

MATERIALS

Materials must comply with Section 20-2, "Materials" of the Standard Specifications and these Special Provisions.

Seed

Seed must comply with Section 20-2.10, "Seed" of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must contain at most 1.0 percent total weed seed by weight.

Seed must be free of the following specific weed species: Salt Cedar/Tamarisk.

Deliver seed to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag attached are not accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Legume seed must comply with the following:

Legume Seed		
Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Lotus rigidus (Shrubby Deervetch)	30	3.0
Lupinus arizonicus (Arizona lupine)	40	3.0

*Seed produced in California only.

Non-legume seed must comply with the following:

Non-Legume Seed		
Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Ambrosia dumosa (Burro-weed)	25	4.0
Aristida adscensionis (Six-weeks three-awn)	30	3.0
Baileya pleniradiata (Wooly marigold)	0	2.0
Cammissonia californica (California evening primrose)	25	2.0
Oenothera deltoids (Dune primrose)	20	2.0
Helianthus niveus (Dune sunflower)	40	5.0
Helianthus annuus (Common sunflower)	40	5.0

Seed Sampling Supplies

At the time of seed sampling, provide the Engineer a glassine lined bag and custody seal tag for each seed lot sample.

Stabilizing Emulsion

Stabilizing emulsion must comply with Section 20-2.11, "Stabilizing Emulsion" of the Standard Specifications and these Special Provisions.

Stabilizing emulsion:

- A. Must be in a dry powder form.
- B. Must be a processed organic adhesive used as a soil tackifier.
- C. May be reemulsifiable.

APPLICATION

Apply erosion control materials in separate applications in the following sequence:

- A. Apply the following mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

Material	Kilograms Per Hectare (Slope Measurement)
Seed	29
Fiber	800

- B. Apply the following mixture with hydro-seeding equipment at the corresponding rates:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	800
Stabilizing Emulsion (Solids)	140

The ratio of total water to total stabilizing emulsion in the mixture must be as recommended by the manufacturer.

Hydraulic application of materials for erosion control (netting) areas shall be applied by hose, from the ground. Erosion control (Type D) materials shall be applied onto the slope face such that the materials are well integrated into the erosion control (netting) and in contact with ground surface. Application shall be perpendicular to the slope face such that erosion control (netting) materials are not damaged or displaced. Erosion control (netting) damaged by the Contractor's operations shall be replaced by the Contractor at the Contractor's expense. The Engineer may change the rates of erosion control materials to meet field conditions.

MEASUREMENT AND PAYMENT

The contract price paid per square meter for Erosion Control (Type D), calculated on the basis of actual slope measurements shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Type D) complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.66 FIBER ROLLS:

Fiber rolls shall be furnished and installed in conformance with details shown on the plans and these Special Provisions and as directed by the Engineer.

Fiber rolls shall be installed on excavation and embankment slopes and other disturbed soil areas.

At the option of the Contractor, fiber rolls shall be Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be either:

- A. Constructed with a pre-manufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in

length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150-mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150-mm from the ends of each roll. The finished roll shall be between 200-mm and 250-mm in diameter, a minimum of 6 m in length, and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150-mm along the length of the blanket.

- B. A pre-manufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200-mm and 300-mm in diameter. Rolls between 200-mm and 250-mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250-mm and 300-mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

Stakes

Wood stakes shall be a minimum of 19-mm x 19-mm x 450-mm in size for Type 1 installation, or a minimum of 19-mm x 38-mm x 450-mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35-mm.

INSTALLATION

Fiber rolls shall be installed as follows:

- A. Fiber rolls (Type 1): Furrows shall be constructed to a depth between 50-mm and 100-mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600-mm apart along the length of the fiber rolls and stopped at 300-mm from each end of the rolls. Stakes shall be driven to a maximum of 50-mm above, or flush with the top of the roll.
- B. Fiber rolls (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.

- C. Fiber rolls shall be placed 3 m apart along the slope for slope inclination (vertical:horizontal) of 1:2 and steeper, 4.5 m apart along the slope for slope inclination between 1:2 and 1:4, 6.0 m apart along the slope for slope inclination between 1:4 and 1:10, and a maximum of 15 m apart along the slope for slope inclination of 1:10 and flatter.
- D. The bedding area for the fiber rolls shall be cleared of obstructions including rocks, clods, and debris greater than 25-mm in diameter before installation.
- E. Fiber rolls shall be installed approximately parallel to the slope contour.
- F. Fiber rolls shall be installed before the application of other erosion control or soil stabilization materials in the same area.

If the intended function of the fiber rolls to disperse concentrated water runoff and to reduce runoff velocities is impaired, the Contractor shall take action to repair or replace the fiber rolls. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Quantities of fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for Fiber Roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fiber rolls, complete in place, including furrow excavation and backfill, repairing or replacing fiber rolls as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

Damage to fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

10-1.67 MINOR CONCRETE (TEXTURED PAVING):

Minor Concrete (Textured Paving) shall be placed as shown on the plans and in conformance with these Special Provisions. Color of rock shall be natural gray and match the existing rock found within the project area.

MATERIALS

Rock for the Minor Concrete (Textured Paving) shall be clean, smooth rock obtained from a single source.

Rock shall conform to the following grading:

Screen Size (Millimeters)	Percentage Passing (By Mass)
355	100
254	90-100
200	0-10

A sample of the rock shall be submitted to the Engineer for approval prior to delivery of the rock to the project site.

Rock shall be secured in place with Class 2 concrete conforming to the provisions in Section 90, "Portland Cement Concrete" of the Standard Specifications and these Special Provisions. Concrete aggregate size shall be 19 mm maximum.

SITE PREPARATION

Areas to receive Minor Concrete (Textured Paving) shall be cleared of trash and debris. Weeds shall be removed to the ground level. Cleared trash, debris and removed weeds shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

After clearing, the areas shall be excavated to the depth shown on the plans, graded to a smooth uniform surface and compacted to a minimum relative compaction of 90 percent. A minimum embedment into the concrete setting base shall be between 50 – 80 percent for all rock.

PLACEMENT

Rock shall be placed while concrete is still plastic, and spaced a maximum of 20-mm apart. The Contractor shall remove concrete adhering to the exposed surfaces of the rock. Loose rocks, or rock with a gap greater than 15-mm, measured from the edge of the rock to the surrounding concrete bedding shall be reset at the Contractor's expense by methods determined by the Engineer.

MEASUREMENT AND PAYMENT

Minor Concrete (Textured Paving) will be measured by the square meter as determined from actual measurements made parallel to the ground slope.

The contract price paid per square meter for Minor Concrete (Textured Paving) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing rock blanket, complete in place as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.68 IRRIGATION CROSSOVERS:

Irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems" of the Standard Specifications and these Special Provisions.

Conduits shall be placed in open trenches in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers" of the Standard Specifications.

Conduits shall be alternate conduits and, at the option of the Contractor, shall be one of the following:

- A. Bituminous coated corrugated steel pipe.
- B. Corrugated aluminum pipe.
- C. Acrylonitrile-butadiene-styrene (ABS) composite pipe.
- D. Corrugated high density polyethylene (CHDPE) pipe conforming to the requirements in ASTM Designation: F 405 or F 667, or AASHTO Designation: M 252 or M 294 and shall be Type S. Couplings and fittings for CHDPE pipe shall be as recommended by the pipe manufacturer.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers" of the Standard Specifications. Sprinkler control crossovers shall conform to the provisions in Section 20-5.027D, "Sprinkler Control Crossovers" of the Standard Specifications.

Installation of pull boxes shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduit and Pull Boxes" of the Standard Specifications. When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

MEASUREMENT AND PAYMENT

The contract price paid per meter for Corrugated High Density Polyethylene Pipe Conduit shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved and complete in place including the placing of special marker as directed by the Engineer, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.69 FINISHING ROADWAY:

Finishing roadway shall conform to the provisions in Section 22, "Finishing Roadway" of the Standard Specifications.

Payment – Full compensation, except as otherwise provided herein, for conforming to the requirements of this article shall be paid for on a lump sum basis and no additional compensation will be allowed therefor.

10-1.70 AGGREGATE BASE:

Aggregate base must comply with Section 26, "Aggregate Bases" of the Standard Specifications and these Special Provisions.

Aggregate base must be Class 2.

Do not store reclaimed asphalt concrete or aggregate base with reclaimed asphalt concrete within 30 m measured horizontally of any culvert, watercourse, or bridge.

The contract unit price paid per cubic meter for Class 2 Aggregate Base shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved and complete in place, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.71 LEAN CONCRETE BASE:

Lean concrete base shall conform to the provisions in Section 28, "Lean Concrete Base" of the Standard Specifications and these Special Provisions.

The finished surface of lean concrete base shall not be above the grade established by the Engineer, or more than 15-mm below the grade established by the Engineer.

The contract unit price paid per cubic meter for Lean Concrete Base shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved and complete in place, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.72 HOT MIX ASPHALT:

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) Type A using the QC/QA process.

Comply with Section 39, "Hot Mix Asphalt" of the Standard Specifications.

Submittals

Quality Control/Quality Assurance Projects

With the job mix formula (JMF) submittal, submit:

- A. California Test 204 plasticity index results.
- B. California Test 371 tensile strength ratio results for untreated HMA.

- C. California Test 371 tensile strength ratio results for treated HMA if untreated HMA tensile strength ratio is below 70.

At project start-up and once during production, submit samples split from your HMA production sample for California Test 371 to the Engineer and the Transportation Laboratory, Attention: Moisture Test.

With the JMF submittal, at project start-up, and each 5000 tonnes, submit the California Test 371 test results for mix design and production to the Engineer and electronically to:

Moisture_Tests@dot.ca.gov

Data Cores

Three business days before starting coring, submit proposed methods and materials for backfilling data core holes.

Submit to the Engineer and electronically to Coring@dot.ca.gov:

- A. A summary of data cores taken.
- B. A photograph of each data core.

For each data core, the summary must include:

- A. Project identification number.
- B. Date cored.
- C. Core identification number.
- D. Type of materials recovered.
- E. Type and approximate thickness of unstabilized material not recovered.
- F. Total core thickness.
- G. Thickness of each individual material to within:
 - 1. For recovered material, 12.5-mm.
 - 2. For unstabilized material, 25-mm.
- H. Location including:
 - 1. County.
 - 2. Route..
 - 3. Post mile.
 - 4. Lane number.
 - 5. Lane direction.
 - 6. Station.

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

- A. The core.
- B. Project identification number.

- C. Core identification number.
- D. Date cored.
- E. County.
- F. Route.
- G. Post mile.
- H. Lane number.
- I. Lane direction.

After data core summary and photograph submittal, dispose of cores under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

Quality Control and Assurance

For the mix design, determine the plasticity index of the aggregate blend under California Test 204. Choose an antistrip treatment and use the corresponding laboratory procedure for the mix design in compliance with:

Antistrip Treatment Lab Procedures for Mix Design

Antistrip Treatment	Lab Procedure
Plasticity index from 4 to 10 ^a	
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7
Plasticity index less than 4	
Liquid	LP-5
Dry hydrated lime without marination	LP-6
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7

Notes:

^a If the plasticity index is greater than 10, do not use that aggregate blend.

For the mix design, determine tensile strength ratio under California Test 371 on untreated HMA. If the tensile strength ratio is less than 70:

- A. Choose from the antistrip treatments specified based on plasticity index.
- B. Test treated HMA under California Test 371.
- C. Treat to a minimum tensile strength ratio of 70.

On the first production day and at least every 5000 tonnes, sample HMA and test under California Test 371.

The Department does not use California Test 371 test results for JMF verification and production to determine specification compliance.

HMA must comply with the following quality requirement when mixed with the asphalt used on the project in the amount determined to be optimum by California Test 367:

Quality Characteristic	Test	Requirement
Surface Abrasion	CT360	Loss not to exceed 0.4 g/cm ²

MATERIALS

Asphalt Binder

The grade of asphalt binder mixed with aggregate for HMA Type A must be PG 64-28 PM (Polymer Modified).

Aggregate

The aggregate for HMA Type A must comply with the 19-mm grading when the depth is 60-mm and above. The aggregate for HMA Type A must comply with the 12.5-mm grading when used for cold planning or 45-mm HMA Type A overlay work.

Antistrip Treatment

Treat aggregate with lime slurry under "Hot Mix Asphalt Aggregate Lime Treatment – Slurry Method" and use Lab Procedure LP-7 for the mix design.

CONSTRUCTION

Vertical Joints

Before opening the lane to public traffic, pave shoulders and median borders adjacent to a lane being paved.

Do not leave a vertical joint more than 45-mm high between adjacent lanes open to public traffic.

Conform Tapers

Place additional HMA along the pavement's edge to conform to road connections and private drives. Hand rake, if necessary, and compact the additional HMA to form a smooth conform taper. Conform tapers are to be 1:30 (vertical:horizontal) or flatter.

Data Cores

Take data cores that include the completed HMA pavement, underlying base, and subbase material. Protect data cores and surrounding pavement from damage.

Take 100-mm or 150-mm diameter data cores:

- A. At the beginning, end, and every 800 m within the paving limits of each route on the project.

- B. After all paving is complete.
- C. From the center of the specified lane.

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. The Contractor may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

- A. Granular material.
- B. Crumbled or cracked stabilized material.
- C. Sandy or clayey soil.

PAYMENT

The contract unit price paid for Hot Mix Asphalt shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved and complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.73 GENERAL CRITERIA FOR PROFILING:

In addition to the straightedge provisions in Section 39-6.03, "Compacting" of the Standard Specifications, asphalt concrete pavement shall conform to the surface tolerances specified herein.

The uppermost layer of asphalt concrete surfacing shall be profiled in the presence of the Engineer using a California Profilograph or equivalent in conformance with California Test 526 and as specified in these Special Provisions.

The California Profilograph or equivalent will not be required for the following areas of the pavement surface but shall conform to the straightedge requirements in Section 39-6.03, "Compacting" of the Standard Specifications:

Pavement with a total thickness less than 0.24 foot;

Pavement on horizontal curves with a centerline curve radius of less than 1,000 feet and the pavement within the superelevation transition on those curves;

Pavement placed in a single lift when required by the Special Provisions;

Pavement with extensive grade or cross slope correction which does not receive advance leveling operations in conformance with the provisions in Section 39-6.02, "Spreading" of the Standard Specifications;

Pavement for ramps and connectors with steep grades and high rates of superelevation, as determined by the Engineer;

Shoulders and miscellaneous areas.

The Contractor shall conform to California Test 526, except a zero (null) blanking band shall be used for determining the Profile Index. Prior to beginning profiles, the profilograph shall be calibrated in the presence of the Engineer. Two profiles shall be obtained within each traffic lane, 3 feet from and parallel with the edges of the lane.

Pavements profiled shall conform to the following Profile Index requirements:

Pavement on tangent alignment and pavement on horizontal curves having a centerline curve radius of 2,000 feet or more shall have a Profile Index of 0.16 foot or less for each 330 feet section profiled;

Pavement on horizontal curves having a centerline curve radius of 1,000 feet or more but less than 2,000 feet, including the pavement within the superelevation transition of these curves, shall have a Profile Index of 0.32 foot or less for each 330 feet section profile;

Pavement within any 330 feet section, containing high point areas with deviations in excess of 0.025 foot in a length of 25 feet or less, when tested in conformance with the requirements in California Test 526, shall be corrected by the Contractor regardless of the Profile Index.

The Contractor shall complete initial runs of the profilograph prior to opening the pavement to public traffic. If initial profiles can not be made prior to opening the pavement to public traffic, the initial runs of the profilograph shall be made the next day that traffic control is permitted for the area to be profiled.

Areas of the top surface of the uppermost layer of asphalt concrete pavement that do not meet the specified surface tolerances shall be brought within tolerance by abrasive grinding.

Abrasive grinding shall be performed to reduce individual deviations in excess of 0.025 foot, and to reduce the Profile Index of the pavement to be within the specified tolerance. Areas which have been subjected to abrasive grinding shall receive a seal coat. Deviations in excess of 0.025 foot which cannot be brought into specified tolerance by abrasive grinding shall be corrected by either (1) removal and replacement or (2) placing an overlay of asphalt concrete. The corrective method for each area shall be selected by the Contractor and shall be approved by the Engineer prior to beginning the corrective work. Replacement or overlay pavement not meeting the specified tolerances shall be corrected by the methods specified above. Corrective work shall be at the Contractor's expense. The Contractor shall run profilograms on the areas that have received abrasive grinding or corrective work until the final profilograms indicate the Profile Index of the area is within the specified tolerance.

When abrasive grinding is used to bring the top surface of the uppermost layer of asphalt concrete surfacing within the specified surface tolerances, additional abrasive grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from, and parallel with, the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline, within a ground area. Ground areas shall be neat rectangular areas of uniform surface appearance.

The original of the final profilograms that indicate the pavement surface is within the Profile Index specified shall become the property of the County and shall be delivered to the Engineer prior to acceptance of the contract.

Full compensation including labor, equipment, materials and incidentals, for Profiling will be included in the contract price for "Hot Mix Asphalt" and no additional compensation will be allowed therefor.

10-1.74 HOT MIX ASPHALT (TYPE A BOND BREAKER):

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) (Type A Bond Breaker) using the Standard process.

HMA (Type A Bond Breaker) must comply with the requirements for HMA Type A of Section 39, "Hot Mix Asphalt" of the Standard Specifications.

Submittals

With the job mix formula (JMF) submittal, submit:

- A. Mix design data for the HMA Type A prior to the 1.0 percent increase in asphalt binder including:
 - 1. California Test 204 plasticity index results.
 - 2. California Test 371 tensile strength ratio results for untreated HMA Type A.
 - 3. California Test 371 tensile strength ratio results for treated HMA Type A if untreated HMA Type A tensile strength ratio is below 70 .

Quality Control and Assurance

Determine the antistrip treatment requirement for HMA (Type A Bond Breaker) as follows:

- A. For the mix design of HMA Type A, determine the plasticity index of the aggregate blend under California Test 204. Choose an antistrip treatment and use the corresponding laboratory procedure for the mix design in compliance with:

Antistrip Treatment Lab Procedures for Mix Design

Antistrip Treatment	Lab Procedure
Plasticity index from 4 to 10 ^a	
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7
Plasticity index less than 4	
Liquid	LP-5
Dry hydrated lime without marination	LP-6
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7

Notes:

^a If the plasticity index is greater than 10, do not use that aggregate blend.

- B. For the mix design of HMA Type A and prior to the 1.0 percent increase in asphalt binder, determine tensile strength ratio under California Test 371 on the untreated HMA Type A. If the tensile strength ratio is less than 70:
1. Choose from the antistrip treatments specified based on plasticity index.
 2. Test treated HMA Type A under California Test 371.
 3. Treat to a minimum tensile strength ratio of 70.
- C. Do not test HMA (Type A Bond Breaker) under California Test 371.

The Department does not use California Test 371 test results for JMF verification and production to determine specification compliance for HMA (Type A Bond Breaker).

QUALITY CONTROL TESTING

Perform sampling and testing at the specified frequency for the following quality characteristics:

HMA Type A – Bond Breaker Minimum Quality Control

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Requirement
Aggregate gradation ^a	CT 202	1 per 750 tonnes and any remaining part	JMF ± Tolerance ^b
Sand equivalent (min.) ^{c, g}	CT 217		47
Asphalt binder content	CT 379 or 382		JMF ± 0.45%
HMA moisture content (max.)	CT 370	1 per 2 500 tonnes but not less than 1 per paving day	1.0%
Percent of maximum theoretical density (minimum) ^{d, e}	Quality control plan	2 per business day (min.)	96%
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants ^f	CT 226 or CT 370	2 per day during production	--
Percent of crushed particles coarse aggregate (% min.) ^g One fractured face Two fractured faces Fine aggregate (% min.) ^g (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face	CT 205	As necessary and designated in the QCP. At least once per project	90
			75
			70
Los Angeles Rattler (% max) ^g Loss at 500 rev.	CT 211		45

Notes:

^a Determine combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

^b The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

^c Report the average of 3 tests from a single split sample.

^d Required if the total paved thickness is at least 45-millimeters.

^e Determine maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

^f For adjusting the plant controller at the HMA plant.

^g The point and method of sampling will be agreed upon before aggregate production begins. Perform this test before lime treatment.

Apply white pigmented curing compound to the finished surface of the HMA (Type A Bond Breaker) within 2 days of placing the Portland cement concrete pavement. Pigmented curing compound must conform to the requirements of ASTM Designation C 309, Type 2, Class A. Curing compound must be applied in 2 separate applications to the area to be surfaced with Portland cement concrete pavement. Apply curing compound at the rate of 3.8 liters per 14 square meters.

ENGINEER'S ACCEPTANCE

The Engineer samples for acceptance testing, and tests for:

HMA Type A – Bond Breaker Acceptance

Quality Characteristic	Test Method	Requirement
Aggregate gradation ^a	CT 202	JMF ± Tolerance ^b
Sand equivalent (min.) ^{c, f}	CT 217	47
Asphalt binder content	CT 379 or 382	JMF ± 0.45%
HMA moisture content (max.)	CT 370	1.0%
Percent of maximum theoretical density (minimum) ^{d, e}	Quality control plan	96%
Percent of crushed particles coarse aggregate (% min.) ^f	CT 205	
One fractured face		90
Two fractured faces		75
Fine aggregate (% min.) ^f (Passing 4.75-mm sieve and retained on 2.36-mm sieve.)		
One fractured face		70
Los Angeles Rattler (% max.) ^f Loss at 500 rev.	CT 211	45

Notes:

^a The Engineer determines combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

^b The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

^c The Engineer reports the average of 3 tests from a single split sample.

^d Required if the total paved thickness is at least 45-millimeters.

^e The Engineer determines maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

^f The point and method of sampling will be agreed upon before aggregate production begins. Perform this test before lime treatment.

MATERIALS

Asphalt Binder

The grade of asphalt binder mixed with aggregate for HMA (Type A Bond Breaker) must be PG 64-16.

Aggregate

The aggregate for HMA (Type A Bond Breaker) must comply with the 9.5-millimeters grading.

Asphalt Binder Content

Increase the amount of asphalt binder mixed with aggregate for HMA (Type A Bond Breaker) by 1.0 percent by weight of the dry aggregate over the optimum binder content (OBC) determined for use in HMA Type A under California Test 367.

Job Mix Formula and HMA (Type A Bond Breaker) Evaluation

Prior to the 1.0 percent increase in asphalt binder, HMA Type A used for HMA (Type A Bond Breaker) must conform to the requirements of Hot Mix Asphalt Mix Design Requirements.

Verification is testing for compliance with the specifications for:

- A. Aggregate quality.
- B. HMA quality specified in the table HMA (Type A Bond Breaker) Acceptance except percent of maximum theoretical density.

CONSTRUCTION

Tack Coat

Apply tack coat for the HMA (Type A Bond Breaker) to the Lean Concrete Base at the same rate as HMA over existing PCC pavement per Section 39-1.09.

Antistrip Treatment

Treat aggregate with lime slurry under "Hot Mix Asphalt Aggregate Lime Treatment – Slurry Method" and use Lab Procedure LP-7 for the mix design.

PAYMENT

HMA (Type A Bond Breaker) will be measured and paid for in the same manner specified for HMA in conformance with the requirements of Section 39-5, "Measurement and Payment" of the Standard Specifications.

Full compensation for the additional one percent of asphalt binder used in HMA (Type A Bond Breaker) and for furnishing and applying white pigmented curing compound to the surface of the HMA (Type A Bond Breaker) shall be considered as included in the contract price paid per ton for HMA (Type A Bond Breaker) as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.75 HOT MIX ASPHALT OPEN GRADED FRICTION COURSE:

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) open graded friction course (OGFC) using the standard process.

Comply with Section 39, "Hot Mix Asphalt" of the Standard Specifications.

Submittals

Three business days before starting coring, submit proposed methods and materials for backfilling data core holes.

Submit to the Engineer and electronically to Coring@dot.ca.gov:

- A. A summary of data cores taken.
- B. A photograph of each data core.

For each data core, the summary must include:

- A. Project identification number.
- B. Date cored.
- C. Core identification number.
- D. Type of materials recovered.
- E. Type and approximate thickness of unstabilized material not recovered.
- F. Total core thickness.
- G. Thickness of each individual material to within:
 - 1. For recovered material, 12.5-mm.
 - 2. For unstabilized material, 25-mm.
- H. Location including:
 - 1. County.
 - 2. Route.
 - 3. Post mile.
 - 4. Lane number.
 - 5. Lane direction.
 - 6. Station.

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

- A. The core.
- B. Project identification number.
- C. Core identification number.
- D. Date cored.
- E. County.
- F. Route.
- G. Post mile.
- H. Lane number.
- I. Lane direction.

After data core summary and photograph submittal, dispose of cores under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

Quality Control and Assurance

Do not test OGFC for plasticity index and tensile strength ratio.

MATERIALS

The grade of asphalt binder mixed with aggregate for OGFC must be PG 58-34.

The aggregate for OGFC must comply with the 12.5-mm grading.

Antistrip Treatment

Treat OGFC aggregate with the same antistrip treatment used for HMA Type A.

Treat aggregate with lime slurry under "Hot Mix Asphalt Aggregate Lime Treatment -- Slurry Method" and use Lab Procedure LP-7 for the mix design.

CONSTRUCTION

Vertical Joints

Before opening the lane to public traffic, pave shoulders and median borders adjacent to a lane being paved.

Place OGFC on adjacent traveled way lanes so that at the end of each work shift, the distance between the ends of OGFC layers on adjacent lanes is between 1.5 m and 3 m. Place additional OGFC along the transverse edge at each lane's end and along the exposed longitudinal edges between adjacent lanes. Hand rake and compact the additional OGFC to form temporary conforms. The Contractor may place Kraft paper, or another approved bond breaker, under the conform tapers to facilitate the taper removal when paving operations resume.

Conform Tapers

Place additional OGFC along the pavement's edge to conform to road connections and private drives. Hand rake, if necessary, and compact the additional OGFC to form a smooth conform taper.

Data Cores

Take data cores that include the completed HMA pavement, underlying base, and subbase material. Protect data cores and surrounding pavement from damage.

Take 100-mm or 150-mm diameter data cores:

- A. At the beginning, end, and every 800 m within the paving limits of each route on the project.
- B. After all paving is complete.
- C. From the center of the specified lane.

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. The Contractor may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

- A. Granular material.
- B. Crumbled or cracked stabilized material.
- C. Sandy or clayey soil.

PAYMENT

Full compensation, except as otherwise provided herein, for conforming to the requirements of this article shall be included in the contract unit price paid for Hot Mix Asphalt and shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved and complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.76 HOT MIX ASPHALT (MISCELLANEOUS AREAS):

GENERAL

Summary

This work includes producing hot mix asphalt (HMA) and placing it on miscellaneous areas.

Comply with Section 39, "Hot Mix Asphalt" of the Standard Specifications.

MEASUREMENT AND PAYMENT

The contract unit price paid per square meter for Place Hot Mix Asphalt (Miscellaneous Area) limited to ditches, overside drains, aprons at the ends of drainage structures, in addition to the price paid to the hot mix asphalt material shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved and complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.77 HOT MIX ASPHALT AGGREGATE LIME TREATMENT – SLURRY METHOD:

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the slurry method and placing it in stockpiles to marinate.

Treat aggregate for HMA (Type A), HMA (Type C), OGFC, HMA Miscellaneous Areas, and HMA dikes with lime slurry.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt" of the Standard Specifications.

Submit the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit a treatment data log from the slurry proportioning device in the following order:

1. Treatment date.
2. Time of day the data is captured.
3. Aggregate size being treated.
4. Wet aggregate flow rate collected directly from the aggregate weigh belt.
5. Moisture content of the aggregate just before treatment, expressed as a percent of the dry aggregate mass.
6. Dry aggregate flow rate calculated from the wet aggregate flow rate.
7. Lime slurry flow rate measured by the slurry meter.
8. Dry lime flow rate calculated from the slurry meter output.
9. Approved lime ratio for each aggregate size being treated.
10. Actual lime ratio calculated from the aggregate weigh belt and the slurry meter output, expressed as a percent of the dry aggregate mass.
11. Calculated difference between the approved lime ratio and the actual lime ratio.
12. Dry lime and water proportions at the slurry treatment time.

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

Your quality control plan (QCP) must include aggregate quality control sampling and testing during aggregate lime treatment. Perform sampling and testing in compliance with:

Aggregate Quality Control During Lime Treatment

Quality Characteristic	Test Method	Minimum sampling and testing frequency
Sand Equivalent	CT 217	Once per 1 000 tonnes of aggregate treated with lime
Percent of crushed particles	CT 205	As necessary and as designated in the QCP
Los Angeles Rattler	CT 211	
Fine aggregate angularity	AASHTO T 304, Method A	
Flat and elongated particles	ASTM D 4791	

Note:

During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log.
2. Do not submit the aggregate quality control data.
3. Submit incomplete, untimely, or incorrectly formatted data.
4. Do not take corrective actions.
5. Take late or unsuccessful corrective actions.
6. Do not stop treatment when proportioning tolerances are exceeded.
7. Use malfunctioning or failed proportioning devices.

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

For the aggregate to be treated, determine the moisture content at least once during each 2 hours of treatment. Calculate moisture content under California Test 226 or California Test 370 and report it as a percent of dry aggregate mass. Use the moisture content calculations as a set point for the proportioning process controller.

MATERIALS

High-calcium hydrated lime and water must comply with Section 24-1.02, "Materials" of the Standard Specifications.

Before virgin aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation. If reclaimed asphalt pavement (RAP) is used, the Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer at least 24 hours before the start of aggregate treatment.

Treat aggregate separate from HMA production.

Do not treat RAP.

Add lime to the aggregate as slurry consisting of mixed dry lime and water at a ratio of 1 part lime to between 2 parts and 3 parts water by mass. The slurry must completely coat the aggregate.

Lime treat and marinate coarse and fine aggregates separately.

Immediately before mixing lime slurry with aggregate, water must not visibly separate from aggregate.

Treat aggregate and stockpile for marination only once.

The lime ratio is the kilograms of dry hydrated lime per 100 kg of dry virgin aggregate expressed as a percent. Water content of slurry or untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

Aggregate Gradation	Lime Ratio
Coarse	0.4 to 1.0
Fine	1.5 to 2.0
Combined virgin aggregate	0.8 to 1.5

You may reduce the combined aggregate lime ratio for open graded friction course to between 0.5 and 1.0 percent.

The lime ratio for fine and coarse aggregate must be within ± 0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ± 0.2 percent of the approved lime ratio when you combine the individual aggregate sizes in the JMF proportions. Determine the lime ratio before adding RAP.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's total treatment in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

Lime Slurry Proportioning

Proportion lime and water with a continuous or batch operation.

The device controlling slurry proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by the data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the contract's duration, collected data must be stored by the controller.

Proportioning and Mixing Lime Slurry Treated Aggregate

Treat HMA aggregate by proportioning lime slurry and aggregate by mass in a continuous operation.

Marinate treated aggregate in stockpiles from 24 hours to 60 days before using in HMA. Do not use aggregate marinated longer than 60 days.

MEASUREMENT AND PAYMENT

Full compensation for treating aggregates with lime slurry shall be considered as included in the contract price paid per tonne for Hot Mix Asphalt as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.78 PRIME COAT:

GENERAL

Summary

This work includes applying liquid asphalt prime coat. The Engineer designates areas receiving prime coat.

Comply with Section 93, "Liquid Asphalts" of the Standard Specifications.

MATERIALS

Liquid asphalt for prime coat must be Grade SC-70.

CONSTRUCTION

Apply at least 0.9 L of prime coat per square meter of designated area. Do not apply more prime coat than can be absorbed completely by the aggregate base in 24 hours.

The Contractor may request in writing the Engineer's approval to modify prime coat application rates.

Before paving, prime coat must cure for 48 hours.

Close public traffic to areas receiving prime coat. Do not track prime coat onto pavement surfaces beyond the job site.

MEASUREMENT AND PAYMENT

The Engineer determines prime coat quantities under the specifications for liquid asphalt in Section 93-1.04, "Measurement" of the Standard Specifications.

Full compensation for furnishing and applying the prime coat is included in the contract price paid per tonne for Hot Mix Asphalt as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.79 HOT MIX ASPHALT (TYPE C):

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) Type C using the QC/QA process.

Comply with the specifications for HMA Type A under Section 39, "Hot Mix Asphalt" of the Standard Specifications.

Submittals

With the job mix formula (JMF) submittal, submit:

1. California Test 204 plasticity index results.
2. California Test 371 tensile strength ratio results for untreated HMA.
3. California Test 371 tensile strength ratio results for treated HMA if untreated HMA tensile strength ratio is below 70.

At project start-up and once during production, submit samples split from your HMA production sample for California Test 371 to the Engineer and the Transportation Laboratory, Attention: Moisture Test.

With the JMF submittal, at project start-up, and each 5 000 tonnes, submit the California Test 371 test results for mix design and production to the Engineer and electronically to:

Moisture Tests@dot.ca.gov

Data Cores

Three business days before starting coring, submit proposed methods and materials for backfilling data core holes.

Submit to the Engineer and electronically to Coring@dot.ca.gov:

1. A summary of data cores taken.
2. A photograph of each data core.

For each data core, the summary must include:

1. Project identification number.
2. Date cored.
3. Core identification number.
4. Type of materials recovered.
5. Type and approximate thickness of unstabilized material not recovered.
6. Total core thickness.
7. Thickness of each individual material to within:
 - 7.1 For recovered material, 12.5-mm.
 - 7.2 For unstabilized material, 25.0-mm.
8. Location including:
 - 8.1. County.
 - 8.2. Route.
 - 8.3. Post mile.
 - 8.4. Lane number.
 - 8.5. Lane direction.
 - 8.6. Station.

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

1. The core.
2. Project identification number.
3. Core identification number.
4. Date cored.
5. County.

6. Route.
7. Post mile.
8. Lane number.
9. Lane direction.

After data core summary and photograph submittal, dispose of cores under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

Quality Control and Assurance

For the mix design, determine the plasticity index of the aggregate blend under California Test 204. Choose an antistrip treatment and use the corresponding laboratory procedure for the mix design in compliance with:

Antistrip Treatment	Lab Procedure
Plasticity index from 4 to 10 ^a	
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7
Plasticity index less than 4	
Liquid	LP-5
Dry hydrated lime without marination	LP-6
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7

Notes:

^a If the plasticity index is greater than 10, do not use that aggregate blend.

For the mix design, determine tensile strength ratio under California Test 371 on untreated HMA. If the tensile strength ratio is less than 70:

1. Choose from the antistrip treatments specified based on plasticity index.
2. Test treated HMA under California Test 371.
3. Treat to a minimum tensile strength ratio of 70.

On the first production day and at least every 5 000 tonnes, sample HMA and test under California Test 371.

The Department does not use California Test 371 test results for JMF verification and production to determine specification compliance.

With the minimum quality control testing for the specified construction process, perform sampling and testing at the specified frequency for the following quality characteristics:

Minimum Quality Control

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Requirement	
Asphalt binder content (%)	CT 379 or 382	1 per 750 tonnes and any remaining part	JMF ± 0.40	
Stabilometer Value ^{a, b} (min.)	CT 366	1 per 4 000 tonnes or 1 per 2 business days, whichever is more	37 ^c (Modified) 35 ^d	
Air voids content (%) ^{a, c}	CT 367		Design ± 2	
Percent of crushed particles ^f Coarse aggregate (% min.) Two fractured faces Fine aggregate (Passing 75-mm sieve and retained on 2.36-mm sieve) (% min.) One fractured face	CT 205	1 per 5 000 tonnes or 1 per 5 business days, whichever is more	95	
			90	
Fine aggregate angularity ^{f, g} (% min.)	AASHTO T 304 Method A		45	
Los Angeles Rattler ^f Loss at 100 rev. (% max.) Loss at 500 rev. (% max.)	CT 211	As necessary and designated in the QCP. At least once per project	12	
			40	
Flat and elongated particles ^f (% max. by weight @ 5:1)	ASTM D 4791		10	
Design air void content			4.0	5.0
Percent of maximum theoretical density (%) ^{h, i, j}	CT 375	1 per 750 tonnes or any single location, whichever is less	92 – 97	91 – 96
Voids in mineral aggregate (% min.) 12.5-mm grading 19.0-mm grading 25.0-mm grading ^k with NMAS = 25.0-mm with NMAS = 19.0-mm	LP-2	1 per 4 000 tonnes or 1 per 2 business days, whichever is more	14	15
			13	14
Voids filled with asphalt (%) 12.5-mm grading 19.0-mm grading 25.0-mm grading	LP-3		12	13
			13	14
			65 - 75	60 - 70
Dust proportion ^l (P200/Pbe)	LP-4	1 per 4 000 tonnes or 1 per 2 business days, whichever is more (Report Only)	65 - 75	60 - 70
			65 - 75	60 - 70
			65 - 75	60 - 70
			0.6 – 1.3	0.6 – 1.3

Notes:

^a Report the average of 3 tests from a single split sample.

^b If the stability range is more than 12 points, prepare and test new briquettes.

^c Follow CT 366: 150 tamps at 35 kg/cm² tamping pressure and 110 °C compaction temperature; cool specimens to 60 °C; apply 5,715 kg. leveling load; and perform stabilometer test at 60 °C.

^d Modify CT 366: 150 tamps at 35 kg/cm² tamping pressure and 110 °C compaction temperature; cool specimens to 60 °C; apply additional 500 tamps at 35 kg/cm² tamping pressure and 60 °C compaction temperature; apply 5,715 kg. leveling load; and perform stabilometer test at 60 °C.

^e Determine the bulk specific gravity of each lab-compacted briquette under CT 308, Method A. Determine theoretical maximum specific gravity under CT 309. Calculate the air voids content of each specimen using CT 309 and LP 1. Modify CT 367, Paragraph C5, to use the design air voids content specified under "Hot Mix Asphalt Type C Mixture."

^f Aggregate must comply with the quality specifications before it is treated with lime. During lime treatment except for dry lime on damp aggregate treatment at continuous mixing plants, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Prepare and test 3 samples from a single split sample for aggregate quality at the frequency specified during lime treatment and report test results as the average of the 3 tests.

^e Void if HMA contains less than 10 percent of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

^h Required if the specified paved thickness is at least 45 millimeters.

ⁱ Determine maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

^j For Standard process, take and average 3 cores per 250 tonnes of HMA placed

^k Minimum VMA dependent upon NMAS of JMF. NMAS is defined as one sieve size larger than the first sieve to retain more than 10 percent.

^l Asphalt content based on dry weight of aggregate .

With the acceptance testing for the specified construction process, the Engineer samples and tests the following quality characteristics:

HMA Type C Acceptance

Quality Characteristic	Test Method	Requirement	
Asphalt binder content (%)	CT 379 or 382	JMF ± 0.40	
Stabilometer Value ^{a, b} (min.)	CT 366	37 ^c (Modified) 35 ^d	
Air voids content (%) ^{a, e}	CT 367	Design ± 2	
Percent of crushed particles ^f	CT 205	95	
Coarse aggregate (% min.) Two fractured faces			
Fine aggregate (Passing 75-mm sieve and retained on 2.36-mm sieve) (% min) One fractured face			
Fine aggregate angularity ^{f, g} (% min.)	AASHTO T 304 Method A	45	
Los Angeles Rattler ^f	CT 211	12	
Loss at 100 rev. (% max.) Loss at 500 rev. (% max.)			
Flat and elongated particles ^f (% max. by weight @ 5:1)	ASTM D 4791	10	
Design air void content		4.0	5.0
Percent of maximum theoretical density (%) ^{h, i, j}	CT 375	92 – 97	91 – 96
Voids in mineral aggregate (% min.)	LP-2	14	15
12.5-mm grading		13	14
19.0-mm grading			
25.0-mm grading ^k with NMAS = 25.0-mm		12	13
with NMAS = 19.0-mm		13	14
Voids filled with asphalt (%)	LP-3	65 - 75	60 - 70
12.5-mm grading		65 - 75	60 - 70
19.0-mm grading 25.0-mm grading		65 - 75	60 - 70
Dust proportion ^l (P200/Pbe)	LP-4	0.6 – 1.3 Report Only	

Notes:

^a The Engineer reports the average of 3 tests from a single split sample.

^b If the stability range is more than 12 points, the Engineer prepares and tests new briquettes.

^c The Engineer follows CT 366: 150 tamps at 35 kg/cm² tamping pressure and 110 °C compaction temperature; cool specimens to 60 °C; apply 5,715 kg. leveling load; and perform stabilometer test at 60 °C.

^d The Engineer modifies CT 366: 150 tamps at 35 kg/cm² tamping pressure and 110 °C compaction temperature; cool specimens to 60 °C; apply additional 500 tamps at 35 kg/cm² tamping pressure and 60 °C compaction temperature; apply 5 715 kg. leveling load; and perform stabilometer test at 60 °C.

^e The Engineer determines the bulk specific gravity of each lab-compacted briquette under CT 308, Method A. The Engineer determines theoretical maximum specific gravity under CT 309. The Engineer calculates the air voids content of each specimen using CT 309 and LP 1. The Engineer modifies CT 367, Paragraph C5, to use the design air voids content specified under "Hot Mix Asphalt Type C Mixture."

^f Aggregate must comply with the quality specifications before it is treated with lime. During lime treatment, except for dry lime on damp aggregate treatment at continuous mixing plants; the Engineer samples coarse and fine aggregate from individual stockpiles, combines aggregate in the JMF proportions, and prepares and tests 3 samples from a single split sample for aggregate quality at the frequency specified during lime treatment and report test results as the average of the 3 tests.

^g Void if HMA contains less than 10 percent of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

^h Required if the specified paved thickness is at least 45 millimeters.

ⁱ Determine maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

^j For Standard process, take and average 3 cores per 250 tonnes of HMA placed.

^k Minimum VMA dependent upon NMAS of JMF. NMAS is defined as one sieve size larger than the first sieve to retain more than 10 percent.

^l Asphalt content based on dry weight of aggregate.

The Engineer tests the 3 density cores you take from each 250 tonnes of HMA production. The Engineer determines the percent of maximum theoretical density for each density core by determining the density core's density and dividing by the maximum theoretical density. The Engineer determines the percent of maximum theoretical density for each 250 tonnes of HMA production by determining the average of the 3 density cores.

If the specified total paved thickness is at least 45 millimeters and any layer is less than 45 millimeters, the Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA.

MATERIALS

Asphalt Binder

The grade of asphalt binder mixed with aggregate for HMA Type C must be PG 64-28 PM.

Aggregate

The aggregate for HMA Type C must comply with the 25.0-mm grading.

Choose a sieve size target value (TV) within each target value limit presented in the following table:

**Aggregate Gradation
(Percentage Passing)
HMA Type C**

25.0-mm HMA Type C

Sieve Sizes	Target Value Limits	Allowable Tolerance
25.0-mm	100	—
19.0-mm	88 - 93	TV ±5
12.5-mm	72 - 85	TV ±6
9.5-mm	55 - 70	TV ±6
4.75-mm	35 - 52	TV ±7
2.36-mm	22 - 40	TV ±5
0.6-mm	8 - 24	TV ±4
0.3-mm	5 - 18	TV ±4
0.075-mm	3 - 7	TV ±2

19.0-mm HMA Type C

Sieve Sizes	Target Value Limits	Allowable Tolerance
25.0-mm	100	—
19.0-mm	90 - 95	TV ±5
12.5-mm	60 - 75	TV ±6
4.75-mm	35 - 52	TV ±7
2.36-mm	22 - 36	TV ±5
0.6-mm	8 - 18	TV ±4
0.075-mm	3 - 7	TV ±2

12.5-mm HMA Type C

Sieve Sizes	Target Value Limits	Allowable Tolerance
19.0-mm	100	—
12.5-mm	90 - 98	TV ±6
9.5-mm	64 - 84	TV ±6
4.75-mm	42 - 57	TV ±7
2.36-mm	29 - 39	TV ±5
0.6-mm	13 - 19	TV ±4
0.075-mm	3 - 7	TV ±2

Before the addition of asphalt binder and lime treatment, aggregate must comply with:

Aggregate Quality		
Quality Characteristic	Test Method	Requirement
Percent of crushed particles ^a Coarse aggregate (% min.) Two fractured faces	CT 205	95
Fine aggregate (% min.) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face		
Los Angeles Rattler (% Max.) ^a Loss at 100 rev. Loss at 500 rev.	CT 211	12
		40
Sand equivalent ^{a, b} (min.)	CT 217	47
Fine aggregate angularity (% min.) ^a	AASHTO T 304 Method A	45
Flat and elongated particles (% max. by weight @ 5:1) ^a	ASTM D 4791	10

Note:

^a During lime treatment except for dry lime on damp aggregate treatment at continuous mixing plants, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions.

^b Reported value must be the average of 3 tests from a single sample.

Hot Mix Asphalt Type C Mixture

During mix design, determine the optimum binder content (OBC) at 5.0 percent air voids content.

Determine the proposed JMF from a mix design that complies with:

Hot Mix Asphalt Mix Design Requirements

Quality Characteristic	Test Method or Lab Procedure	Requirement	
Design air voids content (%)		4.0	5.0
Air voids content ^a (%)	CT 367	4.0	5.0
Voids in mineral aggregate (% min.) ^b	LP-2		
12.5-mm grading		14.0	15.0
19.0-mm grading		13.0	14.0
25.0-mm grading			
with NMAS = 25.0-mm		12	13
with NMAS = 19.0-mm		13	14
Voids filled with asphalt (%)	LP-3		
12.5-mm grading		65.0 – 75.0	60.0 – 70.0
19.0-mm grading		65.0 – 75.0	60.0 – 70.0
25.0-mm grading		65.0 – 75.0	60.0 – 70.0
Dust proportion ^c (P200/Pbe)	LP-4	0.6 – 1.3	0.6 – 1.3
Stabilometer value (min.) ^d	CT 366	37 ^e	37 ^e
		(Modified) 35 ^f	(Modified) 35 ^f

Notes:

^a Calculate the air voids content of each specimen using CT 309 and LP-1. Modify CT 367, Paragraph C5, to use the exact air voids content specified in the selection of OBC.

^b Minimum VMA is dependent upon NMAS of JMF. NMAS is defined as one sieve size larger than the first sieve to retain more than 10 percent.

^c Asphalt content based on dry weight of aggregate

^d Modify CT 304, Part 2.B.2.c: "After compaction in the compactor, cool to 60 ± 2 °C by allowing the briquettes to cool at room temperature for 0.5-hour, then place the briquettes in the oven at 60 °C for a minimum of 2 hours and not more than 3 hours."

^e Follow CT 366: 150 tamps at 35 kg/cm² tamping pressure and 110 °C compaction temperature; cool specimens to 60 °C; apply 5 715 kg leveling load; and perform stabilometer test at 60 °C.

^f Modify CT 366: 150 tamps at 35 kg/cm² tamping pressure and 110 °C compaction temperature; cool specimens to 60 °C; apply additional 500 tamps at 35 kg/cm²; apply 5 715 kg leveling load; and perform stabilometer test at 60 °C.

CONSTRUCTION

Vertical Joints

Before opening the lane to traffic, pave shoulders and median borders adjacent to a lane being paved.

Do not leave a vertical joint more than 45 millimeters high between adjacent lanes open to public traffic.

Conform Tapers

Place additional HMA Type C along the pavement's edge to conform to road connections and private drives. Hand rake, if necessary, and compact the additional HMA Type C to form a smooth conform taper.

Data Cores

Take data cores that include the completed HMA pavement, underlying base, and subbase material. Protect data cores and surrounding pavement from damage.

Take 100-mm or 150-mm diameter data cores:

1. At the beginning, end, and every 800 meters within the paving limits of each route on the project.
2. After all paving is complete.
3. From the center of the specified lane.

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. You may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

1. Granular material.
2. Crumbled or cracked stabilized material.
3. Sandy or clayey soil.

PAYMENT

The contract unit bid price paid per tonne for Hot Mix Asphalt (Type C) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in data coring, complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.80 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS:

The provisions of this section shall apply only to the following contract items:

ITEM CODE	ITEM
390102	HOT MIX ASPHALT (TYPE A)
390129A	HOT MIX ASPHALT (TYPE A, BOND BREAKER)
390152	HOT MIX ASPHALT (TYPE C)

The compensation payable for asphalt binder used in hot mix asphalt will be increased or decreased in conformance with the provisions of this section for asphalt binder price fluctuations exceeding 5 percent (Iu/Ib is greater than 1.10 or less than 0.90) which occur during performance of the work.

The quantity of asphalt binder used in tack coat will be determined by multiplying the item quantity for asphaltic tack coat included in a monthly estimate by the minimum percent residue specified in Section 94, "Asphaltic Emulsions" of the Standard Specifications. The asphaltic emulsion minimum percent residue will be based on the type of emulsion used by the Contractor.

At the Contractor's option, the Contractor may provide actual daily test results for asphalt binder residue for the tack coat used. Test results provided by the Contractor shall be from an independent testing laboratory that participates in the AASHTO Proficiency Sample Program. The Contractor shall take samples of asphaltic emulsion from the distributor truck at mid-load from a sampling tap or thief. Two separate 2-liter samples shall be taken in the presence of the Engineer. The Contractor shall provide one sample to the Contractor's independent testing laboratory within 24 hours of sampling. The second sample shall be given to the Engineer. The test results from the Contractor's independent testing laboratory shall be delivered to the Engineer within 10 days from sample date.

The adjustment in compensation will be determined in conformance with the following formulae when the item of hot mix asphalt or tack coat or both are included in a monthly estimate:

A. Total monthly adjustment = AQ

B. For an increase in asphalt binder price index exceeding 5 percent:

$$A = 0.90 (1.1023) (I_u/I_b - 1.10) I_b$$

C. For a decrease in asphalt binder price index exceeding 5 percent:

$$A = 0.90 (1.1023) (I_u/I_b - 0.90) I_b$$

D. Where:

A = Adjustment in dollars per tonne of asphalt binder used to produce hot mix asphalt and asphaltic emulsion residue used as tack coat rounded to the nearest \$0.01.

I_u = The California Statewide Paving Asphalt Price Index which is in effect on the first business day of the month within the pay period in which the quantity subject to adjustment was included in the estimate.

I_b = The California Statewide Paving Asphalt Price Index for the month in which the bid opening for the project occurred.

Q = Quantity in tonnes of asphalt binder that was used in producing the quantity of hot mix asphalt shown under "This Estimate" on the monthly estimate using the amount of asphalt binder determined by the Engineer plus the quantity in tonnes of asphalt binder that would have been used as residue in the tack coat shown under "This Estimate" on the monthly estimate.

The adjustment in compensation will also be subject to the following:

- A. The compensation adjustments provided herein will be shown separately on payment estimates. The Contractor shall be liable to the State for decreased compensation adjustments and the Department may deduct the amount thereof from moneys due or that may become due the Contractor.
- B. Compensation adjustments made under this section will be taken into account in making adjustments in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities" of the Standard Specifications.
- C. In the event of an overrun of contract time, adjustment in compensation for asphalt binder included in estimates during the overrun period will be determined using the California Statewide Paving Asphalt Price Index in effect on the first business day of the month within the pay period in which the overrun began.

The California Statewide Paving Asphalt Price Index is determined each month on the first business day of the month by the Department using the median of posted prices in effect as posted by Chevron, ExxonMobil, and Union 76 for the Buena Vista, Huntington Beach, and Midway Sunset fields.

In the event that the companies discontinue posting their prices for a field, the Department will determine an index from the remaining posted prices. The Department reserves the right to include in the index determination the posted prices of additional fields.

The California Statewide Paving Asphalt Price Index is available on the Division of Engineering Services website at:
http://www.dot.ca.gov/hq/esc/oe/asphalt_index/astable.html

10-1.81 JOINTED PLAIN CONCRETE PAVEMENT:

GENERAL

Jointed plain concrete pavement shall be constructed in conformance with the provisions in Section 40, "Portland Cement Concrete Pavement" of the Standard Specifications and these Special Provisions, and as shown on the plans.

Insert method for forming joints in pavement shall not be used.

PRE-PAVING CONFERENCE

Supervisory personnel of the Contractor and subcontractors who are to be involved in the concrete paving work shall meet with the Engineer at a pre-paving conference, at a mutually agreed time, to discuss methods of accomplishing the paving work.

The Contractor shall provide a facility for the pre-paving conference within 5 km of the construction site or at a nearby location agreed to by the Engineer. Attendance at the pre-paving conference is mandatory for the Contractor's project superintendent, paving construction foreman, subcontractor's workers, including foremen and personnel performing saw cutting, joint sealing, concrete plant manager, and concrete plant operator. Conference attendees shall sign an attendance sheet provided by the Engineer. Production and placement shall not begin nor proceed unless the above-mentioned personnel have attended the mandatory pre-paving conference.

JUST-IN-TIME TRAINING

Attending a 4-hour Just-In-Time Training (JITT) shall be mandatory, and consist of a formal joint training class on Portland cement concrete and paving techniques. Construction operations for Portland cement concrete paving shall not begin until the Contractor's and the Engineer's personnel have completed the mandatory JITT. The Contractor's personnel included in the list of participants for the pre-paving conference as well as the Engineer's representatives shall attend JITT. JITT shall be in addition to the pre-paving conference.

The JITT class will be conducted for not less than 4 hours on Portland cement concrete pavement and paving techniques. The training class may be an extension of the pre-paving conference and shall be conducted at a project field location convenient for both the Contractor and the Engineer. The JITT class shall be completed at least 15 days, not including Saturdays or holidays, prior to the start of Portland cement concrete paving operations. The class shall be held during normal working hours.

The JITT instructor shall be experienced in the construction methods, materials, and test methods associated with construction of Portland cement concrete pavement and paving techniques. The instructor shall not be an employee of the Contractor or a member of the Engineer's field staff. A copy of the course syllabus, handouts, and presentation material shall be submitted to the Engineer at least 7 days before the day of the training. The Contractor and the Engineer shall mutually agree to course instructor, the course content, and training site. The instructor shall issue a certificate of completion to the participants upon completion of the class. The certificate of completion shall include the course title, date and location of the class, the name of the participant, instructor's name, location and telephone number.

The Contractor's or Engineer's personnel involved with Portland cement concrete paving operations will not be required to attend JITT if they have completed equivalent training within the previous 12 months of the date of the JITT for this project. The Contractor shall provide a certificate of class completion as described above for each staff member to be excluded from the JITT class. The Engineer will provide the final determination for exclusion of staff member's participation. Attendees of the JITT shall complete, and submit to the Engineer, an evaluation of the training. The Engineer will provide the course evaluation form.

Just-In-Time Training shall not relieve the Contractor of responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications.

MATERIALS

Concrete

Attention is directed to Section 90, "Portland Cement Concrete" of the Standard Specifications, regarding mix proportions for concrete being determined by the Contractor.

Primary aggregate gradings shall conform to the gradation requirements of Section 90-3, "Aggregate Gradings" of the Standard Specifications. When combined in the proportions determined by the Contractor, the percent passing the 9.5-mm sieve and retained on the 2.36 mm sieve shall not be less than 16 percent of the total aggregate.

The cementitious material content shall not exceed 400 kg/m³.

Tie Bars

Tie bars shall be deformed reinforcing steel bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 280 or 420; ASTM Designation: A 615/A 615M (Grade 280 or 420), A996/A996M or A706/A706M. Tie bars shall be epoxy-coated in conformance with the requirements in ASTM Designation: A 934/A 934M or A 775/A 775M and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement" of the Standard Specifications, except the epoxy-coating thickness after curing shall be between 175 micrometers to 400 micrometers (7 mils to 16 mils). Fabrication, sampling and jobsite handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement" of the Standard Specifications, except the 2 samples shall be 750 mm long. Epoxy-coated tie bars shall not be bent.

Epoxy (Drill and Bond)

Epoxy for bonding tie bars and dowel bars to Portland cement concrete shall be a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C 881, Type V, Grade 3 (Non-Sagging), Class A, B or C. The class used shall be dependent on the internal temperature of the hardened concrete at the time the epoxy is to be applied. Class A shall be used when the internal temperature is below 4°C, but not lower than recommended by the manufacturer. Class B shall be used when the internal temperature is from 4°C to 15°C. Class C shall be used when the internal temperature is above 15°C, but not higher than recommended by the manufacturer. A Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications shall be furnished with the epoxy. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 7 days prior to the start of work. Epoxy shall be applied in conformance with the manufacturer's recommendations.

Dowel Bars

Dowel bars shall be plain round smooth, epoxy-coated steel conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420, the details shown on the plans and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement" of the Standard Specifications, except that the two samples required in ASTM Designation D 3963/D 3963M shall be 460-mm long. Epoxy coating of dowel bars shall conform to the provisions in ASTM Designation: A 884/A 884M, Class A, Type 1 or Type 2, except that the bend test shall not apply.

Dowel bars shall be free from burrs or other deformations detrimental to free movement of the bars in the concrete.

Bond Breaker

Dowel bars shall be lubricated with a bond breaker over the entire bar. A bond breaker application of petroleum paraffin based lubricant or white-pigmented curing compound shall be used to coat the dowel bars completely prior to placement. Oil and asphalt based bond breakers shall not be used. Paraffin based lubricant shall be Dayton Superior DSC BB-Coat or Valvoline Tectyl 506 or an approved equal. Paraffin based lubricant shall be factory applied. White pigmented curing compound shall conform to the requirements of ASTM Designation: C 309, Type 2, Class A, and shall contain 22 percent minimum nonvolatile vehicles consisting of at least 50 percent paraffin wax. Curing compound shall be applied in 2 separate applications, the last application not more than 8 hours prior to placement of the dowel bars. Each application of curing compound shall be applied at the approximate rate of one liter per 3.7 m².

Dowel Bar Baskets

Dowel bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement" of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance" shall be furnished for each shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement" of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete fasteners shall be used for anchoring dowel bar baskets to lean concrete base, hot mix asphalt used as base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or hot mix asphalt used as base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or hot mix asphalt used as base shall have a minimum shank diameter of 4-mm with a minimum shank length of 64-mm. Concrete nails used as fasteners on asphalt treated or cement treated permeable base shall have a minimum shank diameter of 4-mm with a minimum shank length of 120-mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with dowel bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

Tie Bar Baskets

Tie bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Tie bar baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement" of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance" shall be furnished for each shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement" of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete fasteners shall be used for anchoring tie bar baskets to lean concrete base, hot mix asphalt used as base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or hot mix asphalt used as base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or hot mix asphalt used as base shall have a minimum shank diameter of 4 mm with a minimum shank length of 64-mm. Concrete nails used as fasteners on asphalt treated or cement treated permeable base shall have a minimum shank diameter of 4 mm with a minimum shank length of 120-mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with tie bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

Reinforcement

Reinforcement shall be epoxy coated and shall conform to the provisions in Section 52, "Reinforcement" of the Standard Specifications.

Silicone Joint Sealant

Low modulus silicone joint sealant shall be furnished in a one-part silicone formulation. Acid cure sealant shall not be used. The compound shall be compatible with the surface to which it is applied and shall conform to the following requirements:

Property	Test Method	Requirement
Tensile stress, 150% elongation, 7-day cure at 25°± 1°C and 45% to 55% R.H. ^e	ASTM D 412 (Die C)	310 kPa max.
Flow at 25° ± 1°C	ASTM C 639 ^a	Shall not flow from channel
Extrusion Rate at 25° ± 1°C	ASTM C 603 ^b	75-250 g/min.
Specific Gravity	ASTM D 792 Method A	1.01 to 1.51
Durometer Hardness, at -18°C, Shore A, cured 7 days at 25° ± 1°C	ASTM C 661	10 to 25
Ozone and Ultraviolet Resistance, after 5000 hours	ASTM C 793	No chalking, cracking or bond loss
Tack free at 25° ± 1°C and 45% to 55% R.H. ^e	ASTM C 679	Less than 75 minutes
Elongation, 7 day cure at 25° ± 1°C and 45% to 55% R.H. ^e	ASTM D 412 (Die C)	500 percent min.
Set to Touch, at 25° ± 1°C and 45% to 55% R.H. ^e	ASTM D 1640	Less than 75 minutes
Shelf Life, from date of shipment	—	6 months min.
Bond, to concrete mortar-concrete briquettes, air cured 7 days at 25° ± 1°C	AASHTO T 132 ^c	345 kPa min.
Movement Capability and Adhesion, 100% extension at -18°C after, air cured 7 days at 25° ± 1°C, and followed by 7 days in water at 25° ± 1°C	ASTM C 719 ^d	No adhesive or cohesive failure after 5 cycles

Notes:

- a. ASTM Designation: C 639 Modified (15 percent slope channel A).
- b. ASTM Designation: C 603, through 3-mm opening at 345 kPa.
- c. Mold briquettes in conformance with AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with AASHTO Designation: T 132. Briquettes shall be dried to constant mass at 100 ± 5° C.
- d. Movement Capability and Adhesion: Prepare 305-mm x 25-mm x 75-mm concrete blocks in conformance with ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50-mm of block leaving 12.5-mm on each end of specimen unsealed. The depth of sealant shall be 9.5-mm and the width 12.5-mm.
- e. R.H. equals relative humidity.

The silicone joint sealant shall be formulated to cure rapidly enough to prevent flow after application on grades of up to 15 percent.

A Certificate of Compliance for the silicone sealant shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project.

Foam Backer Rods

Foam backer rods shall be Type 1, conforming to the requirements of ASTM Designation: D 5249. Foam backer rods shall have a diameter prior to placement at least 25 percent greater than the width of the sawcut and shall be expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. Hot applied sealant that will melt the foam backer rod shall not be used. The Contractor shall submit a manufacturer's data sheet verifying that the foam backer rod is compatible with the sealant to be used.

Joint Filler Material

Joint filler material shall be preformed expansion joint filler for concrete (bituminous type), conforming to the requirements of ASTM Designation: D 994.

A Certificate of Compliance for the joint filler material shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The certificate shall be accompanied with a certified test report of the results of the required tests performed on the joint filler material within the previous 12 months prior to proposed use. The certificate and accompanying test report shall be provided for each lot of joint filler material prior to use on the project.

Hydraulic Cement Grout (Non-Shrink)

Hydraulic cement grout (non-shrink) shall conform to the requirements in ASTM Designation: C 1107. At the Contractor's option, clean, uniformly rounded aggregate filler may be used to extend the grout. The extension of grout shall not exceed 60 percent of the mass of the grout or the maximum amount of grout extension recommended by the manufacturer, whichever is less. The moisture content of the aggregate filler shall not exceed 0.5-percent. Grading of the aggregate filler shall conform to the following:

Sieve Size	Percentage Passing
12.5-mm	100
9.5-mm	85-100
4.75-mm	10-30
2.36-mm	0-10
1.10-mm	0-5

PAVEMENT CONCRETE MIX PROPORTIONS

The Contractor shall determine the mix proportions for pavement concrete. The laboratory used to develop the mix proportions shall meet the requirements of ASTM Designation: C 1077, and shall have current AASHTO accreditation for test methods AASHTO Designation: T 97 or ASTM Designation: C 78, and AASHTO Designation: T 126 or ASTM Designation: C 192.

The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be determined in conformance with the requirements in California Test 559. Trial mixtures shall be made no more than 24 months before field qualification.

The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be that determined from the trial mixtures curve to produce a minimum modulus of rupture of 3.9 MPa at 28 days age and 4.5 MPa at 42 days age. To account for variances in materials, production of concrete, and modulus of rupture testing, the Contractor shall include as part of the proposed mix proportions an increase to the cementitious material content or a decrease to the water to cementitious materials ratio, determined from trial mixtures, to ensure that Portland cement concrete produced during paving operations conforms to the requirements in "Modulus of Rupture" in this section.

At least 15 days prior to field qualification, the Contractor shall submit the proposed pavement concrete mix proportions with laboratory test reports. Laboratory test reports shall include modulus of rupture determined for each trial mixture at ages of 10, 21, 28 and 42 days in conformance with the applicable portions of California Test 559.

Field Qualifications

Field qualification of proposed mix proportions will be required prior to placement of pavement concrete. The Contractor shall perform field qualification and submit certified test data to the Engineer. Field qualification data shall be based upon the proposed use of materials, mix proportions, mixing equipment, procedures and size of batch.

Proposed concrete mix proportions will be field qualified when the test results of five beams from a single batch of concrete indicate the average modulus of rupture is at least 3.9 MPa with no single beam lower than 3.8 MPa at an age of the Contractor's choice but not later than 28 days. Beams shall be tested for modulus of rupture at a minimum of 10, 21, and 28 days of age. Test specimens shall be made and tested in conformance with the requirements in California Test 523.

The certified field qualification test data reports shall include the following:

- A. Date of mixing,
- B. Mixing equipment and procedures used,
- C. Volume of batch in cubic meters and the mass or volume,
- D. Type and source of ingredients used,
- E. Penetration and slump of the concrete,
- F. The air content of the concrete, and
- G. The age at time of testing and strength of concrete specimens tested.

Field qualification test data reports shall be signed by a certified representative in charge of the laboratory that performed the tests.

If the Contractor changes a source of supply or proportions, the Contractor shall submit a new proposed mix design and furnish samples from the new source, or sources, at least 60 days prior to their intended use. The new mix proportions shall be trial batched and field qualified, unless, the Engineer determines the change is not substantive. No extension of contract time will be allowed for the time required to perform the sampling, testing, preparing and qualifying new mix proportions for new aggregate sources proposed by the Contractor.

MODULUS OF RUPTURE

The Engineer will test Portland cement concrete pavement for modulus of rupture in conformance with the requirements in California Test 523. Acceptance will be on a lot basis. Each lot shall not to exceed 750 m³ of concrete pavement. The Engineer will determine sample locations. A minimum of six beam specimens shall be made from each sample. Beam specimens will be tested for modulus of rupture at 10, 21, and 28 days. The modulus of rupture for each lot will be calculated by averaging the results of two beams representing that lot tested at 28 days of age. The difference in modulus of rupture between each individual beam result shall not exceed 0.44-MPa.

The Contractor shall perform sampling and testing of beam specimens to determine if concrete pavement has achieved a modulus of rupture of 2.4 MPa when requesting early use of concrete pavement in conformance with the provisions in Section 90-8.03, "Protecting Concrete Pavement" of the Standard Specifications. Beam specimens shall be made and tested in conformance with the requirements in California Test 523.

INSTALLING TIE BARS

Tie bars shall be installed at longitudinal contact joints and longitudinal weakened plane joints as shown on the plans. Contiguous width of new Portland cement concrete pavement tied together with tie bars shall not exceed 15 m. Tie bars shall not be installed at joints between Portland cement concrete and hot mix asphalt pavements.

Tie bars shall be installed at longitudinal joints by one of the following methods:

- A. Drilling and bonding tie bars with two-component, epoxy-resin that conforms to this section. Drilled holes shall be cleaned in conformance with the epoxy manufacturer's instructions and shall be dry at the time of placing the epoxy and tie bars. Tie bars will be rotated 180° while being inserted into the epoxy filled holes. Immediately after inserting the tie bars into the epoxy, the tie bars shall be supported as necessary to prevent movement during curing and shall remain undisturbed until the epoxy has cured as specified by the manufacturer instructions. Tie bars that are improperly placed or bonded, as determined by the Engineer, will be rejected. If rejected, new holes shall be drilled and new tie bars shall be placed and securely bonded to the concrete. Rejected tie bars shall be cut flush with the joint face. Exposed ends of tie bars shall be epoxy coated. The center of the new holes shall be offset 75-mm horizontally from the center of the rejected hole to maintain the minimum clearance to the dowel bar. Work necessary to correct improperly bonded tie bars shall be performed at the Contractor's expense.
- B. Inserting tie bars into the plastic slipformed concrete before finishing the concrete. Inserted tie bars shall have full contact between the bar and the concrete. When tie bars are inserted through the pavement surface, the concrete over the tie bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been an insertion performed. Loose tie bars shall be replaced by drilling and bonding as described in A above, at the Contractor's expense.

C. Using threaded dowel splice couplers fabricated from deformed bar reinforcement material, free of external welding or machining. Threaded dowel splice couplers shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications, and shall be accompanied with installation instructions. Installation of threaded dowel splice couplers shall conform to the requirements of the manufacturer's recommendations.

4. Using tie bar baskets that conform to these Special Provisions

Tie bars shall be oriented perpendicular to the pavement joint and parallel with the surface of the pavement at mid-slab depth. Tie bar alignment tolerances shall conform to the requirements for dowel bars except embedment length tolerance shall be ± 50 mm.

If tie bar baskets are used, they shall be anchored to the base to hold the tie bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each basket (4 per lower runner wire). Temporary spacer wires shall be cut or removed after the baskets are anchored into position before concrete placement. Concrete pavement shall not be placed if the baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor in areas where access is restricted or other construction limitations are encountered. The Contractor shall demonstrate that the baskets are anchored and shall not shift during concrete placement. The Contractor shall provide longer concrete nails than the minimum lengths for the varying bases beneath the Portland cement concrete when baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for Concrete Pavement and no additional compensation will be allowed therefor.

DOWEL PLACEMENT

Dowel bars shall be centered on the joint within a tolerance of ± 50 mm in the longitudinal direction directly over the contact joint or sawcut for the transverse weakened plane joints, as shown on the plans. Prior to placement of dowel bars, the Contractor shall submit to the Engineer a written procedure to identify the transverse weakened plane joint locations relative to the middle of the dowel bars and the procedure for consolidating concrete around the dowel bars.

Dowel bars shall be placed at transverse weakened plane joints within shoulder areas except at drainage inlets.

Dowel bars shall be placed at longitudinal joints as shown on the plans.

Dowel bars shall be placed as shown on the plans by using dowel bar baskets or by mechanical insertion.

When dowel bars are placed by mechanical insertion, the concrete over the dowel bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been any insertion performed. When drill and bonding of dowel bars is performed at contact joints, a grout retention ring shall be used. When dowel bar baskets are used, they shall be anchored to the base to hold the dowel bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each 3.6 m dowel bar basket (4 per lower runner wire). At least 10 concrete fasteners shall be used for basket sections greater than 3.6 m and less than or equal to 4.9 m. Temporary spacer wires connecting dowel bar baskets shall be cut or removed after the dowel bar baskets are anchored into position prior to concrete placement. Paving shall be suspended when dowel bar baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor, in areas, where access is restricted, or other construction limitations are encountered. The Contractor shall demonstrate to the Engineer's satisfaction that dowel bar baskets are adequately anchored and not shift during concrete placement. The Contractor shall provide longer concrete nails than the minimum lengths for the varying bases beneath the Portland cement concrete when anchored dowel bar baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for Concrete Pavement and no additional compensation will be allowed therefor.

Dowel bar placement at transverse and longitudinal weakened plane joints	
Horizontal offset	±25 mm
Longitudinal translation	±50 mm
Horizontal skew	9 mm
Vertical skew	9 mm
Vertical depth	($d/3 + 12$ mm) from pavement surface to top of dowel bar or -15 mm below planned placement

Note: d = pavement thickness in mm

CORE DRILLING FOR DOWEL BAR AND TIE BAR PLACEMENT ALIGNMENT ASSURANCE TESTING

Coring to confirm dowel bar and tie bar placement, alignment, and concrete consolidation shall be provided by the Contractor throughout the project, at locations determined by the Engineer. Each day's paving shall be cored within 2 days by performing a minimum of 2 and a maximum of 4 tests for dowel bar placement and position for every 1670 m² of doweled pavement or fraction thereof and one test for tie bar placement and position for every 3340 m² of pavement with tie bars. One test shall consist of drilling two cores, one on each end of a dowel bar to expose both ends and allow measurement for proper alignment. The minimum core hole diameter shall be 127-mm. If the cores indicate that dowel bars or tie bars are not within the allowable tolerances or if air voids exist surrounding the dowel bars or tie bars, additional cores will be required to determine the limits and severity of unacceptable work.

The holes shall be cored by methods that will not damage the concrete adjacent to the holes. Immediately after coring, the concrete cores shall be submitted to the Engineer for inspection, and the cores shall be identified by the Contractor with a location description.

After removal of cores, core hole voids in concrete pavement shall be cleaned and filled with hydraulic cement grout (non-shrink). After placement of hydraulic cement grout, the material while still plastic shall be finished and textured to match the adjacent pavement surface. The backfill material shall be the same level as the pavement surface.

Water for core drilling operations shall be from a local domestic water supply, and shall contain not more than 1000 parts per million of chlorides as CL, nor more than 1300 parts per million of sulfates as SO_4 , nor shall it contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

Water from core drilling operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into gutters or other drainage facilities.

Dowel bar and tie bar alignment shall be within the specified tolerances. If dowel bars or tie bars are found to be installed improperly, the paving operations shall not continue until the Contractor has demonstrated to the Engineer that the problem which caused the improper dowel bar or tie bar positioning has been corrected.

Dowel bars in rejected joints shall be replaced by the Contractor by saw cutting on each side of the rejected joint a minimum of 0.9-m, lifting out concrete to be removed, installing new dowel bars at the new transverse joints, installing dowel bars and preformed sponge rubber expansion joint filler along the longitudinal joints, placing concrete, and installing new joints. Preformed sponge rubber expansion joint filler shall conform to the requirements in ASTM Designation: D 1752. New dowel bar holes shall be drilled, not more than 3 mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowels to be installed at the contact joints. Dowel bars shall be placed, as shown on the plans, for the 2 new transverse contact joints. Original exposed tie bars, located within the slab replacement area, shall be cut flush with the lane or pavement edge and dowel bars shall be installed to replace the tie bars at an offset of 75-mm, horizontally from the tie bar location. Holes for dowel bars to be placed along the longitudinal joint shall be drilled, not more than 3-mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowel bars to be installed at the contact joints.

When requested by the Contractor and approved by the Engineer, dowel bars which are more than ± 50 mm but less than ± 75 mm from being centered directly over the sawcut for the transverse weakened plane joint, may remain in place, and the Contractor shall pay to the County the amount of \$32.30 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect dowel bar alignment or improper concrete consolidation around dowels. The quantity of concrete pavement area used to determine the amount of payment to the County will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect dowel bar alignment or improper concrete consolidation around dowel bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under

the contract. This reduced compensation shall be in addition to other adjustments for incorrect tie bar alignment or improper concrete consolidation around tie bars as specified in these Special Provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness" of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate" of the Standard Specifications.

Tie bars which are not within the specified tolerance for placement and position, as determined from inspection and measurements of cores, may remain in place when requested by the Contractor and approved by the Engineer. The Contractor shall pay to the County the amount of \$16.15 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect tie bar alignment or improper concrete consolidation around tie bars. The quantity of concrete pavement area used to determine the amount of payment to the County will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect tie bar alignment or improper concrete consolidation around tie bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under the contract. This reduced compensation will be in addition to other adjustments for incorrect dowel bar alignment or improper concrete consolidation around dowel bars as specified in these Special Provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness" of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate" of the Standard Specifications.

LIQUID JOINT SEALANT INSTALLATION

The joint sealant detail for transverse and longitudinal joints, as shown on the plans, shall apply only to weakened plane joints. Weakened plane joints shall be constructed by the sawing method. Should grinding or grooving be required over or adjacent to joints after sealant has been placed, the joint materials shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications, and replaced at the Contractor's expense. Immediately after sawing, a water wash using less than 0.7 MPa pressure shall be used to remove the slurry from the sawing operation.

Seven days after the concrete pavement placement and not more than 4 hours before placing backer rods and joint sealant materials, the joint walls shall be cleaned by the dry sand blast method and other means as necessary to remove from the joint objectionable material such as soil, asphalt, curing compound, paint and rust. Sand blasting shall be performed in at least 2 passes, one for each side of the joint, with the nozzle held at an angle to the joint within 25-mm to 51-mm of the pavement. After cleaning the joint, traces of sand, dust and loose material shall be removed from and near the joint for a distance along the pavement surfaces of at least 50-mm on each side of the joint by the use of a vacuum device. Surface moisture or dampness shall be removed at the joints by means of compressed air or moderate hot compressed air or other means approved by the Engineer. Drying procedures that leave a residue or film on the joint wall shall not be used.

Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1 -mm and a minimum pressure of 0.62-MPa.

Backer rods shall be installed when the temperature of the Portland cement concrete pavement is above the dew point of the air and when the air temperature is 4°C or above. Backer rod shall be installed when the joints to be sealed have been properly patched, cleaned and dried, as determined by the Engineer. Methods of placing backer rod that leave a residue or film on joint walls shall not be used.

Immediately after placement of the backer rod, joint sealant shall be placed in the clean, dry, prepared joints as shown on the plans. The joint sealant shall be applied using a mechanical device with a nozzle shaped to fit inside the joint to introduce the sealant from inside the joint. Adequate pressure shall be applied to the sealant to ensure that the sealant material is extruded evenly and that full continuous contact is made with the joint walls. After application of the sealant, the surface of the sealant shall be recessed as shown on the plans.

Failure of the joint material in either adhesion or cohesion will be cause for rejection of the joint. The finished surface of joint sealant shall conform to the dimensions and allowable tolerances shown on the plans. Rejected joint materials or joint material whose finished surface does not conform to the dimensions shown on the plans, as determined by the Engineer, shall be repaired or replaced, at the Contractor's expense, with joint material that conforms to the requirements.

After each joint is sealed, surplus joint sealer on the pavement surface shall be removed. Traffic shall not be permitted over the sealed joints until the sealant is tack free and set sufficiently to prevent embedment of roadway debris into the sealant.

CONSTRUCTING TRANSVERSE CONTACT JOINTS

A transverse contact (construction) joint shall be constructed, including dowel bars, at the end of each day's work or where concrete placement is interrupted for more than 30 minutes, to coincide with the next weakened plane joint location.

If sufficient concrete has not been mixed to form a slab to match the next weakened plane joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of excess concrete shall be at the Contractor's expense. Excess material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications. A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of dowel bars.

CONSTRUCTING LONGITUDINAL ISOLATION JOINTS

Final alignment of perpendicular transverse weakened plane joints in pavement shall not be made to match the spacing or skew of the weakened plane joints in the existing parallel concrete pavement. Tie bars shall not be placed across longitudinal isolation joints. The edge of the existing pavement shall be saw cut a width 3-mm and to the full depth of the

existing concrete pavement to produce a flat vertical face. Prior to placing concrete, joint filler material shall be placed as shown on the plans. The joint filler shall be secured to the face of the existing pavement joint face by a method that will hold the joint filler in place and prevent the new concrete from adhering to the existing concrete, during placement of concrete.

Sealant for longitudinal isolation joints shall be silicone and placed in conformance with the requirements for liquid joint sealant installation as specified above, except references to backer rods shall not apply.

CONSTRUCTING TRANSVERSE JOINT CONNECTIONS AND ANCHORS

Concrete pavement joints at transitions to hot mix asphalt pavement, pavement end anchors and bridge approach slabs shall conform to the details as shown on the plans. Paint binder shall be applied to the concrete surface that hot mix asphalt pavement will contact. Paint binder shall be applied in conformance with the provisions in Section 39, "Hot Mix Asphalt" of the Standard Specifications.

PROFILE INDEX

The pavement surface shall be profiled, by the Contractor not more than 10 days following concrete placement, in the presence of the Engineer, using a California Profilograph or equivalent in conformance with the requirements in California Test 526, except a blanking band of zero (null) shall be used to determine the Profile Index. Two profiles shall be made within each traffic lane, one meter from and parallel with each lane line.

Profiled pavement shall conform to the following Profile Index requirements:

- A. Pavement on tangent alignment and pavement on horizontal curves having a centerline radius of curve 600 m or more shall have a Profile Index of 64-mm or less for each 0.1-km.
- B. Pavement on horizontal curves having a centerline radius of curve 300 m or more but less than 600 m and pavement within the superelevation transition of those curves shall have a Profile Index of 128-mm or less for each 0.1-km.

Individual high points in excess of 7.5-mm, as determined by measurements of the profilogram in conformance with the requirements in California Test 526, except using a blanking band of zero (null), shall be reduced by grinding in conformance with the requirements in Section 40-1.10, "Final Finishing" of the Standard Specifications until the high points as indicated by reruns of the profilograph do not exceed 7.5-mm.

Pavement grinding shall not be performed before 10 days have elapsed after concrete placement, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa.

CONSTRUCTING WEAKENED PLANE JOINTS (EARLY ENTRY SAW METHOD)

The Contractor may construct weakened plane joints using lighter weight concrete saws (early entry saws) specifically designed for sawing fresh concrete without the use of water. The early entry saws shall be capable of sawing joints within 2 hours of cure time after placement of the concrete pavement without ravelling or tearing, as defined in Section 40-1.08B(1), "Sawing Method" of the Standard Specifications. Joints sawed with early entry saws that develop random cracking shall be removed to the nearest controlled joint and replaced with concrete pavement containing dowel bars and tie bars in conformance with these Special Provisions and as shown on the plans. The removal and replacement work shall be at the Contractor's expense. Weakened plane joints not sawed within 2 hours of placing concrete pavement shall be sawed by conventional power driven wet-type concrete saws in conformance with the requirements of Section 40-1.08B(1), "Sawing Method" of the Standard Specifications.

Sawed grooves shall be cut to a maximum of 3-mm in width for longitudinal and transverse weakened plane joints made with early entry saws. The minimum depth of cut shall be calculated utilizing the formula in Section 40-1.08B(1), "Sawing Method" of the Standard Specifications except $d = t/4$.

TIE BARS ALONG LONGITUDINAL JOINT FOR SHORT RADIUS CURVES

When paving along short radius curves, the transverse joints shall be maintained in a single continuous straight line across lanes, through the radius point. Tie bars shall maintain minimum clearance from the transverse joint as shown on the plans. If the inside or outside curve of the panel does not allow equal uniform spacing of tie bars at 710-mm between tie bars, then the tie bars shall be equally spaced so that a minimum spacing of 375-mm to a maximum spacing of 710-mm is maintained between tie bars. Additional tie bars shall be considered as included in the contract price paid per cubic meter for Concrete Pavement and no additional compensation will be allowed therefor.

If dowel bars are specified along longitudinal joint for short radius curves, then dowel bars shall conform to the requirements of this Special Provision for tie bars spacing and tolerance.

MEASUREMENT AND PAYMENT

Sealing longitudinal and transverse weakened plane joints, and longitudinal isolation joints in Portland cement concrete pavement will be measured by the meter. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the sealed pavement joints will be measured and paid for as Seal Pavement Joint.

The contract price paid per meter for Seal Longitudinal Joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing longitudinal joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing backer rod, repairing and patching spalled or raveled sawed joints, and replacing

or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

The contract price paid per meter for Seal Transverse Joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing transverse joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing joint filler material, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

The contract price paid per meter for Seal Isolation Joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing isolation joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing joint filler material, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

Concrete pavement will be measured by the cubic meter in conformance with the provisions in Section 40-1.13, "Measurement" of the Standard Specifications. No deduction will be made for the volume of epoxy-coated dowel bars, epoxy-coated tie bars and, when used, tie bar baskets with fasteners and dowel bar baskets with fasteners, in the concrete pavement. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the concrete will be measured and paid for as Concrete Pavement.

The contract price paid per cubic meter for Concrete Pavement shall include full compensation for furnishing all labor, materials (including cementitious material in the amount determined by the Contractor), tools, equipment, and incidentals, and for doing all the work involved in constructing the Portland cement concrete pavement complete in place, including furnishing and placing epoxy-coated dowel bars, epoxy-coated tie bars and, when used, any tie bar baskets and dowel bar baskets with fasteners, submittal to the Engineer all test data for determination of mix proportions of concrete for concrete pavement and for providing the facility, Contractor personnel and all the work involved in arranging and holding the pre-paving conference, for constructing and repairing all joints; for performing all profile checks for Profile Index and furnishing final profilograms to the Engineer; for grooving and grinding required for final finishing; and for removing, and replacing pavement for deficient thickness, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

Full compensation for drilling holes and bonding tie bars with epoxy resin shall be considered as included in the contract price paid per cubic meter for Concrete Pavement and no additional compensation will be allowed therefor.

Costs for providing JITT will be determined in conformance with the provisions in Section 9-1.03, "Force Account Payment" of the Standard Specifications, except no markups shall be added, and the Contractor will be paid for one half of the JITT cost. Costs for providing JITT shall include training materials, class site, and the JITT

instructor including the JITT instructor's travel, lodging, meals and presentation materials. All costs incurred by the Contractor or Engineer for attending JITT shall be borne by the party incurring the costs.

Full compensation for core drilling for dowel bar or tie bar alignment and backfilling with hydraulic cement grout shall be considered as included in the contract price per cubic meter for Concrete Pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are out of alignment tolerances and the Engineer orders additional dowel bar or tie bar coring, full compensation for drilling the additional cores shall be considered as included in the contract price per cubic meter for Concrete Pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are within alignment tolerances and the Engineer orders more dowel bar coring the additional cores will be paid for as extra work in conformance with the provisions in Section 4-1.03D, "Extra Work" of the Standard Specifications.

Full compensation for drilling holes and bonding dowel bars with epoxy resin shall be considered as included in the contract price paid per cubic meter for Concrete Pavement and no additional compensation will be allowed therefor.

Full compensation for furnishing and placing epoxy coated reinforcement for transition end panel shall be considered as included in the contract price paid per cubic yard for Concrete Pavement and no additional compensation will be allowed therefor.

Full compensation for furnishing and placing paint binder (tack coat) for transition end panel shall be considered as included in the contract price paid per cubic yard for Concrete Pavement and no additional compensation will be allowed therefor.

10-1.82 JOINTED PLAIN CONCRETE PAVEMENT (RAPID STRENGTH CONCRETE):

Jointed plain concrete pavement (Rapid Strength Concrete) shall consist of constructing rapid strength concrete (RSC) pavement as shown on the plans and in conformance with Section 40, "Portland Cement Concrete Pavement" of the Standard Specifications and these Special Provisions.

DEFINITIONS

The following definitions shall apply to this section:

- A. EARLY AGE. – A time less than 10 times the final set time of the concrete.
- B. FINAL SET TIME. – The elapsed time after initial contact of cement and water, or accelerator, if used, at which a specific penetration resistance of 27.6 MPa is achieved in conformance with the requirements in ASTM Designation: C 403.
- C. OPENING AGE. – The age at which the concrete will achieve the specified strength for opening to public or Contractor traffic.

PRE-OPERATION CONFERENCE

The Contractor and subcontractors involved in construction operations of RSC shall meet with the Engineer at a pre-operation conference, at a mutually agreed time, to discuss methods of accomplishing all phases of the construction operation, contingency planning, and standards of workmanship for the completed item of work.

The Contractor shall provide the facility for the pre-operation conference. The Contractor's superintendent, foremen, subcontractors, field staff, plant personnel including plant supervisors, manager, and operator involved with RSC shall attend the pre-operation conference. The Contractor shall submit a list of participants to the Engineer for approval. The complete listing shall identify each participant's name, employer, title and role in construction of RSC. The pre-operation conference shall be held for no less than 2 hours. Construction operations of RSC shall not begin until the specified personnel have completed the mandatory pre-operation conference.

JUST-IN-TIME TRAINING

Just-In-Time Training (JITT) shall be mandatory, and consist of a formal joint training class on rapid strength concrete. Construction operations for rapid strength concrete shall not begin until the Contractor's and the Engineer's personnel have completed the mandatory JITT. The Contractor's personnel included in the list of participants for the pre-operation conference along with the Engineer's representatives shall attend JITT.

The JITT session will be conducted for not less than 4 hours on rapid strength concrete. The training class may be an extension of the pre-operation conference and shall be conducted at the project field location convenient for both the Contractor's and the Engineer's project staffs. Scheduling and completion of the JITT session shall be completed at least 5 business days prior to the start of construction of rapid strength concrete. The class shall be held during normal working hours.

The JITT instructor shall be experienced in the construction methods, materials, and test methods associated with rapid strength concrete. The instructor shall not be an employee of the Contractor or a member of the Engineer's field staff. A copy of the syllabus, handouts, and presentation material shall be submitted to the Engineer at least 7 days before the day of the training. Selection of the course instructor, the course content and training site shall be as mutually agreed to by the Contractor and the Engineer. The instructor shall issue a certificate of completion to the participants upon the completion of the class. The certificate shall include the course title, date and location of the class, the name of the participant, instructor's name, location and phone number.

The Contractor's or Engineer's personnel involved with rapid strength concrete operations will not be required to attend JITT if they have completed similar training within the previous 12 months of the date of the JITT for this project. The Contractor shall provide a certificate of class completion as described above for each staff member to be excluded from the JITT session. The final determination for exclusion of any staff member's participation will be as determined by the Engineer. All attendees of the JITT shall complete, and submit to the Engineer, an evaluation of the training. The course evaluation form will be provided by the Engineer.

It is expressly understood that Just-In-Time Training shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the plans and specifications.

REMOVING EXISTING PAVEMENT AND BASE MATERIALS

Exact limits of concrete pavement to be replaced will be determined by the Engineer.

Existing concrete pavement and underlying base material shall be removed and replaced with base material and RSC pavement within the same work period. In the event existing pavement or base materials are removed and the Contractor is unable to construct, finish, and cure RSC pavement prior to the specified traffic opening time, a temporary roadway structural section shall be constructed.

The outline of concrete pavement to be removed shall be sawed full depth with a power-driven saw except where the pavement is located adjacent to an asphalt concrete shoulder. Saw cuts within concrete pavement slabs shall be cut no more than 2 days prior to concrete pavement slab removal. Saw cuts made in work shifts prior to the actual removal work shift shall not be made parallel or diagonal to the traveled way and shall be cut so that traffic will not dislodge any pieces or segments.

Tie bars are located at longitudinal joints and shall be sawn through prior to concrete pavement slab removal.

Concrete pavement shall be removed by non-impacting methods. Each pavement panel shall be removed in one or more pieces without disturbance or damage to the underlying base.

Equipment used to remove concrete pavement within the sawed outline, shall not impact the surface of the concrete to be removed within 0.5-m of pavement to remain in place. Pavement and base removal shall be performed without damage to pavement or base to remain in place. Damage to pavement or base to remain in place, shall be repaired or removed and replaced. Repair, or removal and replacement of the damaged pavement and base shall be at the Contractor's expense and will not be measured nor paid for.

Removed materials shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

The material remaining in place, after removing pavement and base to the required depth, shall be graded to a uniform plane, moisture conditioned, and compacted by methods that will produce a firm and stable base. The finished surface of the remaining material shall not extend above the grade established by the Engineer. Areas that are low as a result of over excavation during base removal shall be filled, at the Contractor's expense, with base replacement material at the time and in the same operation that the base replacement layer is placed.

TEMPORARY ROADWAY STRUCTURAL SECTION

Hot mix asphalt and aggregate base, equal to the quantity of pavement removed during the work shift, shall be provided on site for construction of a temporary roadway structural section where existing pavement is to be replaced. The quantity and location of standby material shall be included in the Contractor's contingency plan in conformance with the requirements of these Special Provisions. Temporary roadway structural section shall be maintained and later removed as the first order of work when jointed plain concrete pavement (Rapid Strength Concrete) operations resume. The temporary roadway structural section shall consist of 90-mm thick hot mix asphalt over aggregate base. RSC not conforming to these Special Provisions for RSC may be used for temporary roadway structural section with the Engineer's approval.

Aggregate base for temporary roadway structural section shall be produced from commercial quality aggregates consisting of broken stone, crushed gravel, natural rough-surfaced gravel, reclaimed concrete and sand, or any combination thereof. Grading of aggregate base shall conform to the 19-mm maximum grading specified in Section 26-1.02A, "Class 2 Aggregate Base" of the Standard Specifications.

Hot mix asphalt for temporary roadway structural section shall be produced from commercial quality aggregates and asphalt binder. Grading of aggregate shall conform to the 19-mm grading for Type B hot mix asphalt in Section 39-1.02E, "Aggregate" of the Standard Specifications and asphalt binder shall conform to requirements for liquid asphalt SC-800 in Section 93, "Liquid Asphalts" of the Standard Specifications. Amount of asphalt binder to be mixed with the aggregate shall be approximately 0.3 percent less than the optimum bitumen content determined in conformance with the requirements in California Test 367.

Aggregate base and hot mix asphalt for the temporary roadway structural section shall be spread and compacted by methods that will produce a well-compacted, uniform base, with a surface of uniform smoothness, texture and density. Surfaces shall be free from pockets of coarse or fine material. Aggregate base may be spread and compacted in one layer. Hot mix asphalt may be spread and compacted in one layer. Finished surface of hot mix asphalt shall not vary more than 15-mm from the lower edge of a 3.6-m long straightedge placed parallel with the centerline and shall match the elevation of existing concrete pavement along the joints between the existing pavement and temporary surfacing.

Removed temporary roadway structural section materials shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications, except that removed aggregate base may be stockpiled at the project site and reused for construction of temporary roadway structural sections. When no longer required, standby material or stockpiled material for construction of temporary roadway structural sections shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

RAPID STRENGTH CONCRETE

Rapid Strength Concrete (RSC) shall be a concrete made with hydraulic cement that develops opening age and 7-day specified modulus of rupture strengths.

Requirements of Sections 40-1.05, "Proportioning" and 90-1.01, "Description" of the Standard Specifications shall not apply.

Combined aggregate grading used in RSC shall be either the 37.5-mm, maximum grading, or 25-mm, maximum grading, at the option of the Contractor.

Cement for RSC shall be hydraulic cement as defined in ASTM Designation: C 219 and shall conform to the following requirements:

Test Description	Test Method	Requirement
Contraction in Air	California Test 527, W/C Ratio = 0.39 ± 0.010	0.053 %, max.
Mortar Expansion in Water	ASTM Designation: C 1038	0.04 %, max.
Soluble Chloride*	California Test 422	0.05 %, max.
Soluble Sulfates*	California Test 417	0.30 %, max.
Thermal Stability	California Test 553	60 %, min.
Compressive Strength @ 3 days	ASTM Designation: C 109	17 MPa

*Test is to be done on a cube specimen, fabricated in conformance with the requirements in ASTM Designation: C 109, cured at least 14 days and then pulverized to 100% passing the 300- μ m sieve

At least 45 days prior to intended use, the Contractor shall furnish a sample of cement from each lot proposed for use and all admixtures proposed for use in the quantities ordered by the Engineer.

The Contractor shall submit uniformity reports for cement used in RSC to the Cement Laboratory at the Transportation Laboratory. Uniformity reports shall conform to the requirements in ASTM Designation: C 917, except that testing age and water content may be modified to suit the particular material. Uniformity reports shall be submitted at least every 30 days during RSC pavement operations.

Type C accelerating chemical admixtures conforming to the provisions in Section 90-4, "Admixtures" of the Standard Specifications may be used. In addition to the admixtures listed on the Department's current list of approved admixtures, citric acid or borax may be used if requested in writing by the cement manufacturer and a sample is submitted to the Engineer. Chemical admixtures, if used, shall be included in the testing for requirements listed in the table above.

At least 10 days prior to use in the trial slab, the Contractor shall submit a mix design for RSC that shall include the following:

- A. Opening age.
- B. Proposed aggregate gradings.
- C. Mix proportions of hydraulic cement and aggregate.
- D. Types and amounts of chemical admixtures.
- E. Maximum time allowed between batching RSC and placing roadway pavement.

- F. Range of ambient temperatures over which the mix design is effective (10°C maximum range).
- G. Final set time of the concrete.
- H. Any special instructions or conditions, including but not limited to, water temperature requirements when appropriate.

The Contractor shall submit more than one mix design to plan for ambient temperature variations anticipated during placement of the roadway pavement. Each mix shall be designed for a maximum ambient temperature range of 10°C. The Contractor shall develop and furnish modulus of rupture development data for each proposed mix design. Modulus of rupture development data for up to 7 days shall be provided to the Engineer prior to beginning paving operations. Modulus of rupture development data may be developed from laboratory prepared samples. The testing ages for modulus of rupture development data shall include one hour before opening age, opening age, one hour after opening age, 24 hours, 7 days and 28 days.

Concrete pavement penetration requirements in Section 90-6.06, "Amount of Water and Penetration" of the Standard Specifications shall not apply to RSC.

RSC pavement shall develop a minimum modulus of rupture of as specified in "Pay Factor Adjustment for Low Modulus of Rupture" of these Special Provisions before opening to public or Contractor traffic. In addition, RSC pavement shall develop a minimum modulus of rupture of 4.2 MPa in 7 days after placement. RSC pavement that attains a modulus of rupture of less than specified may be accepted in conformance with "Pay Factor Adjustment for Low Modulus of Rupture" specified herein. Modulus of rupture shall be determined by averaging results from 3 beam specimens tested in conformance with the requirements in California Test 524. Beam specimens may be fabricated using an internal vibrator in conformance with the requirements in ASTM Designation: C 31. No single test shall represent more than the production of that day or 100 cubic meters, whichever is less.

When modulus of rupture at early age is determined using beam specimens, beam specimens shall be cured under atmospheric conditions and at a temperature within 3°C of the pavement. Modulus of rupture at other ages will be determined using beams cured and tested in conformance with California Test 524 except beams will be placed into sand between 5 times and 10 times final set time or 24 hours, whichever is earlier. The Engineer will perform the testing to determine modulus of rupture values of the RSC pavement. The modulus of rupture, as determined above, will be the basis for accepting or rejecting the RSC pavement for modulus of rupture requirements.

Pay Factor Adjustment for Low Modulus of rupture

Where planned pavement nominal thickness is less than 255-mm, payment for jointed plain concrete pavement (Rapid Strength Concrete) will be adjusted for low modulus of rupture tests as follows:

- A. Jointed plain concrete pavement (Rapid Strength Concrete) with modulus of rupture of 2.8 MPa or greater before the lane is opened to the traffic and 7-day modulus of

rupture of 4.2 MPa or greater will be paid for at the contract price per cubic meter for Jointed Plain Concrete Pavement (Rapid Strength Concrete).

- B. Jointed plain concrete pavement (Rapid Strength Concrete) with a 7-day modulus of rupture of less than 3.4 MPa will not be paid for, and shall be removed and replaced, at the Contractor's expense with jointed plain concrete pavement (Rapid Strength Concrete) conforming to the requirements of these Special Provisions.
- C. Jointed plain concrete pavement (Rapid Strength Concrete) with modulus of rupture of 2.1 MPa or greater before the lane is opened to traffic and a 7-day modulus of rupture of equal to or greater than 3.4 MPa will be paid for at a percentage of the contract price per cubic meter for Jointed Plain Concrete Pavement (Rapid Strength Concrete) in conformance with the percentages in the pay table below.
- D. Jointed plain concrete pavement (Rapid Strength Concrete) with modulus of rupture of less than 2.1 MPa when the lane is opened to traffic will be rejected and shall be removed and replaced at the Contractor's expense with jointed plain concrete pavement (Rapid Strength Concrete) conforming to the requirements of these Special Provisions.

Percentage Pay Table

Modulus of Rupture (MPa) at opening to traffic	7-Day Modulus of Rupture (MPa)		
	Greater than or equal to 4.2	Less than 4.2 and greater than or equal to 3.8	Less than 3.8 and greater than or equal to 3.4
Greater than or equal to 2.8	100%	95%	90%
Less than 2.8 and greater than or equal to 2.4	95%	95%	90%
Less than 2.4 and greater than or equal to 2.1	80%*	80%*	80%*

*Any replacement panels that develops one or more transverse cracks within 21 days after placement shall be removed and replaced at the Contractor's expense with jointed plain concrete pavement (Rapid Strength Concrete) conforming to the requirements of these Special Provisions. A transverse crack is defined as a crack running from one longitudinal edge of the panel to the other.

Where planned replacement payment nominal thickness is 255-mm or greater, payment for jointed plain concrete pavement (Rapid Strength Concrete) will be adjusted for low modulus of rupture tests as follows:

- A. Jointed plain concrete pavement (Rapid Strength Concrete) with modulus of rupture of 2.3 MPa or greater before the lane is opened to the traffic and 7-day modulus of rupture of 4.2 MPa or greater will be paid for at the contract price per cubic meter for Jointed Plain Concrete Pavement (Rapid Strength Concrete).
- B. Jointed plain concrete pavement (Rapid Strength Concrete) with a 7-day modulus of rupture of less than 3.4 MPa will not be paid for, and shall be removed and replaced, at the Contractor's expense with jointed plain concrete pavement (Rapid Strength Concrete) conforming to the requirements of these Special Provisions.

- C. Jointed plain concrete pavement (Rapid Strength Concrete) with modulus of rupture of 1.8 MPa or greater before the lane is opened to traffic and a 7-day modulus of rupture of equal to or greater than 3.4 MPa will be paid for at a percentage of the contract price per cubic meter for Jointed Plain Concrete Pavement (Rapid Strength Concrete) in conformance with the percentages in the pay table below.
- D. Jointed plain concrete pavement (Rapid Strength Concrete) with modulus of rupture of less than 1.8 MPa when the lane is opened to traffic will be rejected and shall be removed and replaced at the Contractor's expense with jointed plain concrete pavement (Rapid Strength Concrete) conforming to the requirements of these Special Provisions.

Percentage Pay Table

Modulus of Rupture (MPa) at opening to traffic	7-Day Modulus of Rupture (MPa)		
	Greater than or equal to 4.2	Less than 4.2 and greater than or equal to 3.8	Less than 3.8 and greater than or equal to 3.4
Greater than or equal to 2.3	100%	95%	90%
Less than 2.3 and greater than or equal to 2.0	95%	95%	90%
Less than 2.0 and greater than or equal to 1.8	80%*	80%*	80%*

*Any replacement panels that develops one or more transverse cracks within 21 days after placement shall be removed and replaced at the Contractor's expense with jointed plain concrete pavement (Rapid Strength Concrete) conforming to the requirements of these Special Provisions. A transverse crack is defined as a crack running from one longitudinal edge of the panel to the other.

The Contractor shall pay to the State adjustments in payment for low modulus of rupture tests in conformance with the requirements specified in the tables in this section. The Department will deduct the amount of the adjustments from moneys due or that may become due, the Contractor under the contract.

Proportioning

Weighing, measuring and metering devices used for proportioning materials shall conform to the provisions in Section 9-1.01, "Measurement of Quantities" of the Standard Specifications and these Special Provisions.

Over and under dials, and other indicators for weighing and measuring systems used in proportioning materials shall be grouped so that the smallest increment for each indicator can be accurately read from the point at which the proportioning operation is controlled for ingredients batched at a central batch plant. In addition, indicators for weighing and measuring cement batched from a remote weighing system shall also be placed so that each indicator can be accurately read from the point at which the proportioning operation is controlled.

Aggregates shall be handled and stored in conformance with the provisions in Section 90-5.01, "Storage of Aggregates" of the Standard Specifications. Liquid admixtures shall be proportioned in conformance with the provisions in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures" of the Standard Specifications.

Weighing equipment shall be insulated against vibration or movement of other operating equipment. When the plant is in operation, the mass of each draft of material shall not vary from the designated mass by more than the tolerances specified herein. Each scale graduation shall be 0.001 of the usable scale capacity.

Aggregate shall be weighed cumulatively and equipment for the weighing of aggregate shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the aggregate. Equipment for the separate weighing of the cement shall have a zero tolerance of ± 0.5 percent of its designated individual batch draft. Equipment for measuring water shall have a zero tolerance of ± 0.5 percent of its designated mass or volume.

The mass indicated for any individual batch of material shall not vary from the pre-selected scale setting by more than the following:

Material	Tolerance
Aggregate	± 1.0 percent of designated batch mass
Cement	± 0.5 percent of designated batch mass
Water	± 1.5 percent of designated batch mass or volume

Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cement and water as provided in these Special Provisions. Dry ingredients shall be proportioned by mass. Liquid ingredients shall be proportioned by mass or volume.

At the time of batching, aggregates shall have been dried or drained sufficiently to result in stable moisture content, so that no visible separation of water from aggregate will take place during the proportioning process. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

If separate supplies of aggregate material of the same size group with different moisture content or specific gravity or surface characteristics affecting workability are available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another supply.

Cement shall be kept separate from the aggregates until released for discharge into the mixer. Cement shall be free of lumps and clods when discharged into the mixer. Fabric containers used for transportation or proportioning of cement shall be clean and free of residue before reuse.

Weigh systems for proportioning aggregate and cement shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and distinct material-weighing device. For batches with a volume of one cubic meter or more, proportioning equipment shall conform to one of the following methods:

- A. All ingredients shall be batched at a central batch plant and charged into a mixer truck for transportation to the pour site. Ingredient proportioning shall meet the requirements of Section 90-5, "Proportioning" of the Standard Specifications.

- B. All ingredients except the cement shall be batched at a central batch plant and charged into a mixer truck for transportation to a remote located silo and weigh system for the proportioning of the cement. The remote system shall proportion cement for charging the mixer truck.
- C. All ingredients except the cement shall be batched at a central batch plant and charged into a mixer truck for transportation to a remote location where pre-weighed, containerized cement shall be added to the mixer truck. The cement pre-weighing operation shall utilize a platform scale. The platform scale shall have a maximum capacity of 2.5 tonnes with a maximum graduation size of 0.5 kilograms. Cement shall be pre-weighed into a fabric container. The minimum amount of cement to be proportioned into any single container shall be one half of the total amount required for the load of RSC being produced.
- D. Cement, water, and aggregate shall be proportioned volumetrically in conformance with these Special Provisions.

In order to check the accuracy of batch masses, the gross mass and tare mass of truck mixers shall be determined when ordered by the Engineer. The equipment shall be weighed on scales designated by the Engineer.

The Contractor shall install and maintain in operating condition an electrically actuated moisture meter. The meter shall indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched. The meter shall have a sensitivity of 0.5 percent by mass of the fine aggregate.

No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced. Water added to the truck mixer at the job site shall be measured through a meter that conforms to the provisions in Section 9-1.01, "Measurement of Quantities" of the Standard Specifications.

Aggregate discharged from several bins shall be controlled by gates or by mechanical conveyors. The means of discharge from the bins and from the weigh hopper shall be interlocked so that no more than one bin can discharge at a time, and so that the weigh hopper can not be discharged until the required quantity from each of the bins has been deposited in the weigh hopper.

Weighmaster Certificates

Weighmaster certificates for RSC, regardless of the proportioning method used, shall include all information necessary to trace the manufacturer, and manufacturer's lot number for the cement being used. When proportioned into fabric containers the weighmaster certificates for the cement shall contain date of proportioning, location of proportioning and actual net draft mass of the cement. When proportioned at the pour site from a storage silo the weighmaster certificates shall contain date of proportioning, location of proportioning and the net draft mass of the cement used in the load.

Volumetric Proportioning

When RSC is proportioned by volume, the method shall conform to requirements specified herein.

Aggregates shall be handled and stored in conformance with the provisions in Section 90-5.01, "Storage of Aggregates" of the Standard Specifications. Liquid admixtures shall be proportioned in conformance with the provisions in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures" of the Standard Specifications.

Batch-mixer trucks shall be equipped to proportion cement, water, aggregate and additives by volume. Aggregate feeders shall be connected directly to the drive on the cement vane feeder. The cement feed rate shall be tied directly to the feed rate for the aggregate and other ingredients. Any change in the ratio of cement to aggregate shall be accomplished by changing the gate opening for the aggregate feed. The drive shaft of the aggregate feeder shall be equipped with a revolution counter reading to the nearest full or partial revolution of the aggregate delivery belt.

Aggregate shall be proportioned using a belt feeder operated with an adjustable cutoff gate delineated to the nearest quarter increment. Height of the gate opening shall be readily determinable. Cement shall be proportioned by a method that conforms to the accuracy requirements of these Special Provisions. Water shall be proportioned by a meter conforming to the provisions in Section 9-1.01, "Measurement and Payment" of the Standard Specifications and these Special Provisions.

Delivery rate of aggregate and cement per revolution of the aggregate feeder shall be calibrated at appropriate gate settings for each batch-mixer truck used on the project and for each aggregate source. Batch-mixer trucks shall be calibrated at 3 different aggregate gate settings that are commensurate with production needs. Two or more calibration runs shall be required at each of the different aggregate gate openings. The actual mass of material delivered for aggregate proportioning device calibrations shall be determined by a platform scale as specified in these Special Provisions.

Aggregate belt feeder shall deliver aggregate to the mixer with volumetric consistency so that deviation for any individual aggregate delivery rate check-run shall not exceed 1.0 percent of the mathematical average of all runs for the same gate opening and aggregate type. Each test run shall be at least 500 kg. Fine aggregate used for calibration shall not be reused for device calibration.

At the time of batching, aggregates shall be dried or drained sufficiently to result in stable moisture content, so that no visible separation of water from aggregate takes place during the proportioning process. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

If separate supplies of aggregate material of the same size group with different moisture content or specific gravity or surface characteristics affecting workability are available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting another supply.

Rotating and reciprocating equipment on batch-mixer trucks shall be covered with metal guards.

The cement proportioning system shall deliver cement to the mixer with a volumetric consistency so that the deviation for any individual delivery rate check-run shall not exceed 1.0 percent of the mathematical average of 3 runs of at least 500 kg each. Cement used for calibration shall not be reused for device calibration.

Water meter accuracy shall be such that, when operating between 50 percent and 100 percent of production capacity, the difference between the indicated mass of water delivered and the actual mass delivered shall not exceed 1.5 percent of the actual mass for each of two individual runs of 1200 liters. The water meter shall be calibrated in conformance with the requirements of California Test 109 and shall be equipped with a resettable totalizer and display the operating rate.

Calibration tests for aggregate, cement and water proportioning devices shall be conducted with a platform scale located at the calibration site. Weighing of test run calibration material shall be performed on a platform scale having a maximum capacity not exceeding 2.5 tonnes with maximum graduations of 0.5-kg. The platform scale shall be error tested within 8 hours of calibration of batch-mixer truck proportioning devices. Error testing shall be performed with test masses conforming to California Test 109 and shall produce a witness scale that is within 2 graduations of the test mass load. The scale shall be available for use at the production site throughout the production period. Equipment needed for the calibration of proportioning systems shall remain available at the production site throughout the production period. A Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" shall be furnished with each delivery of aggregate, cement, and admixtures used for calibration tests and shall be submitted to the Engineer with a certified copies of the mass of each delivery. The Certificate of Compliance shall state that the source of materials used for the calibration tests is from the same source as to be used for the planned work. The Certificate of Compliance shall state that the material supplied conforms to the Standard Specifications and these Special Provisions and shall be signed by an authorized representative who shall have the authority to represent and act for the Contractor.

The batch-mixer truck shall be equipped so that an accuracy check can be made prior to the first operation for the project and at any other time as directed by the Engineer. Further calibration of proportioning devices shall be required every 30 days after production begins or when the source or type of any ingredient is changed. A spot calibration shall consist of calibration of the cement proportioning system only. A two run spot re-calibration of the cement proportioning system shall be performed each time 50 tonnes of cement has passed through the batch-mixer truck. Should the spot re-calibration of the cement proportioning system fall outside the limitations specified herein, a full calibration of the cement proportioning system shall be completed before the resumption of production.

Liquid admixtures shall be proportioned by a meter.

Cement storage shall be located immediately before the cement feeder and shall be equipped with a device that will automatically shut down the power to the cement feeder and aggregate belt feeder when the cement storage level is lowered to a point where less than 20 percent of the total volume is left in storage.

The Contractor shall furnish aggregate moisture determinations, made in conformance with the requirements of California Test 223, at least every 2 hours during proportioning and mixing operations. Moisture determinations shall be recorded and presented to the Engineer at the end of the production shift.

Each aggregate bin shall be equipped with a device that will automatically shut down the power to the cement feeder and the aggregate belt feeder when the aggregate discharge rate is less than 95 percent of the scheduled discharge rate of any bin.

Indicators specified herein shall be in working order prior to commencing proportioning and mixing operations and shall be visible when standing near the batch-mixer truck.

Identifying numbers of batch-mixer trucks shall be at least 75-mm in height, and be located on the front and rear of the vehicles.

Volumetric proportioned RSC shall be mixed in a mechanically operated mixer of adequate size and power for the type of RSC to be placed. Mixers may be of the auger type and shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers that have an accumulation of hard concrete or mortar shall be removed from service until cleaned. Other types of mixers may be used provided mixing quality will meet the requirements of these Special Provisions.

Charge or rate of feed to the mixer shall not exceed that which will permit complete mixing of the materials. Dead areas in the mixer, where material does not move or is not sufficiently agitated, shall be corrected by a reduction in the volume of material or by other adjustments. The mixer shall be designed to provide sufficient mixing action and movement to produce properly mixed RSC. Mixing shall continue until a homogeneous mixture is produced at discharge from the mixer. There shall be no lumps or evidence of non-dispersed cement at discharge from the mixer. No water shall be added to the RSC after discharge from the mixer.

Equipment having components made of aluminum or magnesium alloys, which may have contact with plastic concrete during mixing or transporting of RSC, shall not be used.

Uniformity of concrete mixtures will be determined by differences in penetration measurement made in conformance with the requirements in California Test 533. Difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 15-mm. The Contractor shall furnish samples of freshly mixed concrete and provide facilities for obtaining the samples. Sampling facilities shall be safe, accessible, clean and produce a sample which is representative of production. Sample devices and sampling methods shall also conform to the requirements of California Test 125.

Ice shall not be used to cool RSC directly. When ice is used to cool water used in the mix, all of the ice shall be melted before entering the mixer.

Cement shall be proportioned and charged into the mixer by means that will result in no losses of cement due to wind, or due to accumulation on equipment, or other conditions which will vary the required quantity of cement.

Each mixer shall have a metal plate or plates, prominently attached, on which the following information is provided:

- A. Uses for which the equipment is designed.
- B. Manufacturer's guaranteed capacity of the mixer in terms of the volume of mixed concrete.
- C. Speed of rotation of the mixer.

Consistency and workability of mixed concrete when discharged at the delivery point shall be suitable for placement and consolidation.

Information generated by volumetric devices will not be used for payment calculations.

The device that controls the proportioning of cement, aggregate and water shall produce a log of production data. The log of production data shall consist of a series of snapshots captured at 15-minute intervals throughout the period of daily production. Each snapshot of production data shall be a register of production activity at that time and not a summation of the data over the preceding 15 minutes. The amount of material represented by each snapshot shall be the amount produced in the period of time from 7.5 minutes before to 7.5 minutes after the capture time. The daily log shall be submitted to the Engineer, in electronic or printed media, at the end of each production shift or as requested by the Engineer, and shall include the following:

- A. Mass of cement per revolution count.
- B. Mass of each aggregate size per revolution count.
- C. Gate openings for each aggregate size being used.
- D. Mass of water added to the concrete per revolution count.
- E. Moisture content of each aggregate size being used.
- F. Individual volume of all other admixtures per revolution count.
- G. Time of day.
- H. Day of week.
- I. Production start and stop times.
- J. Batch-mixer truck identification.
- K. Name of supplier.
- L. Specific type, size, or designation of concrete being produced.
- M. Source of the individual aggregate sizes being used.
- N. Source, brand and type of cement being used.
- O. Source, brand and type of individual admixtures being used.
- P. Name and signature of operator.

Required report items may be input by hand into a pre-printed form or captured and printed by the proportioning device. Electronic media containing recorded production data shall be presented in a tab delimited format on a 90-mm diskette with a capacity of at least 1.4 megabytes. Each snapshot of the continuous production shall be followed by a line-feed carriage-return with allowances for sufficient fields to satisfy the amount of data required by these specifications. The reported data shall be in the above order and shall include data titles at least once per report.

Replacement Base Layer

Base materials removed shall be replaced with replacement base layer. Replacement base layer shall consist of rapid strength concrete and shall be placed in a separate and distinct operation from that of replacing concrete pavement.

Replacement base layer shall be finished to the grade of the original base layer. The surface shall not be textured and shall be finished to a smooth surface, free of mortar ridges and other projections. The finished surface shall be free from voids and porous areas.

Bond Breaker

Bond breaker shall be placed between pavement and new base layer. Bond breaker shall be one of the following:

- A. Curing paper conforming to the requirements in ASTM Designation: C 171, white.
- B. Polyethylene (PE) film conforming to the requirements in ASTM Designation: C 171, except that the minimum thickness shall be 0.15 mm, white opaque.
- C. Paving asphalt, Grade PG 64-10, conforming to the provisions in Section 92, "Asphalts" of the Standard Specifications.
- D. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A, containing a minimum of 22 percent nonvolatile vehicles consisting of at least 50 percent paraffin wax.

When curing paper or polyethylene film is used, material shall be placed in a wrinkle free manner. Adjacent sheets shall be overlapped a minimum of 150-mm.

When curing compound or paving asphalt is used, all foreign and loose materials remaining from slab removal shall be removed prior to application.

When paving asphalt is used, no water shall be added before applying asphalt to the surface of the base. The paving asphalt shall be applied in one even application at a rate of 0.10-L/m² to 0.45-L/m² over the entire base surface area. Concrete pavement shall not be placed until the paving asphalt has cured.

When curing compound is used, the curing compound shall be applied in two separate applications. Each application shall be applied evenly at a rate of 0.3-L/m² to 0.5-L/m² over the entire base surface area.

Spreading, Compacting and Shaping

Metal or wood side forms may be used. Wood side forms shall not be less than 38-mm thick. Side forms shall be of sufficient rigidity, both in the form and in the connection with adjoining forms, that movement will not occur under the force from subgrading and paving equipment or from the pressure of concrete.

Side forms shall remain in place until the pavement edge no longer requires the protection of forms. Side forms shall be thoroughly cleaned and oiled prior to each use.

Consolidation of RSC shall be by means of high-frequency internal vibrators after the RSC is deposited on the subgrade. Vibrating shall be done in a manner to assure uniform consolidation adjacent to forms and across the full paving width. RSC shall be placed as nearly as possible in its final position and use of vibrators for extensive shifting of the mass of RSC will not be permitted.

RSC shall be spread and shaped by suitable powered finishing machines and supplemented by hand finishing as necessary. Methods of spreading, shaping and consolidating that result in segregation, voids or rock pockets shall be discontinued. The Contractor shall use methods that will produce dense homogeneous pavement conforming to the required cross section.

After the RSC has been mixed and placed, no additional water shall be added to the surface to facilitate finishing. Surface finishing additives, when used, shall be as recommended by the manufacturer of the cement and shall be approved by the Engineer prior to use.

Joints

Prior to placing concrete against existing concrete, a 6-mm thick commercial quality polyethylene flexible foam expansion joint filler shall be placed across the original transverse and longitudinal joint faces and extend the full depth of the excavation. The top of the joint filler shall be placed flush with the top of pavement. Joint filler shall be secured to the joint face of the existing pavement by a method that will hold the joint filler in place during the placement of concrete.

Transverse weakened plane joints in pavement widenings shall be constructed to match the spacing and skew of the weakened plane joints in the adjacent existing pavement. Where the existing transverse weakened plane joint spacing in an adjacent lane exceeds 4.6 m, an additional transverse weakened plane joint shall be constructed midway between the existing joints. The provisions in the second and third paragraphs in Section 40-1.08B, "Weakened Plane Joints" and the third paragraph in Section 40-1.08B(1), "Sawing Method" of the Standard Specifications shall not apply. Sawing of weakened plane joints shall be completed within 2 hours of completion of final finishing. Minimum depth of cut for weakened plane joints shall be 100-mm.

Tie Bars

Tie bars shall be installed at longitudinal joints. Locations of tie bars shall be placed as directed by the Engineer.

Tie bars shall be deformed reinforcing steel bars conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420 and shall be epoxy-coated in conformance with the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement" of the Standard Specifications, except that references made to ASTM Designation: D 3963/D 3963M shall be deemed to mean ASTM Designation: A 934/A 934M or A 775/A 775M. Tie bars shall not be bent.

Tie bars shall not be used at joints where RSC and asphalt concrete pavements join.

Tie bars shall be installed at longitudinal joints by drilling and bonding with epoxy. Epoxy shall be a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C 881, Type V, Grade 3 (Non-Sagging). The class used shall be dependent on the internal temperature of the existing hardened concrete at the time of tie bar installation as follows: Class A for below 4.5°C, Class B for 4.5°C to 15.5°C, and Class C for above 15.5°C. Epoxy shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 7 days prior to the start of work. Drilled holes shall be cleaned in conformance with the epoxy manufacturer's instructions and shall be dry at the time of placing the epoxy and tie bars. Immediately after inserting the tie bars into the epoxy, the tie bars shall be supported as necessary to prevent movement during curing and shall remain undisturbed until epoxy has cured a minimum time as specified by the manufacturer. Tie bars that are improperly bonded, as determined by the Engineer, will be rejected. If rejected, new holes shall be drilled adjacent to the rejected holes, as directed by the Engineer, and new tie bars shall be placed and securely bonded to the concrete. Work necessary to correct improperly bonded tie bars shall be performed at the Contractor's expense.

Final Finishing

Tests to determine coefficient of friction of the final textured surface will be made only if the Engineer determines by visual inspection that the final texturing may not have produced a surface having the specified coefficient of friction. Any tests to determine the coefficient of friction will be made after the pavement is opened to public traffic, but not later than 5 days after concrete placement. Pavement areas having a coefficient of friction as determined in conformance with the requirements in California Test 342 of less than 0.30 shall be grooved in conformance with the provisions in Section 42-1.02, "Construction" of the Standard Specifications. Grooving shall be performed prior to the installation of any required edge drains adjacent to the areas to be grooved.

Transverse straightedge and longitudinal straightedge requirements will not apply to the pavement surface within 300-mm of the existing concrete pavement except as required in these special provisions. Longitudinal straightedge requirements in Section 40-1.10, "Final Finishing" of the Standard Specifications, shall be applied at transverse contact

joints with existing concrete pavement where the straightedge is to be placed with the midpoint coincident with the joints. Pavement not meeting this straightedge requirement shall be corrected within 48 hours by grinding or other methods as approved by the Engineer.

Profiles of the completed pavement surface specified in Section 40-1.10, "Final Finishing" of the Standard Specifications will not be required. The Profile Index requirements in Section 40-1.10, "Final Finishing" of the Standard Specifications shall not apply.

Curing Method

The curing method for replacement pavement shall be as recommended by the manufacturer of the cement and as approved by the Engineer.

QUALITY CONTROL PROGRAM

General

The Contractor shall establish, provide and maintain a quality control program that will provide assurance to the Engineer that all materials and completed construction conform to the contract requirements specified herein.

At least 20 days prior to the placement of the trial slab the Contractor shall submit to the Engineer for approval a written Quality Control Plan (QCP) that shall be used to ensure the quality of the product and the work. At the request of the Engineer or Contractor, the Contractor and Quality Control Managers (QCMs) shall meet with the Engineer to discuss the QCP. The Engineer will have 15 days to approve the QCP. Should the Engineer fail to complete the review of the QCP within the time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the QCP, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays" of the Standard Specifications.

If in the judgement of the Engineer, the Contractor has not implemented or is not complying with the approved QCP, production and placement shall be suspended. Production and placement shall not resume until approved by the Engineer.

Quality Control Plan

The Contractor shall provide a QCP that describes the procedures that the Contractor will use to control the production process, to determine when changes to the production process are needed, and to propose procedures for implementing changes for replacement pavement operations. The QCP shall also include an outline for the placement and testing of the trial slab.

Replacement pavement production and placement shall not begin until the QCP has been approved by the Engineer. Approval of the QCP will be based on the inclusion of all required information. Approval of the QCP does not imply any warranty by the Engineer that adherence to the QCP will result in replacement pavement that complies with these

specifications. It shall remain the responsibility of the Contractor to demonstrate this compliance.

The QCP shall include the names and qualifications of the lead QCM and the assistant QCM. The lead QCM shall be responsible for the administration of the QCP. The lead QCM shall have current American Concrete Institute (ACI) certification as "Concrete Field Testing Technician-Grade I" and "Concrete Laboratory Testing Technician-Grade II." The assistant QCM shall have current ACI certification as "Concrete Field Testing Technician-Grade I" and either "Concrete Laboratory Testing Technician-Grade I" or "Concrete Laboratory Testing Technician-Grade II". All sampling, inspection and test reports shall be reviewed and signed by the QCM responsible for the production period involved prior to submittal to the Engineer. At least one QCM shall be present for each stage of mix design, trial slab construction, during production and construction of replacement pavement and for all meetings between the Contractor and Engineer relating to production, placement or testing of replacement pavement. The QCMs shall not be members of production or paving crews, inspectors or testers on the project during production or placement of replacement pavement. QCMs shall have no duties other than those referenced in these special provisions during the production and placement of replacement pavement.

The QCP shall include an outline of the production, transportation and placement of the replacement pavement. The QCP shall include a contingency plan for correcting situations if there is a problem in production, transportation or placement. The Contractor shall have equipment and personnel present to meet the requirements of the contingency plan. The QCP shall contain provisions for determining when placement of the replacement pavement will be suspended and temporary roadway will be substituted.

The QCP shall include the names of quality control personnel to be used and an outline of sampling, testing to be performed during and after construction of replacement pavement. At the time of submission of the QCP, quality control samplers and testers must be Caltrans qualified by the Department through the Independent Assurance Program (IAP) for the sampling and testing for which they will be responsible.

Before production and placement begins, the Contractor, QCMs and Engineer shall have a meeting with all production, transportation, placement, inspection, sampling and testing personnel to familiarize them with the requirements of the project. Items to be discussed include the production, transportation and placement processes for replacement pavement; contingency plan; and sampling and testing. The Contractor shall provide the facility for this meeting. The meeting date and location will be approved by the Engineer. Attendance at this meeting is mandatory for key personnel including the project manager, QCMs, production plant manager, plant inspector, all concrete delivery truck drivers, paving superintendent, paving foreman, paving machine operator, and all inspectors, samplers and testers. All meeting attendees shall sign in at the meeting. Production and placement operations shall not begin unless the above key personnel have attended the mandatory meeting.

Quality Control Inspection, Sampling and Testing

The Contractor shall perform quality control inspection, sampling and testing to ensure that replacement pavement production and placement conform to the provisions specified herein.

The Contractor shall provide the required sampling, testing and inspection during all phases of replacement pavement production and placement. The Contractor shall provide a minimum of two business days notice to the Engineer, so the Engineer can witness all sampling and testing. The Engineer shall be given unrestricted access to the Contractor's quality control inspectors, samplers, testers and laboratories. During the production and placement period, the Contractor shall provide results of all testing to the Engineer within 15 minutes of completion of testing. The Contractor shall record all inspection, sampling and testing on forms approved by the Engineer. The Contractor shall provide written results of all inspection and testing to the Engineer within 48 hours of completion of each shift of paving and within 24 hours for all 7-day strength tests.

The Contractor shall provide a testing laboratory with adequate equipment and personnel for the performance of the quality control tests. This laboratory shall be located at a location approved by the Engineer and so that prompt testing requirements will be achieved. All sampling and testing equipment shall be maintained in proper working condition. Sampling shall be performed in conformance with the requirements of California Test 125. The QCP shall include a list the equipment to be used including date of last calibration, the names and certifications of sampling and testing personnel, and the location of the laboratory and testing equipment during and after paving operations.

Testing laboratories, testing equipment, and sampling and testing personnel shall conform to the requirements of the Department's IAP.

Trial Slab and Process Control Testing

Prior to construction of RSC pavement, the Contractor shall construct one or more trial slabs under conditions similar to those that will exist during pavement replacement, for each mix design, to show that personnel, equipment, and mixing, placing, curing, and sawing techniques will produce a concrete pavement conforming to these special provisions in the anticipated time period under similar atmospheric and temperature conditions as pavement construction and to establish the correlation described below. During production and placement, the Contractor shall conform to the requirements of these special provisions and to the procedure outlined in the QCP to ensure that mixing, transporting, placing, finishing, curing and sawing techniques and that personnel and equipment to be used will produce replacement pavement conforming to these special provisions.

A trial slab shall be constructed using the approved mix design, admixtures and conditions for batching. During construction of trial slab, the Contractor shall demonstrate placement at the minimum and maximum times allowed from batching to placement. RSC pavement within the roadway shall not proceed until a trial slab meeting the requirements of these Special Provisions has been constructed.

The minimum trial slab dimensions shall be 3 m x 6 m and shall be 225 mm thick where planned replacement pavement nominal thickness is less than 255 mm. The trial slab thickness shall be 260 mm where planned replacement pavement nominal thickness is 255 mm or greater. Where there are planned slab replacements with greater and less than 255 mm thickness then two trial slabs shall be required one at 225 mm thick and one at 255 mm thick. Trial slabs shall be placed near the project site at a location mutually acceptable to the Engineer and the Contractor except slabs shall not be placed on the roadway or within the project limits.

During trial slab construction, the Contractor shall sample and split the aggregate for gradings, cleanness value, and sand equivalent testing with the Engineer, at the Contractor's cost. Both sets of test results of these samples shall conform to the provisions in Section 90-2.02, "Aggregates," of the Standard Specifications. If test results do not conform to the requirements, the trial slab will be rejected.

During trial slab construction and within 20 minutes of RSC delivery, beams shall be fabricated in conformance with the requirements in California Test 524. Beams shall be used to determine early age and 7-day modulus of rupture values. Beams fabricated for early age testing shall be cured so that the monitored temperature in the beams and the trial slab are within 3°C at all times. Internal temperatures of the trial slab and early age beams shall be monitored and recorded at minimum time intervals of 5 minutes by installing thermocouples and or thermistors connected to strip-chart recorders or digital data loggers. Temperature recording devices shall be accurate to within $\pm 1^\circ\text{C}$. Internal temperature readings shall be measured at 25 mm from the top and 25 mm from the bottom, no closer than 75 mm from any edge of the concrete elements, until the early age testing is completed. Beams fabricated for 7-day testing shall be cured in conformance with the requirements in California Test 524, except beams shall be placed into sand at between 5 and 10 times the final set time or 24 hours, whichever is earlier. Testing shall be performed by the Contractor and witnessed by the Engineer. At the Engineer's request, the Contractor shall produce samples for the Engineer to test. Strength results from beams shall be the basis for determining whether RSC pavement operations may proceed. Trial slabs 225 mm thick shall have an early age modulus of rupture of not less than 2.8 MPa and a 7-day modulus of rupture of not less than 4.2 MPa. Trial slabs 260 mm thick shall have an early age modulus of rupture of not less than 2.3 MPa and a 7-day modulus of rupture of not less than 4.2 MPa. Beams failing early age or 7-day modulus of rupture requirements shall be cause for the rejection of the trial slab.

When proposed by the Contractor, in writing, and approved by the Engineer, ASTM Designation: C 805 or C 900 shall be used to estimate the modulus of rupture of the pavement at early ages. The selected test method shall be used to determine modulus of rupture until 7 days after the Contractor notifies the Engineer of withdrawal of the proposal or 7 days after the Engineer notifies the Contractor of withdrawal of approval, in writing. During trial slab curing, correlation testing shall be performed to determine the relation between the modulus of rupture and ASTM Designation: C 805 or C 900 performed on the trial slab. The correlation shall be established by testing at 4 or more time intervals. At a minimum, tests shall be performed one hour before and one hour after the opening age and two others within 15 minutes of the opening age. Modulus of rupture estimates shall be calculated with either a linear, exponential or logarithmic, least squares best-fit equation, whichever provides the best correlation coefficient.

The Contractor shall state in detail the intended location and time; procedure for production, placement and finishing of RSC pavement; sampling, sample curing and sample transportation; testing and reporting of test results for the trial slab in the QCP.

Process Control and Quality Control Testing

The Contractor shall provide continuous process control and quality control sampling and testing throughout production and placement of replacement pavement.

During production of RSC for replacement pavement operations, the Contractor shall sample and test aggregates at least once every 500 cubic meters of RSC produced but not less than once per placement shift. Aggregates shall be tested for conformance with gradations, cleanness value and sand equivalent requirements.

During placement of RSC pavement, the Contractor shall fabricate specimens and test for modulus of rupture within the first 25 cubic meters, within the final truckload and at least once every 100 cubic meters.

During placement of RSC, the Contractor shall sample and test for yield, penetration, air content and unit weight at least once in every 500 cubic meters RSC produced but not less than twice per placement shift.

At the Engineer's request, the Contractor shall provide split samples and fabricate beams for the Engineer to test. The cost of sampling, fabricating and transporting extra samples will be paid for as extra work in conformance with the provisions in Section 4-1.03D, "Extra Work," of the Standard Specifications. When, in the opinion of the Engineer, RSC fails to conform to the mix design requirements or the requirements of these special provisions, the Contractor shall provide samples and testing at the direction of the Engineer. If the material fails to meet requirements of these special provisions, cost of sampling and testing shall be at the Contractor's expense. If the material meets the requirements of these special provisions, the cost of sampling and testing will be paid for as extra work in conformance with the provisions in Section 4-1.03D, "Extra Work" of the Standard Specifications.

Beams used for determining early age modulus of rupture shall be cured under the same conditions as the pavement until one hour prior to testing. Beams fabricated for the 7-day test shall be cured in conformance with California Test 524 as modified in these special provisions. Modulus of rupture test results will be used for accepting or rejecting the replacement pavement and pay factor adjustment for low modulus of rupture.

Materials resulting from the construction of the trial slab, test specimens, temporary roadway structural section, and all rejected replacement pavement shall become the property of the Contractor and shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

REPLACE EXISTING PAVEMENT DELINEATION

Whenever existing pavement delineation is removed, obliterated or damaged due to the work involved in replacing concrete pavement, the Contractor shall replace the delineation in conformance with the requirements of these Special Provisions.

REPLACE EXISTING PAVEMENT DELINEATION

Whenever existing pavement delineation is removed, obliterated or damaged due to the work involved in replacing concrete pavement, the Contractor shall replace or repair the delineation. Replacement delineation shall be installed at existing or new locations, shall conform to the design of the existing delineation and shall be equal in all respects to the best portions of the existing delineation. The work of replacing existing delineation shall be performed in conformance with the requirements for new work of similar character as specified in the specifications.

MEASUREMENT AND PAYMENT

Jointed plain concrete pavement (Rapid Strength Concrete) will be measured and paid for in the same manner specified for concrete pavement in Sections 40-1.13, "Measurement" and 40-1.14, "Payment" of the Standard Specifications, and these Special Provisions.

Jointed plain concrete pavement (Rapid Strength Concrete) payments will be subject to the pay factor values listed in "Pay Factor Adjustment for Low Modulus of Rupture" of these Special Provisions.

Full compensation for the pre-operation conference, including furnishing the facility to hold the pre-operation conference in, shall be considered as included in the contract prices paid for the item involving RSC and no additional compensation will be made therefor.

Costs for providing JITT will be made in conformance with the provisions in Section 9-1.03, "Force Account Payment" of the Standard Specifications, except no markups shall be added, and the Contractor will be paid for one half of the JITT cost. Costs for providing JITT shall include training materials, class site, and the JITT instructor including the JITT instructor's travel, lodging, meals and presentation materials. All costs incurred by the Contractor or Engineer for attending JITT shall be borne by the party incurring the costs.

The provisions in Section 40-1.135, "Pavement Thickness" of the Standard Specifications shall not apply.

Full compensation for removing and disposing of existing concrete pavement and underlying base, constructing trial slabs, furnishing and placing bond breaker, furnishing and disposing of standby materials for temporary roadway structural section, constructing, maintaining, removing, and disposing of temporary roadway structural section, furnishing and applying pavement delineation, shall be considered as included in the contract price paid per cubic meter for Jointed Plain Concrete Pavement (Rapid Strength Concrete), and no additional compensation will be allowed therefor.

The contract unit price paid for Tie Bar (Drill and Bond) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in placing epoxy-coated tie bars, drilling holes and bonding tie bars with epoxy resin, or furnishing and placing threaded dowel splice couplers, in concrete pavement complete in place, including properly aligning tie bars as shown on the plans, as specified in the Standard Specifications, and these Special Provisions, and as directed by the Engineer.

If calibration of volumetric batch-trucks is performed more than 160 km from the project limits, additional inspection expenses will be sustained by the County. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for jointed plain concrete pavement (Rapid Strength Concrete) will be reduced \$1,000.

10-1.83 EXIT RAMP TERMINI:

Portland cement concrete pavement at exit ramp termini shall be constructed as shown on the plans and as provided in Section 40, "Portland Cement Concrete Pavement" of the Standard Specifications and these Special Provisions.

PAYMENT

The contract unit price paid per cubic meter for Jointed Plain Concrete Pavement (Exit Ramp Termini) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved and complete in place as shown on the plans, as specified in the Standard Specifications, and these Special Provisions, and as directed by the Engineer.

10-1.84 PILING:

GENERAL

Piling shall conform to the provisions in Section 49, "Piling" of the Standard Specifications, and these Special Provisions.

Unless otherwise specified, welding of any work performed in conformance with the provisions in Section 49, "Piling" of the Standard Specifications, shall be in conformance with the requirements in AWS D1.1.

Attention is directed to "Project Information" and "Welding" of these Special Provisions.

Difficult pile installation is anticipated due to the presence of very dense layers of gravel and cobbles and the requirements of traffic control.

When a calculated nominal driving resistance is shown on the plans for piling, that value shall be utilized in lieu of nominal resistance in Section 49, "Piling" of the Standard Specifications and these Special Provisions.

Jetting and Drilling

Jetting or drilling to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment" of the Standard Specifications shall not be used for driven type piles.

CAST-IN-DRILLED-HOLE CONCRETE PILES

Cast-in-drilled-hole concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles" of the Standard Specifications and these Special Provisions.

The provisions of "Welding" of these Special Provisions shall not apply to temporary steel casings.

Cast-in-drilled-hole concrete piles 600-mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

Materials

Concrete deposited under slurry shall have a nominal penetration equal to or greater than 90 mm. Concrete shall be proportioned to prevent excessive bleed water and segregation.

Concrete deposited under slurry shall contain not less than 400 kg of cementitious material per cubic meter.

Attention is directed to "Corrosion Control for Portland Cement Concrete" of these Special Provisions.

The combined aggregate grading used in concrete for cast-in-drilled-hole concrete piling shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading and shall conform to the requirements in Section 90-3 "Aggregate Gradings" of the Standard Specifications.

Construction

The Contractor shall submit a placing plan to the Engineer for approval prior to producing the test batch for cast-in-drilled-hole concrete piling and at least 10 working days prior to constructing piling. The plan shall include complete descriptions, details, and supporting calculations as listed below:

- A. Requirements for all cast-in-drilled hole concrete piling:
 1. Concrete mix design, certified test data, and trial batch reports.
 2. Drilling or coring methods and equipment.
 3. Proposed method for casing installation and removal when necessary.
 4. Plan view drawing of pile showing reinforcement and inspection pipes, if required.
 5. Methods for placing, positioning, and supporting bar reinforcement.

6. Methods and equipment for accurately determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
7. Methods and equipment for verifying that the bottom of the drilled hole is clean prior to placing concrete.
8. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

B. Additional requirements when concrete is placed under slurry:

1. Concrete batching, delivery, and placing systems, including time schedules and capacities therefor. Time schedules shall include the time required for each concrete placing operation at each pile.
2. Concrete placing rate calculations. When requested by the Engineer, calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
3. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
4. Slurry testing equipment and procedures.
5. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
6. Methods and equipment for slurry agitating, recirculating, and cleaning.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before use by producing a test batch. The test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during the placement of concrete in the piles. Concrete for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow for testing as specified herein. Depositing of test batch concrete under slurry will not be required. In addition to meeting the specified nominal penetration, the test batch shall meet the following requirements:

- A. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be 2 hours or less, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50-mm or a slump of at least 125-mm after twice that time has elapsed.
- B. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be more than 2 hours, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50-mm or a slump of at least 125-mm after that time plus 2 hours has elapsed.

The time period shall begin at the start of placement. - The concrete shall not be vibrated or agitated during the test period. Penetration tests shall be performed in conformance with the requirements in California Test 533. - Slump tests shall be performed in conformance with the requirements in ASTM Designation: C 143. - Upon completion of testing, the concrete shall be disposed of in conformance with the provisions in Section 7-

1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

The concrete deposited under slurry shall be carefully placed in a compact, monolithic mass and by a method that will prevent washing of the concrete. Concrete deposited under slurry need not be vibrated. Placing concrete shall be a continuous operation lasting not more than the time required for each concrete placing operation at each pile, as submitted in the placing plan, unless otherwise approved in writing by the Engineer. The concrete shall be placed with concrete pumps and delivery tube system of adequate number and size to complete the placing of concrete in the time specified. The delivery tube system shall consist of one of the following:

- A. A tremie tube or tubes, each of which are at least 250 mm in diameter, fed by one or more concrete pumps.
- B. One or more concrete pump tubes, each fed by a single concrete pump.

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. If only one delivery tube is utilized to place the concrete, the tube shall be placed near the center of the drilled hole. Multiple tubes shall be uniformly spaced in the hole. Internal bracing for the steel reinforcing cage shall accommodate the delivery tube system. Tremies shall not be used for piles without space for a 250-mm tube.

Spillage of concrete into the slurry during concrete placing operations shall not be allowed. Delivery tubes shall be capped with a watertight cap, or plugged above the slurry level with a good quality, tight fitting, moving plug that will expel the slurry from the tube as the tube is charged with concrete. The cap or plug shall be designed to be released as the tube is charged. The pump discharge or tremie tube shall extend to the bottom of the hole before charging the tube with concrete. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end. During concrete placement, the tip of the delivery tube shall be maintained as follows to prevent reentry of the slurry into the tube. Until at least 3 m of concrete has been placed, the tip of the delivery tube shall be within 150-mm of the bottom of the drilled hole, and then the embedment of the tip shall be maintained at least 3 m below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. If the seal is lost or the delivery tube becomes plugged and must be removed, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the slurry, and the operation restarted by pushing the capped tube 3 m into the concrete and then reinitiating the flow of concrete.

When slurry is used, a fully operational standby concrete pump, adequate to complete the work in the time specified, shall be provided at the site during concrete placement. The slurry level shall be maintained within 300-mm of the top of the drilled hole.

A log of concrete placement for each drilled hole shall be maintained by the Contractor when concrete is deposited under slurry. The log shall show the pile location, tip elevation, dates of excavation and concrete placement, total quantity of concrete deposited, length and tip elevation of any casing, and details of any hole stabilization method and materials used. The log shall include a 215-mm x 280-mm sized graph of the

concrete placed versus depth of hole filled. The graph shall be plotted continuously throughout placing of concrete. The depth of drilled hole filled shall be plotted vertically with the pile tip oriented at the bottom and the quantity of concrete shall be plotted horizontally. Readings shall be made at least at each 1.5 m of pile depth, and the time of the reading shall be indicated. The graph shall be labeled with the pile location, tip elevation, cutoff elevation, and the dates of excavation and concrete placement. The log shall be delivered to the Engineer within one working day of completion of placing concrete in the pile.

After placing reinforcement and prior to placing concrete in the drilled hole, if drill cuttings settle out of the slurry, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

If temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 m above the bottom of the casing. The withdrawal of casings shall not cause contamination of the concrete with slurry.

Material resulting from using slurry shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

Acceptance Testing and Mitigation

Vertical inspection pipes for acceptance testing shall be provided in all cast-in-drilled-hole concrete piles that are 600-mm in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing to control ground water.

Inspection pipes shall be Schedule 40 polyvinyl chloride pipes with a nominal inside diameter of 50 mm. Each inspection pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50-mm diameter clear opening from 1.0 m above the pile cutoff down to the bottom of the reinforcing cage.

If the Contractor drills the hole below the specified tip elevation, the reinforcement and the inspection pipes shall be extended to 75-mm clear of the bottom of the drilled hole.

Inspection pipes shall be placed around the pile, inside the outermost spiral or hoop reinforcement, and 75-mm clear of the vertical reinforcement, at a uniform spacing not exceeding 840-mm measured along the circle passing through the centers of inspection pipes. A minimum of 2 inspection pipes per pile shall be used. When the vertical reinforcement is not bundled and each bar is not more than 26-mm in diameter, inspection pipes may be placed 50-mm clear of the vertical reinforcement. The inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the clear spacing required herein. The pipes shall be installed in straight alignment, parallel to the main reinforcement, and securely fastened in place to prevent misalignment during installation of the reinforcement and placing of concrete in the hole.

The Contractor shall log the location of the inspection pipe couplers with respect to the plane of pile cut off, and these logs shall be delivered to the Engineer upon completion of the placement of concrete in the drilled hole.

After placing concrete and before requesting acceptance tests, each inspection pipe shall be tested by the Contractor in the presence of the Engineer by passing a 48.3-mm diameter rigid cylinder 610-mm long through the complete length of pipe. If the 48.3-mm diameter rigid cylinder fails to pass any of the inspection pipes, the Contractor shall attempt to pass a 32.0-mm diameter rigid cylinder 1.375 m long through the complete length of those pipes in the presence of the Engineer. If an inspection pipe fails to pass the 32.0-mm diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

The Contractor shall replace each inspection pipe that does not pass the 32.0-mm diameter cylinder with a 50.8-mm diameter hole cored through the concrete for the entire length of the pile. Cored holes shall be located as close as possible to the inspection pipes they are replacing and shall be no more than 150-mm inside the reinforcement. Coring shall not damage the pile reinforcement. Cored holes shall be made with a double wall core barrel system utilizing a split tube type inner barrel. Coring with a solid type inner barrel will not be allowed. Coring methods and equipment shall provide intact cores for the entire length of the pile concrete. The coring operation shall be logged by an Engineering Geologist or Civil Engineer licensed in the State of California and experienced in core logging. Coring logs shall include complete descriptions of inclusions and voids encountered during coring, and shall be delivered to the Engineer upon completion. Concrete cores shall be preserved, identified with the exact location the core was recovered from within the pile, and made available for inspection by the Engineer.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging. Tests may also include crosshole sonic logging and other means of inspection selected by the Engineer. The Contractor shall not conduct operations within 8.0 m of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piling, the Contractor shall allow 3 weeks for the Engineer to conduct these tests and make determination of acceptance if the 48.3-mm diameter cylinder passed all inspection pipes, and 4 weeks if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete these tests within the time allowance, and if in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays" of the Standard Specifications.

All inspection pipes and cored holes in a pile shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Placement and removal of water in the inspection pipes shall be at the Contractor's expense. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting" of the Standard Specifications. The inspection pipes and holes shall be filled using grout tubes that extend to the bottom of the pipe or hole or into the grout already placed.

If acceptance testing performed by the Engineer determines that a pile does not meet the requirements of the specifications, then that pile will be rejected and all depositing of concrete under slurry or concrete placed using temporary casing for the purpose of controlling groundwater shall be suspended until written changes to the methods of pile construction are approved in writing by the Engineer.

The Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected cast-in-drilled-hole concrete pile, and this plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings" of the Standard Specifications. Prior to submitting this mitigation plan, the Engineer will hold a repair feasibility meeting with the Contractor to discuss the feasibility of repairing rejected piling. The Engineer will consider the size of the defect, the location of the defect, and the design information and corrosion protection considerations for the pile. This information will be made available to the Contractor, if appropriate, for the development of the mitigation plan. If the Engineer determines that it is not feasible to repair the rejected pile, the Contractor shall not include repair as a means of mitigation and shall proceed with the submittal of a mitigation plan for replacement or supplementation of the rejected pile.

If the Engineer determines that a rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, the Contractor may elect to 1) repair the pile per the approved mitigation plan, or 2) not repair anomalies found during acceptance testing of that pile. For such unrepaired piles, the Contractor shall pay to the County, \$400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meters, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross-section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment to the County for any such pile be less than \$400. The Department may deduct the amount from any moneys due, or that may become due the Contractor under the contract.

Pile mitigation plans shall include the following:

- A. The designation and location of the pile addressed by the mitigation plan.
- B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
- C. A step by step description of the mitigation work to be performed, including drawings if necessary.
- D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.
- E. Methods for preservation or restoration of existing earthen materials.
- F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
- G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor's (and Subcontractor's if applicable) name on each sheet.

- H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
- I. The seal and signature of an Engineer who is licensed as a Civil Engineer by the State of California.

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. An assessment of the nature and size of the anomalies in the rejected pile.
- B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. The proposed location and size of additional piling.
- B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piling.

All provisions for cast-in-drilled-hole concrete piling shall apply to replacement piling.

The Contractor shall allow the Engineer 3 weeks to review the mitigation plan after a complete submittal has been received.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays" of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an Engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the County assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor (and Subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

MEASUREMENT AND PAYMENT

The contract unit bid price paid for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement" and 49-6.02, "Payment" of the Standard Specifications and these Special Provisions.

Full compensation for driving system submittals shall be considered as included in the contract unit price paid for Drive Steel Pile, and nom additional compensation will be allowed therefor.

10-1.85 PRESTRESSING CONCRETE:

Prestressing concrete shall conform to the provisions in Section 50, "Prestressing Concrete" of the Standard Specifications and these Special Provisions.

The number of working drawings to be submitted for initial review shall be 6 sets.

10-1.86 CONCRETE STRUCTURES:

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures" of the Standard Specifications and these Special Provisions.

Attention is directed to "Precast Concrete Quality Control" of these Special Provisions.

Unless otherwise specified, supplementary cementitious material will not be required in Portland cement concrete used for precast concrete girders.

The Contractor will be permitted to use Type III Portland cement for concrete used in the manufacture of precast concrete girders.

Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

Neoprene strip shall be furnished and installed at abutment backwall joint protection in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these Special Provisions.

Furnishing and installing neoprene strip shall conform to the requirements for strip waterstops as provided in Section 51-1.145, "Strip Waterstops" of the Standard Specifications, except that the protective board will not be required.

FALSEWORK

Falsework shall conform to the provisions in Section 51, "Concrete Structures" of the Standard Specifications and these Special Provisions.

Falsework for cast-in-place decks shall be supported from adjacent girders.

The Contractor's Engineer who signs the falsework drawings shall also certify in writing that the falsework is constructed in conformance with the approved drawings and the contract specifications prior to placing concrete. This certification shall include performing any testing necessary to verify the ability of the falsework members to sustain the stresses required by the falsework design. The Engineer who signs the drawings may

designate a representative to perform this certification. Where falsework contains openings for railroads, vehicular traffic, or pedestrians, the designated representative shall be qualified to perform this work, shall have at least three years of combined experience in falsework design or supervising falsework construction, and shall be registered as a Civil Engineer in the State of California. For other falsework, the designated representative shall be qualified to perform this work and shall have at least three years of combined experience in falsework design or supervising falsework construction. The Contractor shall certify the experience of the designated representative in writing and provide supporting documentation demonstrating the required experience if requested by the Engineer.

Welding and Non-destructive Testing

Welding of steel members, except for previously welded splices and except for when fillet welds are used where load demands are less than or equal to 175 N/mm for each 3-mm of fillet weld, shall conform to AWS D1.1 or other recognized welding standard. The welding standard to be utilized shall be specified by the Contractor on the working drawings. Previously welded splices for falsework members are defined as splices made prior to the member being shipped to the project site.

Splices made by field welding of steel beams at the project site shall undergo nondestructive testing (NDT). At the option of the Contractor, either ultrasonic testing (UT) or radiographic testing (RT) shall be used as the method of NDT for each field weld and any repair made to a previously welded splice in a steel beam. Testing shall be performed at locations selected by the Contractor. The length of a splice weld where NDT is to be performed, shall be a cumulative weld length equal to 25 percent of the original splice weld length. The cover pass shall be ground smooth at the locations to be tested. The acceptance criteria shall conform to the requirements of AWS D1.1, Section 6, for cyclically loaded non-tubular connections subject to tensile stress. If repairs are required in a portion of the weld, additional NDT shall be performed on the repaired sections. The NDT method chosen shall be used for an entire splice evaluation including any required repairs.

For all field welded splices, the Contractor shall furnish to the Engineer a letter of certification which certifies that all welding and NDT, including visual inspection, are in conformance with the specifications and the welding standard shown on the approved working drawings. This letter of certification shall be signed by an Engineer who is registered as a Civil Engineer in the State of California and shall be provided prior to placing any concrete for which the falsework is being erected to support.

For previously welded splices, the Contractor shall determine and perform all necessary testing and inspection required to certify the ability of the falsework members to sustain the stresses required by the falsework design. This welding certification shall (1) itemize the testing and inspection methods used, (2) include the tracking and identifying documents for previously welded members, (3) be signed by an Engineer who is registered as a Civil Engineer in the State of California, (4) and shall be provided prior to erecting the members.

DECK CLOSURE POURS

Where a deck closure pour is shown on the plans, reinforcement protruding into the closure space and forms for the closure pour shall conform to the following:

- A. During the time of placement of concrete in the deck, other than for the closure pour itself, reinforcing steel which protrudes into the closure space shall be completely free from any connection to the reinforcing steel, concrete, or other attachments of the adjacent structure, including forms. The reinforcing steel shall remain free of any connection for a period of not less than 24 hours following completion of the pour.
- B. Forms for the closure pour shall be supported from the superstructure on both sides of the closure space.

SLIDING BEARINGS

Sliding bearings consisting of elastomeric bearing pads lubricated with grease and covered with sheet metal shall conform to the following requirements:

- A. Grease shall conform to the requirements of Society of Automotive Engineers AS 8660. A uniform film of grease shall be applied to the upper surface of the pads prior to placing the sheet metal.
- B. Sheet metal shall be commercial quality galvanized sheet steel. The sheet metal shall be smooth and free of kinks, bends, or burrs.
- C. Construction methods and procedures shall prevent grout or concrete seepage into the sliding bearing assembly.

ELASTOMETRIC BEARING PADS

Elastomeric bearing pads shall conform to the provisions in Section 51-1.12H, "Elastomeric Bearing Pads" of the Standard Specifications.

PRECAST CONCRETE GIRDERS

Precast reinforced concrete girders shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications.

PRECAST PRESTRESSED CONCRETE BRIDGE MEMBERS

Before curing operations, the top surface of each member shall be given a coarse texture by brooming with a stiff bristled broom or by other suitable devices that will result in uniform transverse scoring. That portion of the top surface of box girders that is to be covered by expanded polystyrene shall be given a wood float finish.

When bulb-tee girders with a concrete deck are shown on the plans, surfaces noted to be given a coarse broom finish shall be cleaned of surface laitance and curing compound before placing deck concrete. Exposure of clean aggregate will not be required.

The anticipated deflection and method of accommodation of deflection of precast prestressed concrete girders, prior to the time the deck concrete is placed, shall be shown on the working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings" of the Standard Specifications. The deflection shall include the following:

- A. Anticipated upward deflection caused by the prestressing forces.
- B. Downward deflection caused by the dead load of the girder.
- C. Deflection caused by the creep and shrinkage of the concrete for the time interval between the stressing of the girders and the planned placement of the deck.

The deflection shall be substantiated by calculations that consider the ages of the girder concrete at the time of stressing and the Contractor's planned placement of the deck. Deflection calculations shall be based on the concrete producer's estimate of the modulus of elasticity at the applicable concrete age.

Adjustments to accommodate girder deflections that occur prior to the time the deck concrete is placed may include revisions in bearing seat elevations, but the adjustments shall be limited by the following conditions:

- A. The minimum permanent vertical clearance under the structure as shown on the plans shall not be reduced.
- B. The profile grade and cross slope of the deck shall not be changed.
- C. A minimum of 25 mm of deck slab concrete between the top of the precast girders and the deck slab reinforcement shall be maintained.

Girders with unanticipated girder deflection that do not comply with conditions A, B, and C will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials" of the Standard Specifications.

Adjustments to accommodate girder deflections will not be considered a change in dimensions. Full compensation for increases in the cost of construction, including increases in the quantity of deck or bearing seat concrete, resulting from adjustments to accommodate girder deflections shall be considered as included in the contract prices paid for the various items of work involved, and no additional compensation will be allowed therefor.

The Contractor shall submit a girder erection plan to the Engineer for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings" of the Standard Specifications. The girder erection plan shall include procedures, details, and sequences for unloading, lifting, erecting, and installing temporary bracing, and shall be signed by an Engineer who is registered as a Civil Engineer in the State of California. The Contractor shall allow 20 days for the review of the girder erection plan.

Temporary lateral bracing shall be provided for girders located over I-10. The bracing shall be installed at a minimum at each end of each girder segment and at midspan. The bracing shall be in place prior to the release of the erection equipment from the girder and shall remain in place until 48 hours after the concrete diaphragms have been placed. The bracing shall be designed to prevent overturning of the girders prior to completion of the

work and to resist the following lateral pressures applied at the top of the girder in either direction:

Structure Height, H (meters above ground)	Lateral Pressure (Pa)
$0 < H \leq 9$	720
$9 < H \leq 15$	960
$15 < H \leq 30$	1200
$H > 30$	1440

MEASUREMENT AND PAYMENT

Measurement and payment for concrete in structures shall conform to the provisions in Section 51-1.22, "Measurement" and Section 51-1.23, "Payment" of the Standard Specifications and these Special Provisions.

10-1.87 STRUCTURE APPROACH SLABS (TYPE N):

Summary

This work includes constructing reinforced concrete approach slabs, structure approach drainage systems, and treated permeable base.

Reinforced concrete approach slabs must comply with Section 51, "Concrete Structures," of the Standard Specifications.

Submittals

Furnish a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for the geocomposite drain certifying that the drain complies with these special provisions. The Certificate of Compliance must be accompanied by a flow capability graph for the geocomposite drain showing flow rates and the externally applied pressures and hydraulic gradients. The flow capability graph must be stamped with the verification of an independent testing laboratory.

Notify the Engineer of the type of treated permeable base to be furnished at least 30 days before the start of placement. Once you have notified the Engineer of the selection, the type to be furnished must not be changed without a prior written request to do so and approval thereof by the Engineer.

Notify the Engineer of the source of woven tape fabric at least 45 days before use.

MATERIALS

Concrete

Concrete for structure approach slabs must contain not less than 400 kilograms of cementitious material per cubic meter and must either:

1. Cure for not less than 5 days before opening to public traffic, or
2. Comply with "Rapid Strength Concrete for Structures" of these Special Provisions.

Drainage Pads

Concrete for use in drainage pads must be minor concrete, except the concrete must contain not less than 300 kilograms of cementitious material per cubic meter.

Geocomposite Drain

Geocomposite drain must consist of a manufactured core not less than 6.35 mm thick nor more than 50 mm thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain must produce a flow rate through the drainage void of at least 25 liters per minute per meter of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 168 kPa.

The manufactured core must be one of the following:

1. Preformed grid of embossed plastic.
2. Mat of random shapes of plastic fibers.
3. Drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels.
4. System of plastic pillars and interconnections forming a semirigid mat.

The core material and filter fabric must be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric must be integrally bonded to the side of the core material with the drainage void.

Filter Fabric

Filter fabric must comply with the specifications for filter fabric for underdrains in Section 88, "Engineering Fabrics" of the Standard Specifications.

Treated Permeable Base

Treated permeable base under structure approach slabs must be an asphalt treated permeable base or a cement treated permeable base as specified in Section 29, "Treated Permeable Bases" of the Standard Specifications.

Miscellaneous Materials

Steel components of abutment ties, including plates, nuts, washers, and rods, must comply with Section 75-1.03, "Miscellaneous Bridge Metal" of the Standard Specifications.

Steel angles, plates, and bars at the concrete barrier joints must comply with Section 75-1.03, "Miscellaneous Bridge Metal" of the Standard Specifications.

Hardboard and expanded polystyrene must comply with Section 51-1.12D, "Sheet Packing, Preformed Pads, and Board Fillers" of the Standard Specifications.

Building paper must be commercial quality No. 30 asphalt felt.

PVC conduit used to encase the abutment tie rod must be commercial quality.

CONSTRUCTION

Geocomposite Drain

Install the geocomposite drain with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side must overlap a minimum of 75-mm at all joints and wrap around the exterior edges a minimum of 75-mm beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wraparound at edges, the added fabric must overlap at least 150-mm and be attached to the fabric on the geocomposite drain.

Place core material manufactured from impermeable plastic sheeting having non-connecting corrugations with the corrugations approximately perpendicular to the drainage collection system.

If the fabric on the geocomposite drain is torn or punctured, replace the damaged section completely or repair it by placing a piece of fabric that is large enough to cover the damaged area and provide a 150-mm overlap.

If asphalt treated permeable base is placed around the slotted plastic pipe at the bottom of the geocomposite drain, it must be placed at a temperature of not less than 82°C nor more than 110°C.

Filter Fabric

Place filter fabric immediately after grading and compacting the subgrade to receive the filter fabric.

Align, handle, and place filter fabric in a wrinkle-free manner under the manufacturer's recommendations.

Adjacent borders of the filter fabric must be overlapped from 300-mm to 450-mm or stitched. The preceding roll must overlap the following roll in the direction the material is being spread or must be stitched. When the fabric is joined by stitching, it must be

stitched with yarn of a contrasting color. The size and composition of the yarn must be as recommended by the fabric manufacturer. The number of stitches per 25-mm of seam must be 5 to 7.

Equipment or vehicles must not be operated or driven directly on the filter fabric.

Treated Permeable Base

Construct treated permeable base under Section 29, "Treated Permeable Bases" of the Standard Specifications and these Special Provisions.

Place asphalt treated permeable base at a temperature of not less than 93°C nor more than 121°C. Do not use material stored in excess of 2 hours in the work.

Asphalt treated permeable base may be spread in 1 layer. Compact with a vibrating shoe type compactor or a roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Begin compacting base as soon as the mixture has cooled sufficiently to support the weight of the equipment without undue displacement.

Cement treated permeable base may be spread in 1 layer. Compact base with a vibrating shoe type compactor or with a steel-drum roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Compaction must begin within one-half hour of spreading and must consist of 2 complete coverages of the cement treated permeable base.

Finishing Approach Slabs

Finish and treat the top surface of approach slabs under Section 51-1.17, "Finishing Bridge Decks" of the Standard Specifications. Edges of slabs must be edger finished.

Cure approach slabs with pigmented curing compound (1) under the specifications for curing structures in Section 90-7.01B, "Curing Compound Method" of the Standard Specifications.

MEASUREMENT AND PAYMENT

Structural concrete, approach slab (Type N) will be measured and paid for in conformance with the provisions in Section 51-1.22, "Measurement" and Section 51-1.23, "Payment" of the Standard Specifications and these Special Provisions.

Full compensation for the structure approach drainage system including geocomposite drain, plastic pipe, and drainage pads, treated permeable base and filter fabric shall be considered as included in the contract price paid per cubic meter for Structural Concrete, Approach Slab of the type shown in the Engineer's Estimate, and no additional compensation will be allowed therefor.

10-1.88 SEALING JOINTS:

Joints in concrete bridge decks and joints between concrete structures and concrete approach slabs must be sealed in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures" of the Standard Specifications, and these Special Provisions.

When ordered by the Engineer, a joint seal larger than called for by the Movement Rating shown on the plans must be furnished and installed. Payment to the Contractor for furnishing the larger seal and for saw cutting the increment of additional depth of groove required will be determined as provided in Section 4-1.03, "Changes" of the Standard Specifications.

10-1.89 ARCHITECTURAL FINISH (LAVA ROCK FACING):

Lava rock facing architectural finish shall be applied to concrete surfaces with a mortar bond coat either directly to the surface or to a mortar bedding on the surface as shown on the plans and in accordance with the provisions in these Special Provisions.

MATERIALS

Lava rock for architectural finish shall match the material, color, and size of the rock on the exterior walls adjacent to the front entry doorway of the Desert Museum located at 101 North Museum Drive, Palm Springs, California.

Head and bed mortar joints shall be 13-mm thick.

Mortar shall be a proprietary, premixed packaged blend of cement, lime, and sand, without color, that requires only water to prepare for use as brick mortar. Packages of premix shall bear the manufacturer's name, brand, weight, and color identification. The manufacturer's recommended mixing proportions and procedures shall be furnished to the Engineer.

PREPARING SURFACES

Surfaces of concrete against which lava rock or bedding is to be placed shall be roughened and cleaned, exposing the stone aggregate, and shall be flushed with water and allowed to dry to a surface dry condition immediately prior to laying the lava rock.

Mortar bedding shall be used where necessary to straighten the concrete substrate. Mortar bedding shall be not less than 19-mm thick.

BOND COAT

A bond coat of mortar shall be floated onto concrete surfaces with sufficient pressure to cover the surface evenly with no bare spots and to fill anchor grooves. Organic adhesive shall not be used for bond coat. The surface area to be covered with bond coat shall be no greater than the area that can be covered with brick while the bond coat is still plastic.

Bond coat mortar shall be combed with a notched trowel within 10 minutes before installing lava rock. Lava rock shall not be installed on a skinned over mortar bond coat.

LAYING LAVA ROCK

Lava rock shall be thoroughly wetted before laying. Wetted lava rock shall be drained adequately to prevent floating of the lava rock on the mortar bed. Sprinkling the water onto lava rock is not an acceptable method for wetting.

The lava rock shall be back buttered immediately before installing the units and shall be firmly pressed into the freshly notched bond coat. Lava rock shall be tapped to obtain 100 percent coverage by mortar on the back of each unit.

The facing shall be cured by keeping the lava rock continuously damp for at least 72 hours after laying. Curing materials shall not stain the lava rock, mortared joints, or surrounding concrete surfaces.

Surfaces of concrete, completed masonry, and other such materials exposed to view shall be protected from spillage, splatters and other deposits of cementitious materials from masonry construction. All such deposits shall be removed without damage to the materials or exposed surfaces. Stains, efflorescence, laitance, splashes or spots on the faces of masonry exposed to view shall be removed. Abrasive blast cleaning methods will not be permitted on surfaces of lava rock.

MEASUREMENT AND PAYMENT

Architectural finish (lava rock facing) will be measured and paid for by the square meter.

The contract price paid per square meter for Architectural Finish (Lava Rock Facing) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in lava rock facing, complete in place, including mortar bedding and bond coat, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.90 ARCHITECTURAL SURFACE (TEXTURED CONCRETE):

Architectural texture for concrete surfaces shall conform to the details shown on the plans and the provisions in Section 51, "Concrete Structures" of the Standard Specifications and these Special Provisions.

Architectural textures listed below are required at concrete surfaces shown on the plans:

A. Fractured fin texture.

The fractured fin texture shall be an architectural texture simulating the appearance of straight fins of concrete with a fractured concrete texture imparted to the raised surface between the fins. Grooves between fins shall be continuous with no apparent curves or discontinuities. Variation of the groove from straightness shall not exceed 6-mm for each

3 m of groove. The architectural texture shall have random shadow patterns. Broken concrete at adjoining fins and groups of fins shall have a random pattern. The architectural texture shall not have secondary patterns imparted by shadows or repetitive fractured surfaces.

REFEREE SAMPLE

The architectural texture shall match the texture, color and pattern of the reference surface located at the concrete barrier adjacent to the sidewalk in front of the Desert Museum located at 101 North Museum Drive, Palm Springs, California.

TEST PANEL

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural textures. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing the architectural texture. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of architectural texture for concrete-surfaces.

FORM LINERS

Form liners shall be used for textured concrete surfaces and shall be installed in conformance with the manufacturer's recommendations, unless other methods of forming textured concrete surfaces are approved by the Engineer. Form liners shall be manufactured from an elastomeric material or a semi-elastomeric polyurethane material by a manufacturer of commercially available concrete form liners. No substitution of other types of formliner material will be allowed. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Textured concrete surfaces with such recurring textural configurations shall be reworked to remove such patterns as approved by the Engineer or the concrete shall be replaced.

Form liners shall have the following properties:

Description	ASTM Designation:	Range
Elastomeric material		
Shore A hardness	D 2240	20 to 65
Tensile strength (MPa)	D 412	0.9 to 6.2
Semi-elastomeric polyurethane		
Shore D hardness	D 2240	55 to 65
Tensile strength (MPa)	D 2370	18 minimum

Cuts and tears in form liners shall be sealed and repaired in conformance with the manufacturer's recommendations. Form liners that are delaminated from the form shall not be used. Form liners with deformations to the manufactured surface caused by improper storage practices or any other reason shall not be used.

Form liners shall extend the full length of texturing with transverse joints at 2.5 m minimum spacing. Small pieces of form liners shall not be used. Grooves shall be aligned straight and true. Grooves shall match at joints between form liners. Joints in the direction of grooves in grooved patterns shall be located only in the depressed portion of the textured concrete. Adjoining liners shall be butted together without distortion, open cracks or offsets at the joints. Joints between liners shall be cleaned before each use to remove any mortar in the joint.

Adhesives shall be compatible with the form liner material and with concrete. Adhesives shall be approved by the liner manufacturer. Adhesives shall not cause swelling of the liner material.

RELEASING FORM LINERS

Products and application procedures for form release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the liner material or delamination from the forms. Release agents shall not stain the concrete or react with the liner material. For reliefs simulating fractured concrete or wood grain surfaces the application method shall include the scrubbing method using a natural bristle scrub brush in the direction of grooves or grain. The release agent shall coat the liner with a thin film. Following application of form release agent, the liner surfaces shall be cleaned of excess amounts of agent using compressed air. Buildup of form release agent caused by the reuse of a liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of liner material on the concrete and without pulling or breaking concrete from the textured surface. The concrete surfaces exposed by removing forms shall be protected from damage.

CURING

Concrete surfaces with architectural texture shall be cured only by the forms-in-place or water methods. Seals and curing compounds shall not be used.

MEASUREMENT AND PAYMENT

Architectural texture will be measured and paid for by the square meter.

The contract price paid per square meter for Architectural Fin Texture shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in architectural texture, complete in place, including test panels, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.91 REINFORCEMENT:

Reinforcement shall conform to the provisions in Section 52, "Reinforcement" of the Standard Specifications and these Special Provisions.

The Department's Pre-Qualified Products List for mechanical splices can be found at:

http://www.dot.ca.gov/hq/esc/approved_products_list/

The provisions in "Welding Quality Control" of these Special Provisions do not apply to resistance butt welding.

The following shall apply to ultimate splices for bar reinforcing cages of columns and cast-in-place piles where the longitudinal bars are spliced vertically at the job site in or above their final positions:

1. Instead of being removed from the completed lot, sample splices may be prepared in the same manner as specified in Section 52-1.08C(2)(a), "Production Test Requirements for Service Splices" of the Standard Specifications for service sample splices. These sample splices shall be tested in conformance with the requirements in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria" of the Standard Specifications.
2. Splices may be encased in concrete prior to having the QCM review, approve, and forward each Production Test Report to the Engineer. Should the Contractor exercise this option, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection.

For bar reinforcing cages measuring 1.2 meters in diameter and larger:

1. At least 4 vertical bars of each cage, equally spaced around the circumference, shall be tied at all reinforcement intersections with double wire ties.
2. At least 25 percent of remaining reinforcement intersections in each cage shall be tied with single wire ties. Tied intersections shall be staggered from adjacent ties.
3. Bracing shall be provided to avoid collapse of the cage during assembly, transportation, and installation.

Successful completion of these minimum baseline requirements for reinforcement cages 4 feet in diameter and larger will in no way relieve the Contractor of full responsibility for engineering the temporary support and bracing of the cages during construction.

Reinforcement shown on the plans to be galvanized shall be galvanized in conformance with the requirements in ASTM Designation: A 767/A 767M, Class 1, except that chromating will not be required.

Within areas where galvanized reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be galvanized, plastic coated, or epoxy coated to prevent corrosion of the devices or damage to the galvanized reinforcement.

Galvanized surfaces that are abraded or damaged caused by shipping, handling, or installation shall be repaired as specified in Section 75-1.05, "Galvanizing" of the Standard Specifications.

MEASUREMENT AND PAYMENT

Measurement and payment for reinforcement in structures shall conform to the provisions in Section 52-1.10, "Measurement" and Section 52-1.11, "Payment" of the Standard Specifications and these Special Provisions.

Full compensation for galvanizing steel reinforcement shall be considered as included in the prices paid for the various items of work involved and no additional compensation will be allowed therefor.

10-1.92 REINFORCING BARS GROUTED IN PRESTRESSING DUCTS:

Reinforcing bars grouted in prestressing ducts shall conform to the details shown on the plans and these Special Provisions.

The Contractor shall submit working drawings showing the location, orientation, and installation sequence of the reinforcing bars grouted in prestressing ducts. The prestressed girder shop drawings shall show the embedded ducts and shall be combined with the working drawings into a single submittal to the Engineer for review.

The Contractor may propose a different configuration or construction sequence by submitting prestressed girder shop drawings and working drawings showing the revised configuration or sequence with calculations showing the revised system provides equal design strength as the details shown on the plans.

Reinforcing bars shall conform to the provisions for bar reinforcement in "Reinforcement" of these Special Provisions.

Prestressing ducts shall conform to the provisions in Section 50-1.07, "Ducts" of the Standard Specifications and these Special Provisions.

Grout shall be non-corrosive and conform to the requirements of either ASTM Designation: C 1107, or ASTM Designation: C 845, Type K, and shall provide a minimum compressive strength of 35 MPa at 28 days when tested by California Test 551. The grout shall be mixed in accordance with the manufacturer's recommendations. Water shall conform to the provisions for water for prestressed concrete work in Section 90-2.03, "Water" of the Standard Specifications.

Admixtures shall not contain more than 500 parts per million of chlorides as Cl, when tested by California Test 422, and shall not contain more than 2500 parts per million of sulfates as SO₄, when tested by California Test 417.

After reinforcing bar placement, the ends of ducts containing the reinforcing bars shall be sealed. A vent tube shall be placed at one end and one injection feed tube at the other end. The tubes shall be placed in the duct in a manner which will allow the air to vent and the duct to be completely filled with grout. Sufficient pressure shall be achieved to ensure that the duct is free of voids. Grout shall be pumped into the ducts and continually wasted until no visible slugs or other visible evidence of water or air are ejected.

Grout or water shall not be permitted to flow into any waterway, onto public traffic, across shoulders or lanes occupied by public traffic, or into gutter or other drainage facilities.

Centralizers shall be PVC schedule 80 and shall be of a shape that will not become caught against the inside surface of the duct as the reinforcing bar is moved within the duct. The centralizer shape shall not block the flow of grout during grouting operations.

Full compensation for installing ducts in precast prestressed members shall be considered as included in the contract unit prices paid for Furnish Precast Prestressed Concrete Bulb-Tee Girder (25 m – 30 m) and Furnish Precast Prestressed Concrete Bulb-Tee Girder (30 m – 35 m) and no additional compensation will be allowed therefor.

Full compensation for installing ducts in cast-in-place concrete members shall be considered as included in the contract unit price paid per cubic meter for Structural Concrete, Bridge and no additional compensation will be allowed therefor.

Full compensation for installing reinforcing bars with centralizers and grouting shall be considered as included in the contract price paid per kilogram for Bar Reinforcing Steel (Bridge) and no additional compensation will be allowed therefor.