

A-1 Slurry Sample Specification

Section 10-2.12, TYPE II SLURRY SEAL (Bid Item 7) (CITY OF LOMPOC, DEPARTMENT OF PUBLIC WORKS CALIFORNIA, PROJECT MANUAL, PART A, NOTICE TO CONTRACTORS AND SPECIAL PROVISIONS FOR 2018 CAPE SEAL PROJECT CITY PROJECT NO. FY-18-S-3)

GENERAL

Type II Slurry Seal shall be placed after, and on top of the finished and prepared asphalt rubber chip seal in most areas called out for "Cape Seal," and shall be placed in other prepared roadway or facility areas called out for "Slurry Seal" on the Plan Exhibits and/or the Street & Facility Location List in the appendices of these Special Provisions, except that Type II Microsurfacing shall be placed instead of Type II Slurry Seal on Central Avenue from D Street to O Street, and within the intersection of Central Avenue and V Street. Type II Slurry Seal consists of a mixture of polymer modified asphaltic emulsion, Type II aggregate, water, mineral filler, and additives. Slurry seal shall conform to the provisions of Section 37 "Seal Coats" of the 2015 Caltrans Revised Standard Specifications, including the provisions in Section 37-3, "Slurry Seals and Microsurfacing;" these Special Provisions, including but not limited to Section 10-2.1 General Requirements/Site Preparation; and the direction of the Engineer. Type II Slurry Seal shall be placed in conformance with the contract documents, and such that it may be opened to traffic within no more than 2 to 3 hours from the time of placement, without causing traffic damage to the slurry seal, including but not limited to excessive raveling or shedding of slurry seal materials.

SUBMITTALS

The laboratory which develops the slurry seal mix design must sign and date the original laboratory report and mix design for submittal to the City and the report shall show the results of the tests on individual materials, comparing their values to those required by the specifications. Acceptance of the slurry seal mix design by the City shall be subject to verification testing and review by a laboratory retained by the City.

Submit the laboratory report of test results and a proposed mix design at least 21 days before starting placement of slurry seal, and begin placement only after the City's written approval of the submittal. The report and mix design must include the specific materials to be used. The laboratory report must clearly show the following:

1. Test results used in the mix design
2. Proportion of the following material based on the aggregate's dry weight:
 - Aggregate
 - Filler determined from tests, target, minimum, and maximum
 - Water content, target, minimum, and maximum
 - Polymer modified asphaltic emulsion
 - Asphalt solids content, target, minimum, and maximum
 - Additives
 - Polymer content (in % by weight of residual asphalt)

MATERIALS

Emulsion

Asphaltic emulsion shall be PMCQS1h (polymer modified cationic quick set) asphaltic emulsion and shall conform to the requirements in Section 94, "Asphaltic Emulsions," of the 2015 Caltrans Revised Standard Specifications and these Special Provisions.

Polymer modified asphaltic emulsion shall be composed of a bituminous material uniformly emulsified with water and an emulsifying or stabilization agent and shall contain a polymer.

The polymer used in the manufacture of polymer modified asphaltic emulsion shall be, at the option of the contractor either neoprene, or a copolymer of butadiene and styrene. The polymer used in polymer modified emulsion shall be thoroughly homogenous and shall be milled into the product at the colloid mill.

The PMCQS1h polymer modified asphaltic emulsion shall conform to the requirements prescribed in the following table:

Polymer Modified Asphaltic Emulsion Requirements		
Quality characteristic	Test method	Requirement
Tests on emulsion:		
Saybolt Furol Viscosity @ 25 °C (Saybolt Furol seconds)	AASHTO T 59	15–90
Sieve test (%)	AASHTO T 59	0–0.3
Storage stability after 1 day (%)	AASHTO T 59	0–1
Residue by evaporation (min, %)	California Test 331	62
Particle charge	AASHTO T 59	Positive
Tests on residue by evaporation:		
Penetration at 25 °C	AASHTO T 49	40–90
Ductility at 25 °C (min, mm)	AASHTO T 51	400
Torsional recovery (min, %)	California Test 332	18
Polymer content (min, %)	California Test 401	2.5

Aggregates

The aggregate for slurry seal shall be Type II. Aggregate shall consist of sound, durable, crushed stone or crushed gravel. The material shall be free from vegetable matter and other deleterious substances. If aggregates are blended each component aggregate shall meet the sand equivalency and abrasion resistance and shall be 100% crushed with no rounded particles as tested in accordance with California Test 205. The percentage composition by weight of the aggregate passing each sieve size shall conform to the following grading:

Type II Slurry Gradation

SIEVE SIZES	TYPE II
3/8" (9.5-mm)	100
No. 4 (4.75-mm)	94-100
No. 8 (2.36-mm)	65-90
No. 16 (1.18-mm)	40-70
No. 30 (600-um)	25-50
No. 200 (75-um)	5-15

The aggregate shall also conform to the following quality requirements:

Test	Method of Test	Requirement
Sand Equivalent	California Test 217 or ASTM D2419	65 min.
Durability Index	California Test 229	65 min.

If the results of the aggregate grading do not meet the gradation specified, the slurry seal represented by the 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 \$10 per ton for the slurry seal represented by the test and left in place.

If the results of the Sand Equivalent test for aggregate do not meet the requirement specified, the slurry seal represented by the 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 \$10 per ton for the slurry seal represented by the test and left in place. When the results of both the aggregate grading and the Sand Equivalent test do not conform to the requirements specified, said payments to the City for both non-conforming tests shall apply. The City may deduct these amounts from any moneys due, or that may become due to 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.

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 on the pavement. If necessary for workability, a set-control agent that will not adversely affect the slurry seal may be used.

Mineral filler

Mineral filler shall be any recognized brand of non-air entrained portland cement or hydrated lime that is free of lumps. The type and amount of mineral filler needed shall be determined by the laboratory mix design and will be considered as part of the mineral gradation requirement. A tolerance of $\pm 0.5\%$ from the value prescribed in the approved mix design is permitted when the slurry seal is being placed if it is found to be necessary for better consistency or set times; however, the maximum cement content shall not exceed 2.0% including any such tolerance.

APPLICATION OF SLURRY SEAL

Proportioning

Aggregate, mineral filler, polymer modified asphaltic emulsion, water, and additives, including set-control agent if used, shall be proportioned by volume utilizing the mix design approved by the Engineer. The component materials and the proposed slurry seal mixture shall conform to the requirements specified under Submittals, Materials, and other applicable content of this Type II Slurry Seal section of the Special Provisions, and to the 2015 Caltrans Revised Standard Specifications. 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 aggregate blend.

The percentages of each individual material required shall be shown in the laboratory report. Adjustments may be required during the construction, based on field conditions. The following component materials shall be within the following limits:

Residual Asphalt	7.5% to 13.5% by dry mass of aggregate
Mineral Filler	0% to 2% by dry mass of aggregate
Additive	As needed
Water	As required to produce proper mix consistency. Contactor shall set target, min, and max water contents in their mix designs and ensure construction conforms to approved mix designs.

The completed mixture, after addition of water and any set-control agent, 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 two to three hours after placement without causing damage to the slurry seal, and (b) will prevent development of bleeding, raveling, separation or other distress within 15 days after placing the slurry seal. Traffic shall not be permitted on the slurry seal until it has sufficiently cured. See Curing subsection below for additional requirements and discussion of curing.

The Contractor shall also furnish an aggregate moisture determination from the stockpile prior to placing the slurry seal, and said moisture shall be retested if weather conditions have changed the aggregate moisture content appreciably. Aggregate moisture will be accounted for in determining the aggregate/bitumen ratio to be used during placement. Portable acetylene moisture determination kits will be allowed for determining moisture contents.

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 calibrated and sealed in its calibrated condition in accordance with Caltrans current Material Plant Quality Program (MPQP) prior to usage.

Uniformity of distribution of asphalt will be determined by extraction test in accordance with California Test 310. The bitumen ratio (kg of asphalt per 100 kg of dry aggregates) shall not vary by more than ± 0.4 percent based on the dry aggregate mass approved 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 Caltrans current Material Plant Quality Program (MPQP) 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 1135 liters (300 gallons) each in duration. The water pump shall deliver water 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 1135 liters (300 gallons) each in duration.

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 within 10°F (5°C).

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 the target depth of 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 belt movement or no flow, 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 and shutdown of the operation will be permitted.

Equipment

The first sentence of Section 37-3.01C(3) "Mixing And Spreading Equipment," of the 2015 Caltrans Revised Standard Specifications is amended to read:

Mixing and spreading equipment for slurry seals and microsurfacing must be self-propelled and must accurately deliver and automatically proportion the asphaltic emulsions, water, aggregate, and any mineral filler and additives by volume; and mix them in continuous flow double shaft, multi-blade pugmill mixers of adequate size and power for the type of mixture to be placed, capable of minimum speeds of 200 revolutions per minute. Single shaft pugmills will not be allowed.

A minimum of two operational mixing machines of 12 cubic yard capacity, or larger, shall be maintained on the project. The mixed material retention time in the pug mill shall be less than three seconds. No retention of mixed material shall be allowed within the pug mill by gate shut-off or other mechanical means. Any machines with pugmill retention or shut-off gates shall have them removed prior to being used on this project. The mixing machine shall have sufficient storage capacity of aggregate, emulsified asphalt, and water to maintain an adequate supply to the proportioning controls. All indicators required in the section entitled "Proportioning" shall be in working order prior to commencing mixing and spreading operations.

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 one-tenth of a revolution.

In addition to the requirements of Section 5-1.33, "Equipment," of the 2015 Caltrans Revised Standard Specifications, 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 seal mixture shall be spread by means of a spreader box conforming to the following requirements:

- The spreader box shall be capable of spreading a minimum of 12 feet wide, corresponding to 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 seal from the ends of the box. All spreader boxes over 7.8 feet in application width shall have baffles,

reversible motor driven augers, or other suitable means, to ensure uniform application. Spreader box skids shall be maintained in such manner as to prevent chatter (wash boarding) in the finished mat.

- The spreader box shall have a double strike-off blade design at the rear of the box. The first strike-off blade shall be made of steel or stiff rubber and the second strike-off blade (attached to the first blade) shall be made of a flexible material. 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. A secondary strike-off blade attached to the rear of the spreader box (located behind the double strike-off blades at the rear of the spreader box) shall be provided and shall be adjustable. It shall be designed and operated such that a uniform texture is achieved in the finished surface of the slurry seal.
- Flexible fabric drags attached to the rear of the spreader box shall not be allowed. Strike-off blades (rubber) shall be cleaned or changed daily if problems with cleanliness and longitudinal scouring occur.

Mix Paver Calibration

Prior to beginning work on the project, perform calibration and submit calibration data for all slurry seal trucks in accordance with Section 37-3.01C(3)(f) Equipment Calibration of the 2015 Caltrans Revised Standard Specifications.

Calibrate the mix paver to be used for the placement of slurry seal in the presence of the Engineer according to the method recommended by the mix paver manufacturer. ISSA also provides a procedure for calibration.

Each unit shall be calibrated prior to the beginning of each project for each aggregate type, or as required by the City. The calibration procedure shall include a metered verification for each material used. No machine will be permitted to work until the calibration has been completed or accepted. The units from the meters need to be calibrated to gals of emulsion, tons of aggregate, pounds of filler and gallons of additives.

Surface Preparation

Fulfill the provisions of Section 10-2.1 General Requirements/Site Preparation, 10-2.10 Roadway Preparation, and other applicable content of the Contract Documents. Before placing slurry seal, remove all loose paving particles, all dirt, organics and all other extraneous material. Sweep the streets and areas for application from curb face to curb face or edge of pavement to edge of pavement (when there is no curb), using vacuum type street sweepers or rotary street sweepers with a rear broom as approved by the Engineer. In rural areas, other methods may be used with the written permission of the Engineer.

Allow crack sealant material to cure for a minimum of 30 days on pavement surfaces that have been crack sealed before application of the slurry seal. Waive this requirement if a compatible crack sealant is used that does not require a cure time.

If required by the City, then apply a tack coat using an emulsified asphalt meeting the requirements of AASHTO M 140, M 208, or M 316. Dilute the emulsified asphalt one-part emulsion to one-part water at the plant or the project site as approved by the Engineer. Apply the diluted tack coat at the rate of 0.05 to 0.10 gallons/yd². Allow the tack to cure sufficiently before the application of the slurry seal.

Application Rates

The target slurry seal application rate over existing asphalt concrete, existing slurry seal, or other dense or smooth fine grained paving surface shall be 13.5 lb of dry aggregate and 15.5% emulsion content (% of dry aggregate weight) per square yard of application surface. The target slurry seal application rate over the

½" chip seal shall be 17 lbs of dry aggregate and 15.5% emulsion content (% of dry aggregate weight) per square yard of application surface. Prior to beginning work, the Contractor shall obtain approval from the Engineer for each application rate proposed for use over each different underlying pavement surface.

Application Conditions

Slurry seal shall only be placed when the ambient and pavement surface temperature is 50°F (10°C) minimum and rising. The forecasted high temperature must be at least 65 degrees F within 24 hours after placement. Slurry seal shall not be placed if rain is falling or is imminent or if there is the possibility that the finished product will freeze within 24 hours.

Test Strip

Prior to commencing large quantities of slurry seal application, the Contractor shall complete a 500' long test strip per Section 10-2.1 General Requirements/Site Preparation of these Special Provisions, and shall obtain approval from the Engineer to proceed with additional paving upon review of test strip construction and curing.

Workmanship

The contractor shall apply the slurry seal to meet the following workmanship requirements:

- Spread the slurry seal uniformly, as much as possible using the spreading machine, with as little handwork as possible, and as approved by the Engineer. Evidence of a wash boarding effect in the finished slurry seal will be cause for removal and/or repair of the slurry seal. Spread the slurry such that no ridges remain.
- Longitudinal joints shall correspond with the edges of traffic lanes. The Engineer may permit other patterns of longitudinal joints, if such patterns shall not adversely affect the quality of the finished product, as determined by the Engineer. Longitudinal joints common to two driving lanes, shall be butt joints with overlaps not to exceed 3 inches.
- Make smooth transitions at the ends of each segment of paving to match the existing paving. Building paper shall be placed at transverse joints over previously placed slurry seal to avoid double placement of slurry seal, or other suitable methods approved by the Engineer shall be used. Hand tools shall be available in order to remove spillage. Ridges or bumps in the finished surface shall not be permitted.
- The mixture shall be uniform and homogeneous after spreading on the surfacing and shall not show separation of the emulsion and aggregate after setting.
- The finished surface shall be free of irregularities such as scratch or drag marks.
- Evidence of solidification of the asphalt, balling or lumping of the aggregates, or the presence of uncoated aggregates will be cause for rejection of the slurry seal.
- Where the completed slurry seal is not uniform in color, the street or road shall be treated to eliminate the color variation at the Contractor's expense. The method of treatment must be approved by the Engineer.
- Exercise care to prevent the slurry from being deposited on surfaces not designated to be sealed, i.e., more than 2-inches onto concrete gutters, cross gutters, driveways, etc. The Contractor shall remove slurry from those surfaces not designated to be sealed. The method used to remove the slurry must be approved by the Engineer.

Protect and cure the slurry seal in accordance with the Curing subsection below. The cost to repair and/or cleanup damage caused by pedestrians, bicycles or vehicles tracking through the slurry seal shall be borne solely by the Contractor. If bleeding, raveling, delamination, rutting, washboarding, or other defects occur for which the Engineer requires repairs, then the Contractor shall promptly make such repairs in accordance with the contract documents and the direction of the Engineer. The Contractor shall quantify and submit to the Engineer with its daily quantity submittals the amounts of all materials rejected, wasted, or otherwise removed and disposed from the work, and shall note and deduct such quantities from its pay quantity totals.

Documentation

Submit to the Engineer complete documentation of the quantities and qualities of materials delivered and placed for the Project. Such documentation shall include, but not be limited to:

- A. Calibration: Calibration data for all slurry seal and microsurfacing spreader trucks shall be submitted in accordance with Section 37-3.01C(3)(f) Equipment Calibration of the 2015 Caltrans Revised Standard Specifications sufficiently prior to the start of those items of work for the Engineer to review and approve such submittals before that work begins.
- B. Delivered Quantities: Weigh tickets and delivery tickets for all materials delivered to the jobsite shall be given to the Engineer by the morning of the day following the date of delivery. All Tickets shall clearly show the date of delivery. Tickets not received by the Engineer by 12:00 noon the day after delivery will not be paid for.
- C. Daily reports of all amounts of each mix component actually used in all slurry seal and microsurfacing placed, for each spreader truck, for each day of project work shall be submitted to the Engineer prior to beginning work the next day, and shall include the following:
 - Aggregate used in tons
 - Slurry Seal emulsion used in tons
 - Mineral filler used in pounds
 - Water used in gallons
 - Additives used in mixture in gallons
 - Surface area completed in square yards
 - Surface area application rate, dry pounds of aggregate per square yard
 - Percentage of emulsified asphalt based on mass of dry aggregate
 - Moisture data for the aggregate collected every 2 hours when you are unable to maintain the moisture content to within a maximum daily variation of ± 0.5 percent.
- D. Quality Control Data: All quality control data, including test results, shall be submitted to the Engineer as soon as such data is available. Any portion of that data which is required in daily reports in item C above shall be submitted in accordance with that item.
- E. Aggregate: A chronological list of all delivery tickets by gradation type and stockpile, listing delivery date, ticket number and tonnage. A list of current stockpiles and the amounts left from the weigh tickets listed and the waste amount in each stockpile.
- F. Asphalt Emulsion: A chronological list of all delivery tickets, listing delivery date, ticket number and amount. Also list the amount of emulsion currently at stockpile, from delivery tickets.
- G. Quantity of Material Lost: Each weight measurement taken and a running total of Quantity of Material Lost shall be submitted to the Engineer before beginning work the next day, or if all such materials are retained at the staging area in a manner approved by the Engineer for measurement at a later time, such as at the completion of the placement and sweeping work, then provide such documentation to the Engineer by the morning of the day after such measurements are taken.

No payment will be made for the quantity of dry aggregate which exceeds the theoretical amount of dry aggregate which should have been utilized based upon the approved application rate, the approved mix design, and the weight of emulsion used for the project.

FIELD SAMPLING

During the placement of the slurry seal, the City may take a number of field samples of the mixed slurry per slurry mixer per day. As a minimum, this would include samples taken from the chute while the slurry mixer is operating for each street and in each direction, and may also include samples from the mat placed by the mixer/spreader truck. Three Wet Track Abrasion Test specimens may be fabricated from each sample taken from the chute. A laboratory retained by the Engineer may test specimens from each sample. If a specimen fails to pass the Wet track Abrasion Test (WTAT) criteria in the following "Slurry Seal Test Values" table, then the other specimens from that sample will be tested at the Contractor's expense. The average of the test results from the three specimens will be used with results from other samples taken from the same truck to determine pay reduction as provided below, if the Engineer allows the material to remain without replacement. The samples shall also be tested for residual asphalt content and water content to make sure they meet specifications and conform to the approved mix design.

Slurry Seal Test Values

Test Requirements	ASTM Test Method	MIN.	Max.
Wet Track Abrasion Test (Weight loss, gm/m ²)	D3910	0	540
Consistency Test (mm)	D3910	20	30
Extraction Test (Emulsion Content, %)	D2172	(± 1.0% of mix design)	
Water Content, % of Dry Aggregate Weight	D2172	Per approved mix design	

If the average of all Wet Track Abrasion Tests made per slurry mixer per day by the Engineer fail to conform to the requirements in the Slurry Seal Test Values table above, and the Engineer allows the material to remain in place rather than be replaced at the Contractor's sole expense, then the Contractor agrees that payment for the work represented by the failed tests shall be reduced as specified in the following table.

WTAT Pay Reduction Factors

WTAT LOSS (gm/m ²)	Payment Reduction (Percent)
0 - 540	0
540.1 - 650	5
650.1 - 750	15
750.1 - 860	30
860.1 - 1070	70
1070.1 or Greater	100

Slurry seal with WTAT loss greater than 1070.1 gm/m², and slurry seal otherwise rejected by the Engineer due to non-conformance with the contract documents, shall be removed and replaced to the satisfaction of the Engineer at the Contractor's sole expense.

CURING

Ensure all slurry seal is scheduled, constructed, and protected to comply with the contract documents both for the quality and coverage required, as well as for public convenience and access.

Streets, roads, and other areas of application shall only be closed from the hours of 7:00 A.M. to 5:00 P.M., to allow vehicles access to the street, road, or area by 5:00 P.M without any damage to the slurry seal. The application of any materials to the roadway or area shall be completed as early as necessary to allow sufficient cure time, cooling, finishing, delineation, and cleanup in order to allow public traffic full access to the roadway or area no later than 5:00 P.M., or earlier if so directed by the Engineer. The application of emulsified paving materials, including, but not limited to slurry seal, shall be completed by 1:30 P.M. at the

latest, or as early as necessary to allow sufficient cure time in order to allow public traffic full access to the street or road no later than 5:00 P.M.

Provide adequate cure time while protecting the slurry seal from any damage until the slurry seal can be opened to public traffic without any damage resulting to the slurry seal from such traffic. Ensure the slurry seal mixture continually conforms to the contract documents, conforms to the approved mix design, and maintains appropriate quantities of mix additives in order to perform as specified in the contract, and not result in excessive raveling or other performance problems.

Separate slurry seal placement into multiple application days for both street and facility locations as is necessary to maintain public, owner and tenant access and convenience, and as required by the City. Two-way traffic shall be maintained on all streets and anywhere else required by the City, unless otherwise approved by the City in writing. Intersections and school, commercial, government, and multi-unit residential driveways shall be completed in a minimum of two (2) parts to allow continual ingress and egress of traffic, where required by the Engineer.

When ambient temperatures are below 75°F (25°C), Contractor shall use extra care in confirming sufficient curing of slurry seal prior to opening it to traffic.

The time required and/or conditions evidencing sufficient curing shall be approved by the Engineer upon confirmation in the field. The slurry seal must build sufficient cohesion to resist abrasion due to traffic. Minor stone loss is normal, but according to ISSA should never exceed 3%. If the mixture is opened to traffic too early, it will ravel off quickly, particularly in high stress areas. A general rule of thumb according to ISSA is the when the slurry turns black throughout, it can be opened to traffic.

The slurry seal shall be placed in conformance with the contract documents, and such that it may be opened to traffic within no more than 2 to 3 hours from the time of placement, without causing traffic damage to the slurry seal, including but not limited to excessive raveling or shedding of slurry seal materials. Traffic shall not be allowed on the slurry seal until it has adequately cured. Approval shall be obtained from the Engineer of the slurry seal curing, prior to allowing traffic.

Sand blotter (dry kiln sand) shall not be used unless approved in writing by the Engineer. All measures specified above shall be implemented, and if the Engineer determines that the use of sand blotter is necessary, then after the Engineer's written approval, sand blotter may be placed in a manner that prevents any damage to the slurry seal from its use. Sand blotter shall be placed and maintained in a manner and quantity sufficient to protect the slurry seal from damage, and to ensure the safety of all modes of traffic passing over it. The Contractor shall sweep and remove sand blotter once the slurry seal has cured sufficiently to prevent damage to the slurry seal by vehicle traffic, and at least within 2 working days. Full compensation for supplying, placing, maintaining, and removing sand blotter shall be considered as included in the contract price paid for slurry seal, and no separate payment will be made therefor.

Any damage to the slurry seal resulting in whole or in part from the Contractor failing to fully comply with the provisions of this section shall be promptly corrected to the satisfaction of the Engineer at the Contractor's sole expense. Such correction shall include but not be limited to removal of slurry seal where determined necessary by the Engineer, and/or re-application of the specified slurry seal in accordance with the contract documents to rectangular limits not less than full lane width, and as approved by the Engineer. Such repairs shall be accomplished as soon as the problems are noted.

ROLLING

The slurry seal shall be rolled after placement and initial curing with three (3) passes of a minimum 8-ton pneumatic tire roller equipped with a water spray system, which has all tires inflated per the manufacturer's specifications, and which meets the requirements of Caltrans 2015 Revised Standard Specifications, Section 37. Full compensation for supplying and operating a pneumatic tire roller shall be included in the price paid for slurry seal and no separate payment will be made therefore.

SWEEPING

Protect and cure slurry seal in accordance with the contract documents, and prevent damage and loss of significant or excessive slurry seal materials. Promptly remove and dispose of spilled, failed, and rejected materials and perform necessary repairs or replacement as directed by the Engineer and in accordance with the contract documents.

Sweep the slurry seal 24 hours after placement without damaging the slurry seal. For 4 days afterwards, sweep the slurry seal daily unless determined otherwise by the Engineer. Two weeks after the slurry has been placed and streets, or other slurry sealed areas have been opened to traffic, the Contractor shall sweep the surface to remove any loose aggregate. The contractor shall sweep the slurry sealed streets or areas from curb face to curb face or edge of pavement to edge of pavement (when there is no curb), using vacuum type street sweepers. In rural areas other methods may be used with the written permission of the Engineer. The Contractor shall also promptly sweep any other areas required by the Engineer, where loose or out of place project materials exist.

The Contractor shall quantify and document all sweepings of slurry seal materials placed, for City review. If the amount of sweepings is excessive, the City will apply pay reductions for the pay quantities represented by the excessive sweepings, or require the Contractor to make the necessary repairs, including but not limited to removal if necessary and reapplication of the slurry seal in accordance with the contract documents. All materials collected (by sweeping or otherwise) from the slurry seal placed shall be transferred to a location approved by the Engineer and weighed to determine the Quantity of Material Lost from the roadway or application surface. Quantities of materials collected from areas which the Contractor repaired or re-applied slurry seal at its own expense in accordance with the contract documents and as approved by the Engineer, should be deducted or excluded from the Quantity of Material Lost documentation which the Contractor shall provide to the Engineer. The Contractor shall provide to the Engineer each weight measurement taken and a running total of Quantity of Material Lost of placed slurry seal before beginning work the next day, or shall retain all such materials at the staging area in a manner approved by the Engineer for measurement at a later time, such as at the completion of the placement and sweeping work. The Contractor shall separately store and accurately measure and document the Quantity of Material Lost from each application area which appears to ravel, shed, or lose greater than 5% of the weight of dry aggregate of the slurry seal placed in that application area, in order to avoid payment reductions applying to a larger area.

Pay reductions for excessive loss of placed slurry seal material shall be imposed as follows:

Quantity of Material Lost Pay Reduction Factors

Quantity of Material Lost (% by weight of dry aggregate placed)		Payment Reduction (Percent)
0	5	0
5	10	10
10	15	25
15	20	40
20	30	70
30 or Greater		100

The Engineer may require repair or replacement of slurry seal which has raveled, shed, or lost excessive amounts of material, or which otherwise does not conform to the contract documents, as determined by the Engineer. Once the Engineer has reviewed and confirmed the Quantities of Material Lost and has authorized disposal of such materials, the Contractor shall properly dispose of all such materials.

QUALITY CONTROL

The Contractor is responsible for quality control (QC) sampling, testing, and documentation, and shall submit a QC plan including materials and procedures for verifying the quality of the slurry aggregates and emulsified asphalt(s); measures to ensure placement of materials conforms to the contract documents; and measures and documentation to ensure the in-place end product conforms to the contract documents. The Contractor's QC plan shall include but is not limited to sampling, testing, inspection, monitoring, documentation, and corrective action procedures during transport, stockpiling, proportioning, placement, and sweeping/cleanup operations. The plan shall include, as a minimum, the following:

- Sampling and testing procedures for in accordance with AASHTO MP 32.
- Sampling and testing procedures for asphalt emulsion.
- Sampling and testing procedures for residual binder content.
- Actions the contractor will take to correct any deficiencies and who will be responsible to the make corrections.
- Regular submittals of all QC data, and who will be responsible for those submittals.

A written Quality Control Plan (QCP) shall be developed which details the Contractor's QC program that meets the requirements of these specifications. The QCP shall be contract specific and signed by the Contractor's representative. Slurry seal and microsurfacing construction shall not begin or proceed without the Engineer's approval of the QCP and QC personnel present on the project. Failure to comply with these provisions will result in shutdown of the operations until such time as the Contractor's operations are in compliance.

Unless the Engineer accepts other documentation of the qualifications and/or responsibilities of the Contractor's QC staff, the QC staff shall include the following as a minimum:

- QCP Administrator – The person with overall responsibility of the QCP
- QCP Manager – The person responsible for the execution of the QCP and liaison with the Agency. This person shall be on the project, and have the authority to stop or suspend construction operations.
- QC Technicians – The person(s) responsible for conducting QC tests and inspection to implement the QCP. QC technicians shall have Level 2 Aggregate Testing Certification from the American Concrete Institute (ACI) or other accrediting body approved by the Agency.
- Certified Crew Members – Two crew members (job foreman and mixer/spreader operator), at a minimum, shall possess a valid slurry seal certification and be on the project at all times the slurry seal is being constructed. The slurry seal certification is administered by the National Center for Pavement Preservation (NCP) on behalf of AASHTO TSP² (Transportation System Preservation Program).

MEASUREMENT AND PAYMENT

Bid Item 7 "Type II Slurry Seal" will be measured by the Ton of slurry seal placed in conformance with the contract documents, as approved by the Engineer, by combining the weight of the aggregate and asphaltic emulsion. The weights of added water, set-control additive, and water used to pre-wet the pavement shall not be included in the measurement for payment.

If test results for aggregate grading or sand equivalent do not comply with the specifications, you may remove the installed slurry seal represented by the test results or request it remain in place, as approved by the Engineer, with a payment deduction of \$10 per ton. If test results for both aggregate grading and sand equivalent do not comply with the specifications, both deductions are made. An aggregate grading or cleanness value test represents 300 tons or 1 day's production, whichever is less.

No payment will be made for tonnage of slurry seal in excess of 110% of the calculated quantities required to cover the application areas at the application rates approved by the Engineer, in conformance with these Special Provisions and the approved submittals.

The Contract price paid per TON for Type II Slurry Seal shall be considered to include full compensation for furnishing all labor, materials, tools, equipment, mix designs, submittals, preparatory work, documentation, quality control, guarantees, warranties, incidentals, clean up, and for doing all the work involved in constructing the slurry seal complete in place, and protecting the slurry seal until it has cured, all as shown on the plan exhibits, and as specified in these Special Provisions and in the 2015 Caltrans Revised Standard Specifications, and as directed by the Engineer.

The contractor must furnish the following warranty after completion of the work and prior to final payment: The Contractor hereby warrants that all workmanship and all materials furnished under the contract comply fully with requirements of these Type II Slurry Seal specifications. If at any time within two years from the date of filing of the Notice of Completion, any unfaithful or defective work should appear, which in the opinion of the City is due to inferior materials or workmanship, the Contractor warrants to do whatever is necessary to remedy the defects immediately without cost to the City. The City will notify the Contractor in writing of the defects and the repairs to be made, and the Contractor will begin repairs within a mutually agreed time frame. Such repairs shall include but not be limited to re-application of the specified Type II Slurry Seal in accordance with the contract documents to rectangular limits not less than full lane width and as approved by the Engineer, over any areas where greater than 10% of the underlying pavement material, including but not limited to chip seal material, is visible.