

**CONSTRUCTION STANDARDS**

**SECTION CS 16**

**SLURRY SEAL**

**CS 16-1 GENERAL:** Furnishing and placement of slurry seal shall conform with Section 37-2, “Slurry Seal” of the CALTRANS Standard Specifications except as amended by the provisions in this Section CS 16, “Slurry Seal” of the City Standard Specifications.

**CS 16-02 MATERIALS:** Materials for slurry seal shall conform to the requirements of Section 37-2.02 “Materials (Slurry Seal)” of the CALTRANS Standard Specifications except as modified by the following requirements included in these City Standard Specifications:

**A. Asphalt Emulsion:** Asphalt Emulsion shall consist of Polymer Modified Asphalt Emulsion and shall be quick setting Type PMCQS-1h grade conforming to the requirements for Type CQS-1h of Section 94, “Asphaltic Emulsions,” of the CALTRANS Standard Specifications, except as modified by these City Standard Specifications.

1. The polymer modified asphalt emulsion shall conform to the requirements shown in **Table CS 16-1** in addition to the requirements specified in Section 94, “Asphalt Emulsions” of the Caltrans Standard Specifications.

**Table CS 16-1**

**Polymer Emulsified Asphalt Test Requirements**

<b>TEST ON EMULSION</b>	<b>METHOD OF TEST</b>	<b>REQUIREMENTS</b>
Residue by Distillation %, Minimum	AASHTO T59	60
<b>TEST ON RESIDUE FROM DISTILLATION TEST</b>	<b>METHOD OF TEST</b>	<b>REQUIREMENTS</b>
Penetration, 77° F (25°C), 100g,5s	ASTM D5/AASHTO T49	40-80
Torsional Recovery	CALTRANS Test Method 331	18% minimum

2. The polymer latex shall be added to the water/soap phase by injection prior to the mill manufacture of the emulsified asphalt by the emulsion producer.
3. The optimum rate of application for the polymer emulsified asphalt to be added to the aggregate shall be determined by the job mix design submitted by the

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Contractor for approval by the Inspector. The actual rate of application of the polymer shall be within 1% of the optimum rate.

**B. Aggregate:** Aggregate for slurry seal shall conform to the provisions in Section 37-2.02C, "Aggregate (Slurry Seal)" of the CALTRANS Standard Specifications for Type II aggregate with the following exceptions:

1. The percentage of aggregate passing the No. 4 sieve shall be 100 percent.
2. The aggregate shall have a minimum Sand Equivalent result of seventy-two (72) when tested in accordance with California Test Method 217.
3. The aggregate shall have a minimum Durability Index result of seventy-five (75) when tested in accordance with California Test Method 229.
3. Aggregate shall be 100% crushed with no rounded particles, volcanic in origin and black in color. The use of gray or light colored aggregate will not be allowed.

**C. Storage of Materials:** The Contractor shall arrange for storage of materials at locations of his choice as long as it is in compliance with the conditions specified in this paragraph. Storage of materials for slurry seal, including aggregate, emulsions, etc., shall not be permitted on public right-of-way. Additionally, storage of said materials shall not be permitted on public or private property without first obtaining a written authorization from the owner or its representative. The authorization shall include the specific terms of the agreement by the owner to allow the Contractor to store these materials. Stockpiled materials shall be placed on flat, graded surfaces. The Contractor shall be responsible for the complete clean up and removal of all materials at stockpile/storage locations.

**CS 16-03 MIX DESIGN:** Mix Design shall conform to Section 37-2.03, "Mix Design" of the CALTRANS Standard specifications except as modified herein.

The "Wet Stripping" Test shown in the table following the 2<sup>nd</sup> paragraph of CALTRANS Standard Specifications Section 37-2.03, Mix Design shall be modified to include the requirement of "Pass (90% minimum)".

**CS 16-04 PROPORTIONING:** Proportioning shall conform to Section 37-2.04, "Proportioning" of the CALTRANS Standard specifications except as modified herein.

- A.** The components of the slurry seal mix shall be proportioned in accordance with the requirements of these Standard Specifications and the approved mix design which is suitable for the current climate, curing, and traffic conditions. The mix design shall include the recommended application rate considering these factors.
- B** Volume or weight controls for proportioning each individual material to be added to the slurry seal mix (i.e. aggregate, mineral filler, emulsified asphalt and additive) shall be provided, properly marked and calibrated.
- C.** The completed slurry seal mixture after addition of water and any control agent used, shall be such that the slurry seal mixture has proper workability and (a) break, set, and be ready for traffic no latter than 4:00 pm of the day of application unless

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otherwise allowed by the Inspector. There shall be no bleeding, raveling, separation or other distress within seven (7) days after placing the slurry seal.

**CS 16-05 MIXING AND SPREADING EQUIPMENT:** Mixing and spreading equipment shall conform to Section 37-2.05, "Mixing and Spreading Equipment" of the CALTRANS Standard Specifications except as modified herein.

- A. The slurry seal shall be mixed in a self-propelled mixing machine (mixer/spreader truck) equipped with a continuous flow pug mill capable of accurately delivering and automatically proportioning each component of the slurry seal mix.
- B. Each spreader box used on the project shall be equipped with augers to ensure uniform application of the slurry and shall have inboard set skids.
- D. The slurry box squeegees, rubber belting or similar material, shall be flexible enough to spread the slurry uniformly over the surface.
- E. Each mixer/spreader truck used on the project shall be calibrated in accordance with California Test 109. Calibration shall take place a maximum of ten days prior to application of slurry seal. The Contractor shall notify the Inspector a minimum of three (3) days prior to calibration so that City representatives may make arrangements to observe.

**CS 16-06 PLACING:** Placing of slurry seal shall conform to Section 37-2.06, "Placing" of the CALTRANS Standard Specifications except as amended herein.

- A. A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that complete coverage is obtained. No lumping, balling, or unmixed aggregate shall be permitted. No streaks such as caused by oversize aggregate shall be left in the finished pavement.
- B. No excessive buildup or unsightly appearance of slurry shall be permitted on longitudinal or transverse joints. Burlap or similar material drags shall be used to smooth out these joints.
- C. Squeegees shall be used to spread slurry in areas not accessible to the slurry mixer/spreader.
- D. When required by local conditions, the surface to be slurried shall be lightly pre-dampened with a fog spray of water.
- E. Slurry seal shall be spread at a rate of 15 pounds of dry aggregate per square yard. The completed spread shall be within ten (10) percent of the specified rate. The Contractor shall submit certified weight tickets for all loads of aggregate delivered to the project site(s). Tickets shall be submitted to the Inspector by the end of each day in which a delivery is made.
- F. The spreader box shall be pulled at a rate NOT GREATER THAN 270 FEET PER MINUTE.
- G. At limits of slurry seal (start or finish), a straight line cut-off shall be obtained by laying down a strip of building paper or other approved material. Such paper and any excess slurry shall be removed and disposed of by the Contractor after application of the slurry seal.

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- H. Edge limits of the slurry on both sides of the street or bike path shall be maintained in a neat, straight, and uniform line. Slurry seal shall extend to the lip of gutter. The slurry may be allowed to extend onto the gutter pan one (1) to two (2) inches, but a neat, straight, and uniform line must be maintained. In the event that slurry extends onto the gutter more than one (1) to two (2) inches or the slurry is not in a neat, straight, uniform line, it will be the responsibility of the Contractor to remove all excess slurry from the gutters using an appropriate method. Any runs or drips that spill on to any concrete surface shall be removed the same day that the spill occurs. At the completion of removal operations, concrete surfaces shall be restored to original condition (grey/white concrete finish). All work associated with the removal of slurry from the concrete surfaces shall be conducted at the Contractor's expense.
  - I. For the convenience of the Contractor a Deficiency List will be provided by the Inspector. The items on the Deficiency List shall be completed by the Contractor within one (1) working day from the date the Deficiency List is issued. At the end of the project a Final Punch list will be issued to the Contractor for outstanding items.

**CS 16-07 SCHEDULE:** The Contractor shall comply with the following requirements in furnishing the Inspector the Schedule for the proposed work.

- A. The Contractor shall prepare and submit a written schedule to the Inspector for approval listing the streets, limits of slurry sealing, and the date of proposed sealing.
- B. The written schedule shall be submitted a minimum of five (5) working days prior to the first event on the Schedule.
- C. The Contractor shall consult with Vacaville Sanitary Service during the process of preparing the Schedule in order to avoid scheduling streets for sealing on trash/recycling pick-up days.
- D. The Contractor shall provide a map to the Inspector showing the order in which the streets for a particular day are to be sealed. The map shall be submitted at least five (5) working days in advance of the work.
- E. The Contractor shall adhere diligently to said written schedule in the prosecution of the work.

**CS 16-08 PREPARATION:** Prior to sealing each street, the Contractor shall verify that each street to be sealed has been "approved for sealing" by the Inspector. In order for the street to be approved for sealing the Contractor shall ensure the following requirements have been performed by the Contractor to the Inspector's satisfaction:

- A. **All thermoplastic markings, painted markings and pavement markers have been removed in accordance with the following requirements:**
  - 1. All existing painted or thermoplastic traffic stripes and pavement markings within areas to receive slurry seal shall be removed prior to sealing operations, unless indicated otherwise on the Project Plans.
  - 2. Removal of existing painted or thermoplastic striping/markings shall be performed by grinding. Removal shall be to the satisfaction of the Inspector.

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3. Existing pavement markers in the areas of sealing shall be removed and disposed of by the Contractor in accordance with Section 15-2, "Existing Highway Facilities" of the CALTRANS Standard Specifications and as amended herein.
  4. Any pavement damaged during marker removal shall be repaired to the satisfaction of the Inspector prior to slurry sealing of the roadway. All repair work shall be at the Contractor's expense.
  5. Nothing in these specifications shall relieve the Contractor from his responsibilities as provided in Section 7-1.09, "Public Safety," of the CALTRANS Standard Specifications.
  6. Immediately following the removal of existing pavement striping/markings and pavement markers, the Contractor shall clean and sweep roadways and on-site-paved areas to eliminate all materials attributed to or involved with removal operations. All materials shall be removed from the roadway prior to the end of each working day or as directed by the Inspector. The Contractor shall not use water to flush down streets in place of street sweeping.
  7. ***Portions of streets that have been previously open to public traffic shall be subject to the following additional requirements:***
    - a. Stop bars and legends, excluding those at intersections with collector or arterial streets may be removed up to seven (7) calendar days prior to placement of slurry seal. All other stripes and markings, including crosswalks and stop bars at intersections with collector or arterial streets requiring removal shall be removed the same day slurry seal is to be placed.
    - b. If pavement markers, paint or thermoplastic delineation, stop bars, or legends are removed in advance of the day of slurry seal application, the Contractor shall install temporary pavement delineation in accordance with Section CS 16-12, "Temporary Pavement Delineation" of the City Standard Specifications.

**B. All vegetation has been removed in accordance with the following requirements:**

1. All vegetation has been removed from all cracks in the existing paved surfaces and along the edge of pavement or gutter lips prior to placing slurry seal.
2. In the event that mature trees are encountered adjacent to streets or bike paths requiring slurry seal, it is the responsibility of the Contractor to conduct its operations around the trees such that the desired slurry sealing result is accomplished without damage to the trees. No trimming of trees shall be allowed without specific written permission of the Inspector. Any trimming that may be required must be approved at least two (2) working days in advance of slurry sealing operations.
3. Vegetation and tree limbs removed shall be disposed of outside the highway right-of-way in accordance with provisions in Section 7-1.13, "Disposal of

Material Outside The Highway Right of Way” of the CALTRANS Standard Specifications.

**C. All manhole covers, valve boxes, and utility lids have been protected in accordance with the following requirements:**

1. The surface of all manhole covers and miscellaneous utility covers and lids within the limits of work shall be protected from the slurry seal.
2. All materials used to protect lids and covers shall be removed and disposed of properly after slurry sealing operations.
3. All lids and covers shall have a clean surface after slurry sealing.
4. Prior to application of slurry seal, the Contractor shall mark the locations of all existing utility covers and lids within the streets to be slurry sealed.

**D. Asphalt crack sealing has been applied in accordance with the following requirements:**

1. Crack sealing shall consist of cleaning, drying and sealing cracks in bituminous pavements.
2. The crack sealing material to be furnished and applied by the Contractor shall be CalSeal<sup>®</sup> Modified Asphalt Joint Sealant, as manufactured by Henry Inc., or an approved equal and shall conform to the following requirements specified in **Table CS 16-2:**

**Table CS 16-2**

**Crack Seal Material Properties**

<b>PHYSICAL PROPERTIES</b>	<b>METHOD OF TEST</b>	<b>REQUIREMENTS</b>
Softening Point	ASTM D36	180° F - 205° F
Cone Penetration @ 77° F	ASTM D5329	20-50 dmm
Resilience @ 77° F	ASTM D5329	40% - 68%
Bitumen Content	ASTM D4	60% - 64%
Flow @ 140° F	ASTM D5329	0mm – 3mm
Ductility, 77° F	ASTM D113	30 cm – 38 cm
Weight per Gallon	ASTM D70	9.7 – 9.8 lbs/gal

3. The Contractor shall provide to the Inspector a certificate from the supplier of the crack sealing material giving the trade name of the sealer and verification that the sealer conforms to these specifications.

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4. Crack sealing material shall be applied to all cracks 3/16" or wider in accordance with manufacturer recommendations and these provisions of the City Standard Specifications.
  5. The Contractor shall refer to the manufacturer's product information sheet or application specifications for application methods, handling requirements, and other information.
  6. No sealant shall be placed in cracks until cracks have been cleaned free of all deleterious materials, including old sealant, organic materials, sand, dust and clay, and are dry.
  7. Cracks shall be filled flush with the surface and any overfill shall be squeegeed so that the overband cap does not exceed 1/16" above the surface and the width does not exceed two (2) inches beyond the crack edges.
  8. The Contractor shall be responsible for protection of newly placed materials from damage by traffic, weather, or other forces until fully cured. All crack sealed areas damaged by any force prior to acceptance of the work shall be corrected by the Contractor at his/her own expense.
  9. Work shall be scheduled such that crack seal operations in a given area are performed and completed at least one week prior to application of slurry seal.
- E. The surface of each street to be slurry sealed has been adequately cleaned a maximum of forty-eight (48) hours prior to spreading of slurry seal by sweeping as necessary to remove all loose particles of paving, dirt, vegetation, oil, and gasoline drippings; and all other extraneous material.

**CS 16-09 ROAD CLOSURES FOR SLURRY SEAL OPERATIONS:** Streets (or sections of streets) to be slurry sealed shall be closed to all but emergency (police, fire and ambulance) vehicles during the sealing and curing period. The closures shall be subject to the following conditions:

- A. Streets that have been previously open to public traffic shall be closed for as short a time as possible, and in all cases shall be opened for use by the public prior to 8 AM and after 5 PM on Monday through Friday, all day on Saturday and Sunday, all day on designated holidays, and when construction operations are not actively in progress (unless noted otherwise on the Project Plans or within the Special Provisions provided for the project).
- B. Access for emergency vehicles shall be allowed whenever necessary.
- C. The Contractor shall conform to the requirements of a Traffic Control Plan in accordance with the requirements of Section CS16-11, "Traffic Control Plan" and this Section CS 16-09, "Road Closures For Slurry Seal Operations" of the City Standard Specifications.
- D. The Contractor shall furnish and install C3A signs (ROAD CLOSED TO THRU TRAFFIC) at the entrance to all streets that "dead end" due to road closures for slurry sealing operations. All signs shall be provided, installed, and maintained by the Contractor.

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**E. *Portions of streets to be slurried sealed that include an existing business, residence, or school frontage that shall be subject to the following additional requirements:***

1. The Contractor shall notify each business, residence, or school, of planned slurry sealing adjoining their properties two weeks prior to such work by furnishing and delivering printed material (i.e. Door Hangers) to each residence, school, or business indicating when their street and adjacent streets will be closed for slurry sealing.
2. A second notification (i.e. Door Hangers) shall be furnished and delivered five (5) working days for businesses and three (3) working days for residences and schools in advance of such work. In addition to this requirement, the Contractor shall notify all schools within the project area of planned slurry sealing of bike paths a minimum of five (5) working days in advance of such work by furnishing and delivering printed material (i.e. door hangers) to each school.
3. The Inspector shall make the final determination as to which streets require posting. A sample of the Door Hanger can be obtained from the Inspector for Private Development projects and is included in the Special Provisions for City Capital Improvement projects. The Door Hanger proposed for use by the Contractor must be reviewed and approved by the Inspector prior to distribution.
4. During street closures, businesses and residences along the street shall be provided pedestrian passage as far as practical. Convenient pedestrian access to driveways, houses and buildings along the street shall be maintained. The maximum distance that a resident must walk to a legal parking area during sealing operations shall be one thousand (1,000) feet. Vehicular access to any business and/or residence shall only be blocked once during the slurry seal process.
5. Pedestrian access shall be provided at intersections or at other locations as directed by the Inspector. Placing sand or aggregate, or laying down a strip of building paper or other approved material shall be the methods used to provide pedestrian access. The pedestrian access shall be a minimum of forty-eight inches (48") wide.
6. The Contractor shall cooperate with, and advise as to the current schedule, the Vacaville Police and Fire Departments, local ambulance services, the Vacaville City Coach (Bus), Vacaville Sanitary Service, the Vacaville Unified School District Transportation Department, Travis Unified School District Transportation Department, and the U.S. Post Office forty-eight (48) hours in advance of the start of work on any street. The Contractor shall also notify United Parcel Service (UPS), Federal Express, and other mail delivery services of planned road closures and the current schedule.
7. The Contractor shall make arrangements to keep the work area free of parked vehicles and shall cooperate fully with local authorities in maintaining traffic flows through the area. The Contractor shall notify the Inspector of any vehicles

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that remain within the limits of that day's operation, so that the Inspector may coordinate the removal of that vehicle.

8. The Contractor shall install Type II barricades with "No Parking" signs (signs to be furnished by the City – Contractor shall notify Inspector two weeks in advance of when signs are needed) and shall clearly mark the date(s) and hours that **NO PARKING ZONES** shall be in effect. The dates posted on the barricades must match the dates that the work is scheduled to be performed at the location posted. Barricades shall be spaced at one hundred (100) foot intervals or less on both sides of streets. These signs and dates shall be fully coordinated with the City of Vacaville Police Department to conform to all current Vehicle Code requirements for notice and signing, and in no event shall said signs be posted less than 72 hours (three working days) in advance of the sealing operation.
9. The Contractor shall be responsible for re-notifying all affected residences, schools and businesses in the event that a street needs to be rescheduled due to unforeseen delays. Re-notification shall be in accordance with the requirements specified above for initial notification. The Contractor shall also be responsible for re-posting of "No Parking" signs and barricades.

**CS 16-10 LANE CLOSURES FOR SLURRY SEAL OPERATION:** Lane closures may be required along portions of City streets (streets open to public traffic) to complete slurry sealing of adjacent project streets/areas. Lane closures shall be subject to the following conditions:

- A. The Contractor shall conform to the requirements of a Traffic Control Plan in accordance with the requirements of Section CS16-11, "Traffic Control Plan" and this Section CS 16-10, "Lane Closures For Slurry Seal Operations" of the City Standard Specifications.
- B. The Contractor shall ensure at least one driveway to a business or apartment complex is open at all times by placing sand or aggregate, or laying down a strip of building paper or other approved material.
- C. At least one minimum 10-foot wide lane in each direction of travel shall be provided at all times. Unless otherwise specified by the City Traffic Engineer, the full width of traveled way shall be open for use by the public prior to 8 AM and after 5 PM, Monday through Friday, all day on Saturday and Sunday, all day on designated legal holidays (unless noted otherwise in the Special Provisions provided for the project), and when construction operations are not actively in progress. (The City Traffic Engineer may specify certain conditions on specific aspects of the Traffic Control Plan which may alter the hours of closure from those identified above.) When not in use, all components of the traffic control system shall be removed from the traveled way and shoulder.

**CS 16-11 TRAFFIC CONTROL PLAN:** The Contractor is required to conform to the requirements specified herein for preparing, submitting, and obtaining City approval for a Traffic Control Plan for any Street and Lane Closure necessary for Slurry Seal operations.

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- A. The Contractor shall prepare and submit a Traffic Control Plan to the Inspector for review and approval at least fifteen (15) working days prior to planned beginning of the Lane or Street Closure. The Traffic Control Plan shall depict the details of all proposed lane and/or street closures.
  - B. For each closure, the Contractor shall submit a detailed drawing showing placement of delineators, barricades, construction signing, flagmen, etc. and shall indicate the reasons for each closure and the duration of each closure.
  - C. When placing slurry seal at signalized intersections, the Contractor shall contact the City Traffic Engineer a minimum of forty-eight (48) hours in advance of working at the intersection in order to modify the signal operation.

**CS 16-12 TEMPORARY PAVEMENT DELINEATION:** Temporary pavement delineation shall be furnished, placed, maintained, and removed in accordance with the provisions in Section CS 12-05, "Temporary Pavement Delineation" of the City Standard Specifications.

**CS 16-13 PERMANENT TRAFFIC STRIPES, PAVEMENT MARKING, AND PAVEMENT MARKERS:** Permanent traffic stripes, pavement marking, and pavement markers shall conform to Section CS 12, "Traffic Stripes, Pavement Markings, and Pavement Markers" of the City Standard Specifications except as amended herein.

- A. No permanent traffic stripes, pavement marking, or pavement markers shall be installed for seven (7) calendar days after the street has been slurry sealed, not including the day of application. This period of time has been set aside to allow the slurry to cure.
- B. Permanent traffic stripes, pavement marking, and pavement markers shall be installed on or between the eighth (8<sup>th</sup>) and the thirteenth (13<sup>th</sup>) calendar day following the day of slurry sealing.

**CS 16-14 STREET SWEEPING FOLLOWING APPLICATION OF SLURRY SEAL:** The Contractor shall provide all necessary equipment, skill and manpower to sweep all completed slurry sealed streets/areas to the satisfaction of the City Inspector in accordance with the following requirements:

- A. The Contractor shall use a commercial sweeper to sweep each street and area slurry sealed.
- B. During the sweeping, the sweeper shall use only the rear broom. The front brooms shall not be used during this sweeping operation.
- C. The initial sweeping shall be performed no sooner than three (3) and no more than five (5) calendar days after the slurry has been applied to the street/area.
- D. The final sweeping on through streets shall be performed no sooner than two (2) weeks and no later than four (4) weeks after the slurry has been applied to the street/area. The final sweeping on cul-de-sacs shall be performed no sooner than four (4) weeks and no later than six (6) weeks after the slurry has been applied to the street/area.

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- E.** The sweepings removed shall be disposed of outside the highway right-of-way in accordance with provisions in Section 7-1.13, “Disposal of Material Outside The Highway Right of Way” of the CALTRANS Standard Specifications.