress, and (b) will prevent development of bleeding, raveling, separation or other distress within 15 days after placing the slurry seal.

Asphaltic emulsion shall be added at a rate of between 10 to 15 percent by weight of the dry aggregate. The quantity of asphaltic emulsion to be used in the slurry seal mixture will be determined from the design asphalt binder content, as approved by the Engineer, and the asphalt solids content of the asphaltic emulsion furnished.

The Contractor shall furnish an aggregate moisture determination for every two hours of operation or maintain the moisture content to within a maximum daily variation of ± 0.5 percent.

The aggregate shall be proportioned using a belt feeder operated with an adjustable cutoff gate. The height of the gate opening shall be readily determinable. The emulsion shall be proportioned by a positive displacement pump. Any variable rate emulsion pump, if used, shall be equipped with a means to seal the adjusting unit in its calibrated condition. Water shall be introduced into the mixer by a meter registering in gallons delivered.

Uniformity of distribution of asphalt will be determined by extraction test in accordance with California Test 310. The bitumen ratio (pounds of asphalt per 100 pounds of dry aggregates) shall not vary more than 0.5 pounds of asphalt above or 0.5 pound of asphalt below the amount approved by the Engineer. This requirement shall apply to representative samples taken from any location or operation designated by the Engineer.

The delivery rate of aggregate and emulsion per revolution of the aggregate feeder shall be calibrated at the appropriate gate settings for each mixer-spreader

truck used on the project in accordance with California Test 109 and the requirements of these special provisions.

The aggregate belt feeder shall deliver aggregate to the pugmill with such volumetric consistency that the deviation for any individual aggregate delivery rate check-run shall not exceed 2.0 percent of the mathematical average of three runs of at least 3 tons in duration each. The emulsion pump shall deliver emulsion to the pugmill with such volumetric consistency that the deviation for any individual delivery rate check-run shall be within 2.0 percent of the mathematical average of three runs of at least 500 gallons in each duration.

These check-runs shall be performed for each aggregate source using a vehicle scale that has been error tested in accordance with California Test 109.

The emulsion storage located immediately before the emulsion pump shall be equipped with a device which will automatically shut down the power to the emulsion pump and aggregate belt feeder when the emulsion level is lowered sufficiently to expose the pump suction line.

A temperature-indicating device shall be installed in the emulsion storage tank at the pump suction level. The device shall indicate temperature of the emulsion and shall be accurate to $\pm 5^\circ$ F.

The belt delivering the aggregate to the pugmill shall be equipped with a device to monitor the depth of aggregate being delivered to the pugmill. Said device for monitoring depth of aggregate shall automatically shut down the power to the aggregate belt feeder whenever the depth of aggregate is less than 70 percent of the target depth flow. A second device shall be located where it will monitor movement of the aggregate belt by detecting revolutions of the belt feeder. The device for monitoring no flow or belt movement, as the case may be, shall automatically shut down the power to the aggregate belt when aggregate belt movement is interrupted. This second device will not be required where the aggregate delivery belt is an integral part of its drive chain.

To avoid erroneous shutdown by normal fluctuation, a delay of 3 seconds between sensing less than desirable storage levels of aggregate or emulsion and shutdown of the proportioning operation will be permitted.

37-2.05 Mixing and Spreading Equipment. - The slurry seal shall be mixed in continuous pugmill mixers of adequate size and power for the type of slurry seal to be placed. All indicators required in the section entitled "Proportioning" shall be in working order prior to commencing mixing and spreading operations.

Mixers-spreader trucks shall be equipped to proportion emulsion, water, aggregate, and set-control additives by volume. All rotating and reciprocating equipment on mixer-spreader trucks shall be covered with metal guards.

The mixer-spreader truck shall not be operated unless all low-flow and no-flow devices and revolution counters are in good working condition and functioning and all metal guards are in place. All indicators required by these special provisions shall be visible while walking alongside the mixer-spreader truck.

Aggregate feeders shall be connected directly to the drive on the emulsion pump. The drive shaft of the aggregate feeder shall be equipped with a revolution counter reading to the nearest full revolution of the aggregate delivery belt.

At least two operational spreader trucks shall be available at the jobsite during the spreading operation except when continuous placement type mixer-spreader trucks are used.

In addition to the requirements of the fourth paragraph of Section 5-1.10, "Equipment and Plants", the identifying number of mixer-spreader trucks shall be at least 2 inches in height, located on the front and rear of the vehicle.

The slurry mixture shall be spread by means of a controlled spreader box conforming to the following requirements:

The spreader shall be capable of spreading a traffic lane width and shall have strips of flexible rubber belting or similar material on each side of the spreader box and in contact with the pavement to positively prevent loss of slurry from the ends of the box. All spreader boxes over 7-1/2 feet in width shall have baffles, reversible motor driven augers, or other suitable means, to insure uniform application on superelevated sections and shoulder slopes. Spreader box skids shall be maintained in such manner as to prevent chatter (wash boarding) in the finished mat.

Rear flexible strike-off blades shall make close contact with the pavement, and shall be capable of being adjusted to the various crown shapes so as to apply a uniform slurry seal coat.

Flexible drags, to be attached to the rear of the spreader box, shall be provided as directed by the Engineer. All drags and strike-off blades (rubbers) shall be cleaned or changed daily if problems with cleanliness and longitudinal scouring occur.

The spreader box shall be clean, free of all slurry seal and emulsion, at the start of each work shift.

Slurry mixture, to be spread in areas inaccessible to the controlled spreader box, may be spread by other approved methods.

37-2.06 Placing - The slurry mixture shall be uniformly spread on the existing surfacing within the rate specified without spotting, rehandling or otherwise shifting of the mixture.

Slurry seal shall not be placed when the existing pavement temperature is below 50° F. or during unsuitable weather.

Before placing the slurry seal, the pavement surface shall be cleaned by sweeping, flushing or other means necessary to remove all loose particles of paving, all dirt and all other extraneous material.

Slurry seal mixture shall be spread at a rate within 20 to 25 pounds of dry aggregate per square yard. The exact rate will be as determined by the Engineer. The completed spread shall be within 10 percent of the rate determined by the Engineer.

Longitudinal joints shall correspond with the edges of traffic lanes. The Engineer may permit other patterns of longitudinal joints, if such patterns will not adversely affect the quality of the finished product, as determined by the Engineer.

All through driving lanes shall be spread in full lane width pulls only. Longitudinal joints, common to two driving lanes, shall be butt joints with overlaps not to exceed 3 inches. Building paper shall be placed at transverse joints, over previously placed slurry seal, or other suitable methods used to avoid double placement of slurry seal. Hand tools shall be available in order to remove spillage. Ridges or bumps in the finished surface will not be permitted.

The mixture shall be uniform and homogenous after spreading on the surfacing and shall not show separation of the emulsion and aggregate after setting.

Adequate means shall be provided to protect the slurry seal from damage by traffic until such time that the mixture has cured sufficiently so that the slurry seal will not adhere to and be picked up by the tires of vehicles.

37-3 FOG SEAL COAT

37-3.01 Description. - This work shall consist of furnishing and applying emulsified asphalt or cationic maltenes emulsion as a fog seal coat as shown on the plans, as specified in these specifications and as directed by the Engineer.

37-3.02 Materials. - Fog seal coat shall be grade SS1 asphaltic emulsion or cationic maltenes emulsion, as specified in the special provisions or on the plans, in accordance with Section 94, "Asphaltic Emulsions" of these standard specifications.

37-3.03 Maintaining Traffic. - At locations where public traffic is being routed over a surface upon which a fog seal is to be applied, the fog seal shall not be applied to more than one-half the width of the traveled way at a time, and the remaining width shall be kept free of obstructions and open for use by public traffic until the fog seal first applied is ready for use by traffic.

The contractor shall provide for the passage of public traffic in accordance with the provisions in Section 7-1.08, "Public Convenience," and 7-1.09, "Public Safety" and when directed by the Engineer, traffic shall be routed through the work under one-way control.

37-3.04 Preparation of Surface. - Immediately before applying the fog seal, the surface to be sealed shall be cleaned of all loose and extraneous material.

37-3.05 Application. - Fog seal shall not be applied when weather conditions are unsuitable or when the surface temperature is below 50° F.

Fog seal coat shall be applied in accordance with the provisions of Section 94, "Asphaltic Emulsions," and the provisions of this section.

Grade SS-1 asphalt emulsion shall be diluted with an equal amount of water and sprayed at the rate of 0.05 to 0.2 gallon (of diluted material) per square yard. The exact rate of application will be determined by the Engineer.

Cationic maltenes emulsion shall be diluted with water at the approximate rate of 33 percent of water, by volume of the combined mixture. The diluted mixture of cationic maltenes emulsion shall be spread at the rate of 0.04 to 0.10 gallon per square yard. The exact rate of application will be determined by the Engineer.

Fog seal material shall be applied by means of a pressure distributor in a uniform, continuous spread over the section to be treated and within the temperature range specified for the type of material.

If the cut off of the distributor is not positive, a strip of building paper, at least 3 feet in width and with a length equal to that of the spray bar plus one foot, shall be used at the beginning and end of each spread.

When more than one type of seal coat is to be applied, the fog seal coat shall be applied at least four days in advance of the application of an adjoining seal coat requiring screenings. The seal coats shall be applied in such a manner that the joint between the two types will present a neat and uniform appearance true to the line shown on the typical cross section and as established by the Engineer.

After the application of a fog seal coat, any asphaltic emulsion that becomes tacky shall be sprinkled with water in the amount ordered and as directed by the Engineer, and any cationic maltenes emulsion that fails to penetrate or causes the surface treated to become slippery, shall be blotted with sand in the amount ordered and as directed by the Engineer.

Fog seal shall not be applied to open graded paving courses.

37-3.06 Measurement. - Quantities of seal coat to be paid for will be measured by the ton in accordance with the provisions in Section 94, "Asphaltic Emulsions."

37-3.07 Payment. - The quantities of fog seal will be paid for at the contract unit price per ton unless included in the price of asphalt concrete. The price shall include preparation for treatment, furnishing, mixing and applying the fog seal.

The above price and payment shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying fog seal coat, complete in place, as shown on the plans, and as specified in these specifications and as directed by the Engineer.

Water furnished and applied to tacky emulsion and for mixing with asphaltic emulsion fog seal will not be paid for and full compensation therefor will be considered as included in the contract price paid for the asphaltic emulsion fog seal.

Water furnished for mixing with cationic maltenes emulsion fog seal or sand required for blotter material will not be paid for and full compensation therefor will be considered as included in the contract price paid for the cationic maltenes emulsion fog seal.

No adjustment of compensation will be made for any increase or decrease in the quantity of fog seal material required, regardless of the reason for such. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," shall not apply to the item of fog seal coat.

SECTION 39

ASPHALT CONCRETE

Asphalt concrete shall conform to Section 39 of the Caltrans Standard Specifications and these City Standard Specifications.

39-1.01 Description. - Asphalt concrete is designated as Type A, Type B, Type C, or Open Graded. Type C asphalt concrete shall be as specified in the special provisions. Asphalt concrete is also designated by gradation, according to percentage of crushed particles and sand equivalent of the aggregate (for dense graded mixtures) or according to intended use (for open graded mixes) and by class, according to texture of the mixture. The use of recycled asphalt pavement (RAP) may be permitted at the discretion of the Engineer in type C mixes at a percentage determined by the Engineer not to exceed 15% of total aggregate weight.

Attention is directed to Sections 7-1.11, "Preservation of Property," 7-1.12, "Responsibility for Damage," and 8-1.10, "Utility and Non-Highway Facilities." The Contractor's operations shall be conducted in a manner that existing facilities or improvements will not be harmed or damaged.

At locations where public traffic is routed over the base grade, the Contractor shall plan the paving operations to minimize the delay of traffic.

The Contractor, when required to provide for the passage of public traffic through the work, shall do so in accordance with the provisions of Section 7-1.08, "Public Convenience," and 7-1.09, "Public Safety." The Contractor shall also conform his operations and comply with the provisions of Section 12, "Construction Area Traffic Control Devices."

39-2.02 Aggregate. - Aggregate for asphalt concrete mixtures shall consist of crushed or natural stone, gravel, sand, or other mineral material. The coarse and fine aggregate shall be composed of sound, tough, durable particles.

Approval of sources of supply of aggregate shall be obtained from the Engineer prior to delivery of the material to the plant.

Unless otherwise specified in the special provisions, the aggregate grading of the types of asphalt concrete shall conform to these Standard Specifications.

Type C will conform to 3/4 inch maximum, medium grading.

Unless otherwise shown on the plans or specified in the special provisions, Type B shall be used for the base lift course and for the surface lift course. Should the surface lift course be less than 2 inches in thickness, the type, gradation, and class shall be designated by the Engineer.

In Section 39-2.02 of the Caltrans Standard Specifications, the aggregate grading requirements tables, Types A and B asphalt concrete, for the following gradings, shall be deleted, and replaced with the following tables (all other gradation tables in Section 39 of Caltrans shall remain unchanged):

- 3/4" maximum, coarse
- 3/4" maximum, medium
- 1/2" maximum, coarse
- 1/2" maximum, medium
- 1/2" maximum, fine

In the following tables, the symbol "X" is the percentage based on the job mix formula established by the Engineer, based on aggregate materials and submittals from the Contractor and his supplier.

AGGREGATE GRADING REQUIREMENTS
Type A and B Asphalt Concrete
(Replacement Gradings)
Percentage Passing

Sieve Sizes	Operating Range	Individual Test
3/4" Maximum, Coarse		
1"	100	100
3/4"	90-100	90-100
3/8"	60-75	55-80
No. 4	40-55	35-60
No. 8	27-40	X \pm 5
No. 30	12-22	X \pm 5
No. 200	3-6	X \pm 3

3/4" Maximum, Medium

1"	100	100
3/4"	95-100	90-100
3/8"	65-80	60-85
No. 4	45-60	40-65
No. 8	30-45	X \pm 5
No. 30	15-25	X \pm 5
No. 200	3-7	X \pm 3

1/2" Maximum, Coarse

3/4"	100	100
1/2"	95-100	90-100
3/8"	75-90	70-95
No. 4	50-67	X \pm 5
No. 8	35-50	X \pm 5
No. 30	15-30	X \pm 5
No. 200	4-7	X \pm 3

1/2" Maximum, Medium

3/4"	100	100
1/2"	95-100	90-100
3/8"	80-95	75-100
No. 4	55-72	X \pm 5
No. 8	38-55	X \pm 5
No. 30	18-33	X \pm 5
No. 200	4-8	X \pm 3

Sieve Sizes	Operating Range	Individual Test
1/2" Maximum, Medium		
3/4"	100	100
1/2"	95-100	90-100
3/8"	80-95	75-100
No. 4	55-72	X ± 5
No. 8	38-55	X ± 5
No. 30	18-33	X ± 5
No. 200	4-8	X ± 3

1/2" Maximum, Fine		
3/4"	100	100
1/2"	95-100	92-100
3/8"	80-95	77-100
No. 4	58-75	X ± 5
No. 8	43-60	X ± 5
No. 30	20-35	X ± 5
No. 200	6-12	X ± 3

When the combined grading of coarse and fine aggregates is deficient in material passing the No. 200 sieve, a commercial filler shall be added to the mixture as specified by the Engineer. The amount of commercial filler to be added shall be only that amount necessary to make the combined grading of the materials comply with the grading requirements for the completed mixture. In no case shall the amount of commercial filler added exceed 3 percent by weight of the combined aggregate.

The combined aggregate shall conform to the table in Section 39-2.02 of the Caltrans Standard Specifications except that the results of the Los Angeles Rattler test, loss at 500 revolutions, shall be a maximum of 33 percent for individual test or 30 percent for operating range, for Types A and B asphalt concrete.

Delete paragraph 8 (page 39-5, top) of Section 39-2.02 of the Caltrans Standard Specifications. In lieu thereof, if the results of either or both the aggregate grading and Sand Equivalent tests do not meet the requirements specified for individual test, the Engineer shall seek appropriate remedy as specified in Section 5, "Control of Work."

The asphalt concrete mixture shall conform to the quality requirements specified in Section 39-2.02 of the Caltrans Standard Specifications and to the following additional requirements:

Test	California Test	Asphalt Concrete Type*		Open Graded Asphalt Concrete
		A	B	
Percent Voids	304	2-5	2-5	---
Film Stripping %	302	25	25	25
Swell	**	**	**	0.030"

* Including asphalt concrete base type.

** Covered in Caltrans Standard Specifications.

39-2.02A Job Mix Formula. - A job mix formula shall be established by the Engineer for each designation of asphalt concrete, based on samples of conforming aggregate materials supplied for each source or supplier proposed by the Contractor. Where more than one source or supplier is designated to supply asphalt concrete, those mixes will be kept separated. The mixes will not be intermixed in the same lift or section of pavement. The paving contractor will submit paving plans showing, in advance, where the mixes will be used from each source. This paving plan will be subject to approval by the Engineer. The job mix formula for each classification shall be within the limits as shown in the table below and as specified herein for aggregate grading requirements. The job mix formula will establish a single percentage of aggregate passing each required sieve size, a percentage of asphalt binder to be added to the aggregate, and a single temperature at which the mixture is discharged from the pugmill to the haul vehicle. Contractor may submit a job mix formula and mix design for consideration by the Engineer. Designs must be accompanied by current test results that indicate compliance with these Standard Specifications as well as Special Provisions.

The paving asphalt content of the mixtures will be calculated on percentage basis by weight of dry aggregate. The paving asphalt content for each designation of asphalt concrete shall not be less than the minimum limits given below.

Minimum Asphalt Content (%)

GRADATION AND CLASS		A	TYPE B	OPEN
3/4"	Coarse	4.5	4.5	
	Medium	4.5	4.5	
1/2"	Coarse	5.0	5.0	
	Medium	5.0	5.0	
	Fine	5.4	5.4	
3/8"	-			5.0
1/4"	-			5.5
No. 4	7.0	7.0		

After the job mix formula is established, all asphalt concrete mixtures shall conform to the production tolerances as indicated below. The tolerances as indicated are plus or minus the figures shown below:

SIEVE SIZE (Percent Pass)	TYPE		Open
	A	B	Total Aggregate
No. 4	Weight	Percent	-
No. 8 & 30	7	7	-
No. 200	5	5	-
	3	3	-
	Weight	Percent	Total Mixture
Asphalt Content	0.45	0.45	0.45
Temperature of Mixture	10° F	10° F	10° F

Any variation from the job mix formula greater than the percentage shown shall be investigated, and the conditions causing the variation shall be corrected immediately.

39-2.04 Equipment. - All equipment furnished for the hauling, spreading, and compacting of asphalt concrete mixtures shall be maintained in prime mechanical condition. Equipment that drips fuel, oil or grease shall be removed from the project site until leakage is corrected. Equipment shall be serviced and lubricated away from the paving site.

39-3.01 Storage. - The different aggregate sizes shall be kept separated until they have been delivered to the cold feed elevator feeding the dryer. The storage yard shall be maintained in a neat and orderly fashion and separate stockpiles shall be readily accessible for sampling. Each size of aggregate shall be separately fed by feeders to the cold elevators in proper proportion and at a rate to permit correct and uniform temperature control of the heating and drying operation. The aggregates shall be dried and delivered to the mixer at a temperature between 250°F and 325°F. The temperature between these limits shall be regulated according to the viscosity characteristics of the asphalt, temperature of the atmosphere, and the workability of the mixture. Aggregates in the hot bins shall not contain moisture to an extent to cause the mixture to foam, slump, or segregate during hauling and placing operations.

39-3.01A Cold Storage. - Once the job mix formula is established, based on samples of aggregate submitted by the Contractor, the aggregate at the cold feed to the dryer shall be within the tolerances as set forth below. The tolerance figures in the table are plus or minus the percent passing the sieve of the size indicated.

<u>Sieve Size</u>	<u>Percent</u>
No. 4 & Larger	10
No. 8	5
No. 200	3

39-3.01B Hot Storage. - The gradings of aggregate hot storage shall be as indicated in the following table.

Total Percent Passing by Weight

Sieve Sizes	Bin 4 3/4" x 1/2"	Bin 3 1/2" x 3/8"	Bin 2 3/8" x #8	Bin 1 fine
1"	100	--	--	--
3/4"	75 - 100	100	--	--
1/2"	0 - 25	80 - 100	100	--
3/8"	0 - 15	20 - 65	90 - 100	--
No. 4	--	0 - 15	30 - 60	100
No. 8	--	--	0 - 15	85 - 100
No. 30	--	--	--	35 - 60
No. 200	0 - 2	0 - 2	0 - 6	6 - 14

39-3.03 Proportioning. - Delete paragraph one of Section 39-3.03 of the Caltrans Standard Specifications. The proportions of aggregate and paving asphalt, within the limits specified in the job mix formula, as specified in Section 39-2.02A, "Job Mix Formula," shall be regulated to produce a satisfactory mixture.

The sequence in which several aggregates shall be drawn or weighed may vary under different conditions. The paving asphalt shall be added in an evenly spread sheet over the length of the mixer box in a batch plant, or shall be spread evenly across the mixer box in a continuous mix plant.

39-3.04 Mixing. - The asphalt content of the asphalt mixture may be determined in accordance with ASTM Designation: D 2172 or as specified in Section 39-3.04, "Mixing" of the Caltrans Standard Specifications.

Mixing shall be accomplished in the shortest time that will produce a satisfactory mixture. Mixing time shall be within the following limits:

Batch Plants - 0 to 10 seconds dry mixing followed by 25 to 50 seconds mixing after the addition of the paving asphalt.

Continuous Mix Plants - 25 to 60 seconds based on the formula:

$$\text{Mixing time, s} = \frac{\text{pugmill capacity, lb}}{\text{pugmill output, lb/s}}$$

The Engineer or his authorized representatives shall have access at any time to all parts of the mixing plant to insure the manufacture of asphalt concrete mixtures in strict accordance with these specifications. In order that accurate and sufficiently large samples of aggregate may be obtained from hot storage, easy and safe access shall be provided to the location on the plant where samples may be taken.

39-4.01 Subgrade. - Subgrade preparation shall be in accordance with Section 21, "Subgrade Preparation," of these specifications. Delete Sections 39-4.01 and 39-4.02 of the Caltrans Standard Specifications.

39-5.01 Spreading Equipment. - Pavers shall be capable of spreading and finishing the asphalt concrete true to line, grade, and crown required.

The pavers shall be equipped with quick and efficient steering devices and shall have reverse as well as forward traveling speeds.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with distributing screws of the reversing type to place the mixture uniformly in front of the screed.

The screed shall be equipped with a controlled heating device for use when required. The screed shall strike off the mix to the depth and cross section specified without the aid of manual adjustment during operation.

Particular attention shall be directed to the setting, clearance and wear condition of the tamper bar on paver screeds so equipped.

39-5.03 Hauling Equipment. - Vehicles used for hauling asphalt concrete mixtures shall have tight, smooth, metal beds, and shall be free from dust, screenings, excessive petroleum oils, volatiles, or other mineral spirits which may affect the mix being hauled. Trucks shall be provided with tarpaulins or cargo covers of sufficient size and weight to protect the entire load. Loads shall be covered whenever precipitation is in the air, when the air temperature is 50°F or

below, if the temperature of any load leaving the plants falls more than 20°F between the time of leaving the plant and placing on the roadbed, and at other times as the Engineer may direct. The Contractor shall provide haul trucks of size, speed, and condition to ensure orderly and continuous operation.

39-6.01 General Requirements. - No asphalt concrete paving mixture shall be placed when the weather is foggy or rainy, or the ambient air temperature is 50°F or below.

Asphalt concrete paving mixtures shall be placed only when the surface is dry and in satisfactory condition. In case of sudden rain, the Engineer may permit the placement of mixtures in transit from the plant, provided that the subgrade is free from pools of water and the mixture is laid and compacted at the proper temperature.

39-6.02 Spreading. - The speed of the paver shall be regulated to eliminate the pulling and tearing of the mat. The paver shall be related to the production rate of the plant and hauling equipment and to the capability of the compaction equipment. Pavers shall be operated in a manner that will insure continuous and uniform movement. There shall be a minimum of intermittent paver stops and starts.

The table below sets forth approximate paver speeds, for various delivery rates and thicknesses of pavement, necessary to achieve continuous paving operation 12 feet wide.

Thickness (feet)	Delivery Rates			
	100 ton/hr.	150 ton/hr.	200 ton/hr.	250 ton/hr.
0.08	24 ft./min.	36 ft./min.	48 ft./min.	60 ft./min.
0.13	18 ft./min.	27 ft./min.	36 ft./min.	45 ft./min.
0.17	12 ft./min.	18 ft./min.	24 ft./min.	30 ft./min.
0.25	8 ft./min.	12 ft./min.	16 ft./min.	20 ft./min.

In limited areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the asphalt concrete mixture may be spread, raked, and luted by hand tools. The mixture shall be thoroughly compacted by means of pneumatic tampers or other methods as will produce the required degree of compacted thickness.

When hand spreading is permitted, the mixture shall be dumped either on the grade or on dump sheets outside the area upon which it is to be spread, and then distributed into place using hot shovels, and spread with hot rakes in a uniformly loose layer to the full width required, and at a depth that, when the work is completed, it will have the required thickness and will conform to the grade and surface tolerance specified. Fanning or broadcasting of material across the mat will not be permitted.

Whenever hand spreading or backwork is required behind the paving spread, the paving machine shall be stopped until such hand spreading or backwork is completed.

Longitudinal joints and edges shall be constructed to true line markings. Lines for the paver to follow in placing individual lanes shall be parallel to the centerline of the roadway or to a baseline established by the Engineer.

The material being placed in the abutting lanes shall be tightly crowded against the face of the previously placed lane. The paving machine shall be

positioned to overlap the existing mat only to the extent that the material placed against the joint is tightly crowded against the vertical face at the joint and that the conform raking leaves no ridges or depressions. Before compacting or pinching the joint, the coarse aggregate in the overlapped material that has dislodged through raking shall be removed from the pavement surface and discarded.

Transverse construction joints and temporary runoff tapers shall be constructed so that no gradual ramping down of the mat occurs back from the joint.

39-6.03 Compacting. - The completed pavement shall have an average density equal to or greater than 98 percent of the laboratory density derived from compacting and testing the mixture in accordance with California Test 304 and 308. The laboratory-compacted specimens will be composed of the same materials, in like proportions, as the job mix formula.

Final compaction of the paving may be tested by nuclear density gauges California Test 375 or by coring and testing cores in accordance with California Test 308, to establish compliance with these specifications. In the event of non-compliance with these specifications, the Engineer may require that the nonconforming segments of paving be replaced, or may assess the Contractor a penalty amount to be deducted from the contract amount for this payment item, for each cubic yard of asphalt concrete not in compliance. For each ton of asphalt concrete not in compliance with these specifications, the Engineer may require that the nonconforming segments of paving be replaced or assess the Contractor a penalty to be deducted from the contract item amount.

SECTION 40

PORTLAND CEMENT CONCRETE PAVEMENT

Portland cement concrete pavement shall conform to Section 40 of the Caltrans Standard Specifications and these City Standard Specifications.

40-1.01 Description. - Subgrade preparation shall conform to Section 21 of these City Standard Specifications.

SECTION 41

PAVEMENT SUBSEALING AND JACKING

Pavement subsealing and jacking shall conform to Section 41 of the Caltrans Standard Specifications.

SECTION 42

GROOVE AND GRIND PAVEMENT

Grooving and grinding pavement shall conform to Section 42 of the Caltrans Standard Specifications.