

## **Sample Specifications**

### **Cold In-Place Recycling (CIR) for Thin Section Treatment**

#### **39-7.1 Mix Design**

A minimum 30 days prior to starting the Cold in Place Recycling the contractor will take samples of the existing pavement, prepare, and submit a mix design for the Engineers approval. The mix design shall be prepared in a lab certified to perform the tests specified. The mix design shall be performed in accordance to the Wirtgen Cold Recycling Manual, ED 2010, or other method approved by the Engineer.

Minimum criteria used for acceptance of the proposed mix design will be:

Dry Indirect Tensile Strength	>250 kPa (37 psi)
Minimum Wet Strength	225 kPa (33 psi)

The design submittal must indicate the following information:

- Cold in Place Recycling CIR equipment and method proposed
- Grain Size Distribution Report
- Bitumen Grade
- Bitumen Content
- Bitumen Source
- Water Content
- Cement or Lime Content
- Cement or Lime Source
- Cement or Lime Grade
- Any other additives
- Results of Mix Design indicating strength and foaming parameters
- Maximum Density per Cal 216
- Bulk density of recommended oil content
- Test results of the Mix Design

#### **39-7.2 Quality Control Plan**

Provide a quality control plan (QCP) that describes the organization, responsible parties, and procedures you will use to:

1. Perform control quality activities required by the project specifications
2. Determine when corrective actions are needed (action limits)
3. Implement corrective actions

The QCP must contain copies of the forms that will be used to provide all required inspection records and sampling and testing results. On the form used to record and report the quality control measurements, also show the job mix formula information. The QCP must also demonstrate how the project will be divided into lots, and the approximate number of each test to be performed per lot to be in accordance with the testing requirements set for in the project specifications.

As part of the QCP the contractor will provide a contingency plan that describes the corrective actions you will take in the event of equipment break down or material out of compliance.

### **39-7.2.1 Contingency Plan**

The contingency plan must include any corrective actions including repairing and reopening the roadway to traffic using hot mix asphalt in compliance with the, "Hot Mix Asphalt," portion of the project or temporary bituminous surfacing in compliance with these special provisions.

Hot mix asphalt must:

1. Be hot mix asphalt (Type A)
2. Use 1/2-inch aggregate grading
3. Use asphalt binder grade PG 64-10 or PG 64-16

Temporary bituminous surfacing must:

1. Be commercial quality bituminous material
2. Contain aggregate using 1/2-inch HMA grading in compliance with Section 39-1.02E, "Aggregate," of the Standard Specifications.
3. Use liquid asphalt SC-800 in compliance with Section 93, "Liquid Asphalts," of the Standard Specifications.

The contractor shall meet with the Project Engineer at least 7 days before starting cold-in-place recycling work to review the QCP and contingency plan.

### **39-7.2.2 QC Laboratory**

Provide a Caltrans certified testing laboratory and personnel to perform quality control inspection, sampling and testing.

Provide the Engineer with unrestricted access to the laboratory, sampling and testing sites, and all information resulting from submitted mix designs and quality control inspection and testing activities. Proficiency of testing laboratories and sampling and testing personnel must be reviewed, qualified, and accredited by Caltrans Independent Assurance Program before starting cold-in-place recycling work.

Perform inspection, sampling and testing at a rate sufficient to ensure that cold-in-place recycling mixture, placement, compaction and finishing complies with the specifications.

### **39-7.2.3 Production Quality Control**

Divide the project into 3,000-square yard lots as per the approved QCP. For each lot perform the following:

1. Determine the actual recycle depth at each end of the milling drum at least once every 500 feet along the cut length
2. Take and split a sample of the CIR mixture from directly behind the recycler as near as possible to the start of the lot. Sampling shall be in accordance with the approved QCP. A sample shall consist of a minimum of four (4), five gallon buckets of processed material. Split the samples into two (2) parts and label the containers with location including stationing. Submit 1 split part to the Engineer and use 1 part for the Quality Control testing.
3. QC testing shall consist of the following for each lot processed:
  - Wet gradation of the coarse fraction (2" through #4 Sieve). Per CTM 202.
  - CTM 216 Compaction Curve. Under no circumstances shall a common composite be used.
  - A minimum of six (6) briquettes for indirect tensile strength testing shall be produced

from one sample. Three shall be used to determine an average dry indirect tensile strength and three shall be used to determine an average soaked indirect tensile strength. Briquettes samples shall be compacted and curing started within three (3) hours from the time of sampling. All indirect tensile strength tests shall be performed in accordance with the Wirtgen Cold In-Place Recycling Manual method A5.1, 2010 edition.

4. Determine in place density and relative compaction of at least 10 random locations per Cal 231 (using direct transmission nuclear density gauge.). Use test results from the CTM 216 sampled from within the lot to determine the percent compaction. Additional testing is acceptable however, a minimum of 10 tests per lot shall be recorded and submitted for the basis of acceptance.

For each day measure or calculate and record the following information:

1. Length, width, depth of cut and calculated weight in tons of material processed
2. Weight of recycling agent added in tons
3. Percentage of added recycling agent in the lot's CIR mixture by weight
4. Weight of recycling additive used in tons (if used)
5. Percentage of recycling additive in the lot's CIR mixture by weight (if used)
6. Ambient and compacted recycled pavement surface temperatures
7. Rate off of seal coat application

On the form used to record and report the quality control measurements, also show the project mix design information.

Make adjustments during CIR operations for optimum quality. If adjustments are made, document the reason for the change and identify on the daily quality control inspection records and sampling and test results.

The Contractor shall be responsible for the quality of construction and materials incorporated into the project. The Contractor's QC measures shall ensure that operational techniques and activities provide integral and finished material of acceptable quality.

Contractor sampling and testing shall be performed to control the processes and ensure material compliance with the requirements of the Contract.

The Contractor shall perform all Quality Control testing and sampling for the project. All QC sampling and testing shall be performed by technicians certified by the State of California for that particular test method, where applicable, and all laboratory testing shall be performed by laboratories accredited by the Caltrans Independent Assurance Program for the applicable methods.

Contractor shall furnish copies of all test results to the Engineer or other authorized department representative within 48 hours of completing the test.

The Contact shall furnish a complete QC Final Report including all test results, as well as summary of findings. The final QC report shall be reviewed and approved prior to issuing payment.

### **39-7.3 Placement**

CIR shall be to a depth as stated on the project plans within the lines and grades of the project plans and specifications or as directed by the Engineer.

Placement of the CIR materials will be in accordance with Section 39 of these specifications.

### **39-7.3.1 Recycling Equipment**

A single-unit self-propelled cold recycling machine with a down cutting cutter head shall be capable of pulverizing and recycling the existing hot-mix asphalt pavement to a maximum depth of 6 inches (0.12m), incorporate the foamed asphalt and compaction water, and mix the materials to produce a homogeneous material.

The milling and mixing unit must be equipped with a gradation control bar that will stabilize the milled surface during milling to prevent the pavement from chunking. The minimum power of this machine shall be 950 hp. The machine shall be capable of pulverizing and recycling not less than 12ft 6ins (3.8 m) wide in each pass.

The machine shall have two independent systems for adding foamed asphalt and metered water with each system having a full width spray bar with a positive displacement pump interlocked to the machine's ground speed to insure that the amount of foamed asphalt and compaction water being added is automatically adjusted with changes to the machine's ground speed. Each additive system shall have its own spray bar equipped with 2 nozzles per foot of spray bar. The foamed asphalt spray bar must be electrically heated. Individual valves on the spray bar shall be capable of being turned off (in pairs) as necessary both foamed asphalt and water to minimize overlap on subsequent passes.

The single unit must also have a tamper bar screed attached to the milling and mixing unit. The tamper bar screed must have the ability to tamp at varying frequency. The screed shall have slope control and the ability convey material out the side of the screed if there is a surge of material between the mixing chamber and the screed. The mixing unit and screed combination must have electronic grade controls.

### **39-7.3.2 Fog Seal and Sand Spreading**

If directed by the Engineer at the end of each days production the contractor shall apply a uniform fog seal to the surface at a rate of 0.12 gal/sq. ft. and shall meet SS1H "Fog Seal" Cut 50. If directed by the Engineer, sand shall be spread at a rate of 1.0 to 2.0 pounds per square yard. Exact spread rate shall be determined by the Engineer. Remove excess sand from the CIR surface. Sand cover shall be spread by means of a self-propelled spreader equipped with a mechanical device that will spread the sand at a uniform rate over the CIR surface. The area treated shall be capable of holding traffic at the end of each day's production without any deformation or damage to the surface.

The Contractor will use their knowledge and expertise to deliver a product that meets the requirements of this section and contract.

### **39-7.4 Acceptance**

The project shall be divided into lots of 3,000 square yards, extending along the lane lines of the road way. If one day's production will be less than 3000 square yards that day's production shall be a lot. If one day's production is one lot plus an additional amount greater than 1000 square yards, the additional work shall be a separate lot. For additional amounts, less than 1000 square yards the additional amount shall rolled into the previous lot unless a distinct material change is noted, in which case a new lot shall be created.

Acceptance will be based on the following criteria:

- A. The average minimum Wet Indirect Tensile Strength of a lot shall be 225 kPa (33 psi).
- B. The average relative compaction of a lot shall be a minimum of 98% of the maximum wet density as measured by Cal 216. No single test shall be less than 96% relative compaction.

For lots outside of the acceptance criteria the Engineer determines a deduction for each test result outside the specifications using the reduced payment factors shown in the following tables:

**A- ITS Test Results**

<b><u>% of Minimum Wet Strength (225 kPa)</u></b>	<b><u>Pay Factor</u></b>
> 100%	100%
> 98%	98%
> 96%	96%
> 94%	94%
> 92%	92%
> 90%	90%
< 90%	Remove at Engineers Sole Discretion

**B- Compaction**

<b><u>% of Relative Compaction as Measured By Cal 216 Average Density Per Lot</u></b>	<b><u>Pay Factor</u></b>
> 98%	100%
> 97%	95%
> 96%	90%
> 95%	85%
> 94%	Remove at Engineers Sole Discretion

In the event a lot is subject to both pay factors, they will be cumulative. (I.E. An 90% pay factor for ITS and a 95% pay factor for Compaction equals a 86% cumulative pay factor.  $.90 \times .95 = .86$ )

In the event that the contractor fails to perform the required tests listed above the, contractor shall not be compensated for lots process without the appropriate QC test results.

In the case of discrepancy or contested laboratory results the recycled layer shall be cored for indirect tensile strength determination and in-situ density. The coring must be done once the layer has fully cured. Typically CIR layers are fully cured within 6 weeks of placement. However, actual cure time depends on the environmental conditions around the mat during curing. The actual cured state shall be verified coring, and subsequent moisture testing.

Coring shall not be performed as a method for payment in the event that the contractor fails to perform the required quality control testing and inspections.

**39-7.5 Method of Measurement**

The unit of measurement for Cold In-Place Pavement Recycling shall be per square foot for the depth specified in the contract. The area to be paid shall be the length measured along the centerline of the roadway multiplied by the average perpendicular width.

Additional excavation/recycling performed by the Contractor outside the lines provided in the Plans shall not be measured and compensated by the owner without approval by the Engineer.

**39-7.6 Minimum Qualifications for Cold In-Place Recycling (CIR) Contractor**

The contractor directly responsible for providing the cold in place recycling activities shall provide minimum qualifications for the Engineers approval prior to being awarded the project. The minimum qualifications shall include:

- At least two years' experience providing cold in-place recycling services utilizing the method of recycling call for within this specification
- A list of five (5) or more successful cold in-place recycling projects, utilizing the method of recycling called for within this specification, with a list of references, including contact information.
- The resume of a cold foam expert with a minimum of two (2) years' experience providing QA/QC services on cold in-place recycling projects, utilizing the recycling method set forth within this specification. This individual shall be on site full time during recycling activities, oversee quality control duties throughout the project, and be responsible for submitting test results to the agency for acceptance. The cold foam expert shall also be available for project meetings throughout the project.

### **39-7.7 Basis of Payment**

Cold In-Place Pavement Recycling shall be paid for at the contract unit price per square foot adjusted by the pay factor. This amount shall be full compensation for all work necessary within the dimensions shown on the Plans or specified herein, including but not limited to pulverizing existing pavements, additional materials, stabilizing agent(s), mineral filler, water, grading, compaction, sampling, testing and for all materials, labor, tools, equipment, hauling permits, mobilization and any incidentals necessary to complete the work.