Section 1 Sample Types and Frequencies

Section 1
Sample Types
and Frequencies

6-101 General

6-101
General

Sampling and testing materials or products and quality of work must be in strict accordance with contract specifications. Sampling and testing are of equal importance.

Samplers must be familiar with materials handling and processing methods as well as contract requirements. Their knowledge of testing must be sufficient to ensure compatibility between samples and test procedures.

It is the resident engineer's responsibility to ensure the safety of the sampler. The sampler should report any hazardous conditions encountered to the resident engineer. The district weights and measures coordinator inspects material production plants for safety in areas that the sampler will enter.

6-102 Types of Sampling and Testing

6-102
Types of Sampling
and Testing

The following describes the different types of sampling and testing used by Caltrans.

6-102A Preliminary Tests

Preliminary tests are tests made prior to award of a contract. Construction personnel rarely sample for preliminary tests. Such tests are used for design purposes to provide data for the materials information package for prospective bidders.

6-102B Initial Samples and Tests

Initial samples and tests are performed on materials proposed for use in the project. These tests determine whether proposed materials or products meet specifications.

Construction personnel may sample potential sources. Tests may be performed by the district materials laboratory or the Office of Materials Engineering and Testing Services, (METS) depending on their respective capabilities.

Soils and aggregate samples to be tested by METS must be forwarded by the district materials laboratory. Do not send them directly to METS.

Sampling and testing potential source materials is not mandatory unless specified. Charge the contractor for the cost of sampling and testing potential sources in accordance with Section 6, "Control of Materials," of the *Standard Specifications*. The normal time required for complete testing of potential sources is as follows:

Table 6-1.1 Time Required for Source Testing

Aggregates for bituminous mixtures	2 weeks
Aggregates for cement treatment	4 weeks
Aggregates for concrete mixture	4 weeks
Aggregates for concrete pavement	60 days
Screenings	2 weeks
Soils	3 weeks
Untreated base materials	3 weeks

6-102C Acceptance Tests

Acceptance tests are tests performed on materials that will be incorporated into the work. Sampling should begin as soon as the material is delivered or in place. Continue acceptance testing as work progresses.

Sample materials entering the work at the locations specified in the *Standard Specifications* or the special provisions. If the sampling location is not specified, sample at the location indicated in the tables, at the end of this section. Sample products such as portland cement concrete, concrete treated base, and asphalt concrete randomly.

Turn around times required for specific acceptance tests performed by a Caltrans materials laboratory are shown in the following table:

Table 6-1.2 Turn Around Times for Acceptance Tests

Material	Priority tests (Work Days)	Normal tests (Work Days)
Aggregates for cement treatment (R-Value only)	5	7
Aggregates for concrete	3	7
Aggregates to be mixed with bituminous material in the lab	10	(priority only)
Base materials, untreated	7	12
Bituminous mixture	3	7
Asphaltic emulsion	3	15
Liquid asphalt	3	15
Paving asphalt	3	15
Portland cement	12	30
Screenings	3	7

	Minimum Time (Work days)
Coating tests	3
Expansion joint material	3
Fencing, all types	2
Guide posts	3
Geosynthetic fabrics	3
Geosynthetic fabrics (UV testing)	45
Metal guardrail	7
Pavement markers	4
Prestressing steel	10
Reinforcing steel and wire	2
Rubber (accompanied by manufacturers test report)	3
Rubber (without test report)	14
Structural steel	10
Type B joint seal	7

6-102C (1) Priority of Testing Samples

Mark all Form TL-0101s, "Sample Identification Card," "Priority" or "Normal".

6-102C (1a) Priority

Use the "priority" designation for the first few samples of each construction material and all acceptance samples and tests of bituminous mixtures. Continue using the priority designation until the resident engineer has assurance that the material being produced is of consistent quality. Use the "priority" designation for all samples if the material being supplied is of questionable quality or if the operation or the source of the material changes.

Indicate if there is a preference for telephone, faxed, or e-mailed test results on Form TL-0101, along with the telephone number of the person who is to receive them.

6-102C (1b) Normal

For tests on samples from potential sources and for samples on materials entering the work after the resident engineer has assurance that the material is of consistent acceptable quality use the "normal" designation. Reports on tests with "normal" designations are distributed by mail.

6-102C (2) Certification of Samplers and Testers

All acceptance testers require certification. No tests or samples are to be taken on Caltrans projects unless the tester is certified in the test being performed.

Training and certification of samplers and testers is covered in detail in the *Independent Assurance Manual.*

6-102D Independent Assurance Sampling and Testing

Independent assurance sampling and testing is the responsibility of the district materials engineer. See the *Independent Assurance Manual* published by METS for details. The district materials unit keeps results of independent assurance samples and tests.

If any of the assurance tests fail, the tester will notify the resident engineer immediately by telephone.

6-102E Federal Highway Administration Samples and Tests

When the project includes federal funding, a representative of the Federal Highway Administration (FHWA) may select samples or sample locations. Label the sampling, directed by FHWA, "FHWA Check Samples," and send them to either the district materials laboratory or METS for testing. FHWA, the district materials engineer, and the resident engineer receive copies of test results for check samples.

6-102F Special Samples and Tests

Specific problems such as roadway failures, difficulty in achieving required densities, or inconsistent test results, may require special samples and tests. When such material problems are encountered, contact the district materials engineer. The district materials engineer may request help from the Division of Construction or METS. The unit that requests a research project will provide oversight for special investigations and sampling.

6-103 Acceptance Records

6-103 Acceptance Records

Keep records of all samples and tests in the project files as permanent job records. Materials incorporated into the project, represented by failing tests, must be documented in the project files also. For more information on procedures to follow in the case of failing tests refer to Section 3-6, "Control of Materials," of this manual.

It is not necessary to secure separate samples for each project when two or more projects receive materials from the same source. File a copy of the test report with each project.

6-104 Test Result Summary

6-104 Test Result Summary

Monitor acceptance testing by using form CEM-3701, "Test Result Summary." Corrective action or retesting failing tests must be noted in the "Remarks" column of the form.

6-105 Field Tested Material Sample Identification

6-105 Field Tested Material Sample Identification

Prepare Form TL-0101, "Sample Identification Card," in accordance with the following details:

- Fill in every blank space with complete information, including the quantity and lot of the material sampled.
- Distribute copies as shown on the form on the same day the sample is shipped.
- The "Location of Source" must clearly indicate the place where the sample was obtained.
- For liquid asphalts, paving asphalts and asphaltic emulsions include the refinery designations and shipment number. This data is available from the Certificate of Compliance that accompanies the materials.
- For asphalt concrete samples, be sure to:
  1. Identify the plant producing the material.
  2. Include the type of mix and maximum size of aggregate represented by the sample.
  3. Under "Remarks," include the grade and source of the bituminous binder contained in the sample.
  4. Under "Remarks," record the percentage of bituminous binder designated by the engineer.
- Be sure that the Sample Identification Card indicates the use for which the material is intended so that the proper tests will be performed. This is especially important for electrical conductors, as the applicable specifications depend on where and how the conductor is to be used. Without this information, the testing engineer does not know what specification to use in determining compliance.
- Indicate whether it is intended to crush oversize material or if any special blends are contemplated for potential sources of aggregate testing.
- To protect the Sample Identification Card against moisture or stains, place it in an oil and waterproof envelope.

6-106 Contractor Requested Sampling and Testing from Local Deposits

When charging the contractor for testing local materials as specified in Section 6-2, "Local Materials," of the *Standard Specifications* note this under "Remarks" on Form TL-0101. The district materials laboratory will advise the resident engineer of the amount of the charges.

6-107 Shipping of Samples

When shipping samples from the job to the laboratory, use the most economical mode of transportation available consistent with the time element involved. Do not ship samples cash on delivery to METS.

6-108 Project Certification

Send a materials certification memorandum to the Division of Construction upon completion of each project. File a copy of the memorandum in the job files and forward the original to the Division of Construction as soon as possible, preferably with submission of the final or semifinal estimate. Note All non-conforming materials on the memorandum. This includes materials accepted at reduced pay factors under acceptance specifications.

For federally funded projects early submission of the memorandum is necessary to expedite the submission of a voucher to FHWA.

A construction engineer must sign the materials certification memorandum.

An example materials certification memorandum follows:

6-106 Contractor Requested Sampling and Testing from Local Deposits

6-107 Shipping of Samples

6-108 Project Certification

Example 6-1.1 Project Certification Memorandum

State of California

Business Transportation and Housing Agency

Memorandum

To: _____
Division of Construction
Attention: Progress Pay Coordinator

Date:
File: Category 61
Job Stamp:

From: **DEPARTMENT OF TRANSPORTATION**

Subject: Materials Certification

This is to certify that:

The results of the tests on acceptance samples indicate that the materials incorporated in the construction work and the construction operations controlled by sampling and testing were in conformity with the approved plans and specifications

Exceptions to the plan and specifications are explained on the back of this memorandum (or on attached sheet).

No Exceptions to the plans and specifications were found.

_____*(signed by a Construction Engineer)*_____

6-109 Materials

The tables on the following pages provide a guide for sampling and testing requirements.

Close adherence to the sample size requirement shown in the table will prevent unnecessary delays and the expense of obtaining supplementary samples to complete tests.

The frequency of sampling indicated in the tables is a guide under normal conditions. Materials well within specifications and uniform in character may require less frequent sampling and testing.

In the project files, document adjustments to the testing frequencies shown in the tables.

Table 6-1.3 PORTLAND CEMENT CONCRETE – PAVEMENT (1 of 3)

PORTLAND CEMENT CONCRETE, See Notes (6) (9) - PAVEMENT

MATERIAL OR PRODUCT		TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS FREQUENCY OF SAMPLING	REMARKS
AGGREGATE	COARSE AGGREGATE	LA Rattler (500 Rev.) See Note (6)	211	See Note (3)	See Note (2)		1 for every 3,000 m^3, if preliminary tests show abrasion loss greater than 40% . See Note (1)
		Cleanness Value	227			1 for every 400 m^3, 1 per day min. See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	Recommend 1 acceptance test per day if 3 consecutive tests over 80
		Alkali Silica Reactivity	ASTM C1293 or ASTM C1260	Aggregate producer submits certified test results from qualified lab to METS for approval			Contact METS for list of approved sources
	FINE AGGREGATE	Colorimetric Test	213	See Note (3)	See Note (2)	Only if initial test shows critical or contamination is suspected	
		Mortar Strength	515				
		Sand Equivalent	217			1 for every 400 m^3, See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	Recommend 1 acceptance test per day if 3 consecutive tests over 80
		Durability	229				

Table 6-1.3 PORTLAND CEMENT CONCRETE – PAVEMENT (2 of 3)

	COARSE & FINE AGGREGATE	Specific Gravity & Absorption	206, 207	See Note (3)	See Note (2)	When aggregate source changes, See Note (7)	
		Soundness	214				Soundness for Fine Aggregate waived if durability is > 60
		Sieve Analysis	202			1 for every 400 m^3, 1 per day min. See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	
		Freeze-Thaw	528	See Note (4)	See Note (5)		
		Moisture	223 &/or 226		Not applicable	1 for every 400 m^3, 1 per day min. See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	Sample must be in an airtight container
CEMENT		Various Properties		3.5 kg	None with Certificate of Compliance (See REMARKS)	1 for every 400 m^3, 1 per day min. See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	If no Certificate of Compliance, sample at least 14 days prior to use for previously tested brands, 35 days for untested brands
WATER		Chlorides, Sulfates	405, 422, 417	Clean 2-L plastic jug with lined, sealed lid.	At point of use (See REMARKS)	As required for acceptance (See REMARKS)	City water supplies for domestic use usually need not be tested unless suspected of high chloride or sulfate content. On-job-wells are to be tested
ADMIXTURES	AIR ENTRAINING AGENT	Air entraining properties, chloride identification	ASTM C260	1-L can or plastic bottle of liquid, 1 kg of powder	Samples must reach METS at least 1 week prior to use	As new supplies arrive on the job or each time brand is changed	Prior to sampling and testing, check with METS for brands that may be used when properly certified
	WATER REDUCERS OR SET RETARDERS	Claimed properties, chloride identification	ASTM C494	1-L can of liquid, 1 kg of powder	Samples must reach METS at least 1 week prior to use, untested brands require 5 weeks prior to use		

CONCRETE	Yield	518	See test method. See Note (8)	See ASTM C172	1 for each 4 hours production	If yield test used for payment, 1 per each 1200 m^3, min. or 2 per mix design per job
	Ball Penetration	533			When test specimen is fabricated and when consistency or uniformity is questionable, min 2 per day	
	Modulus of Rupture	523	1 set of 3 beams 150 x 800 mm (min.) for center point loading and 150 x 150 x 510 mm (min.) for third-point loading		1 set for each 3,000 m^3	Recommend min. 2 sets per shift. Normally, from each set, break 1 beam at 7 days, 1 beam at 10 days, and 3rd beam as required, 50% decrease after 10 sets if all in compliance
	Air Content	504			As required, min. once every 4 hours, each time 518 is performed	Where specified for freeze thaw resistance, acceptance testing shall not be less than once every hour
	Coarse aggregate per m^3 of concrete	529	45 kg		As required to assure uniformity of concrete, see Standard Specifications, Section 90-6.01	
	Thickness	531			As required, see Standard Specifications, Section 40-1.35	
PIGMENTED CURING COMPOUND	Compliance (See Standard Specifications & special provisions)		1-L can		As new shipments arrive on job or each time brand is changed	For chlorinated rubber base type, sample and test if not previously inspected at the source

Note:

(1) Not required if P.C.C. from same source is used on other work and test is being made there. No need to duplicate the test just for the sake of record. The actual test results may be used anywhere they are applicable.

(2) From material site or stockpile: 60 days prior to use.

(3) 70 kg of 63 mm x 37.5 mm - 45 kg of 37.5 mm x 19 mm - 35 kg of 19 mm x No. 4 - 35 kg of pea gravel - 25 kg of sand. This material for test numbers 202, 206, 207, 211, 213, 214, 217, 227, 229 and 515.

(4) See California Test No. 528 or contact the Office of Materials Engineering and Testing Services (METS).

(5) Contact district materials engineer for special sampling procedures at least 120 calendar days before intended use.

(6) For lightweight concrete, see Standard Specifications and special provisions.

(7) When prior test results are acceptable and material appears to be of uniform composition, a max. of 2 tests per day will satisfy acceptance test requirements for this material. Adjustments to testing frequencies shall be documented in the project files.

(8) No deductions for cement content will be made based on the results of California Test No. 518.

(9) See California Test No. 125 for sampling procedures.

Table 6-1.4 PORTLAND CEMENT CONCRETE (6) - BRIDGES & MAJOR STRUCTURES (R.C.B., P.C.C. Arch Culverts, Retaining Walls) (1 of 3)

PORTLAND CEMENT CONCRETE, See Notes (6) (9) - BRIDGES & MAJOR STRUCTURES (R.C.B., P.C.C. Arch Culverts, Retaining Walls)

MATERIAL OR PRODUCT		TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
AGGREGATE	COARSE AGGREGATE	LA Rattler (500 Rev.) See Note (6)	211	See Note (3)	See Note (2)		
		Cleanness Value	227			1 for every 400 m^3, 1 per day min. See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3.	Recommend 1 acceptance test per day if 3 consecutive tests over 80
		Alkali Silica Reactivity	ASTM C1293 or ASTM C1260	Aggregate producer submits certified test results from qualified lab to METS for approval			Contact METS for list of approved sources
	FINE AGGREGATE	Colorimetric Test	213	See Note (3)	See Note (2)	Only if initial test shows critical or contamination is suspected	
		Mortar Strength	515				
		Sand Equivalent	217			1 for every 400 m^3, See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	Recommend 1 acceptance test per day if 3 consecutive tests over 80
		Durability	229				
	COARSE & FINE AGGREGATE	Specific Gravity & Absorption	206, 207	See Note (3)	See Note (2)	When aggregate source changes, See Note (7)	
		Soundness	214				Soundness for Fine Aggregate waived if durability is > 60
		Sieve Analysis	202			1 for every 400 m^3, See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	
		Freeze-Thaw	528	See Note (4)	See Note (5)		
		Moisture	223 &/or 226		Not applicable	1 for every 400 m^3, 1 per day min. See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	Sample must be in an airtight container

Table 6-1.4 PORTLAND CEMENT CONCRETE (6) - BRIDGES & MAJOR STRUCTURES
(R.C.B., P.C.C. Arch Culverts, Retaining Walls) (2 of 3)

CEMENT		Various Properties		3.5 kg	None with Certificate of Compliance (See REMARKS)	1 for every 400 m^3, 1 per day min. See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	If no Certificate of Compliance, sample at least 14 days prior to use for previously tested brands, 35 days for untested brands
WATER		Chlorides, Sulfates	405, 422, 417	Clean 2-L plastic jug with lined, sealed lid	At point of use (See REMARKS)	As required for acceptance (See REMARKS)	City water supplies for domestic use usually need not be tested unless suspected of high chloride or sulfate content. On-job-wells are to be tested
ADMIXTURES	AIR ENTRAINING AGENT	Air entraining properties, chloride identification	ASTM C260	1-L can or plastic bottle of liquid, 1 kg of powder	Samples must reach METS at least 1 week prior to use	As new supplies arrive on the job or each time brand is changed	Prior to sampling and testing, check with METS for brands that may be used when properly certified
	WATER REDUCERS OR SET RETARDER	Claimed properties, chloride identification	ASTM C494	1-L can of liquid, 1 kg of powder	Samples must reach METS at least 1 week prior to use, untested brands require 5 weeks prior to use		
CONCRETE		Yield	518	See test method. See Note (8)	See ASTM C172	As necessary to assure accuracy of mix design; min. 2 per each mix design	
		Ball Penetration	533			When test specimen is fabricated & when consistency or uniformity is questionable, min. 2 per day	
		Slump	ASTM C143				Concrete placed underwater, seal course
		Compressive Strength	ASTM C172, 540	1 set of 125 x 250 mm cylinders for each test	See ASTM C172	1 set for approximately every 250 m^3 concrete or as required for acceptance. Min. 1 set per job and class of concrete for each days production of critical structural elements	For trial batches, see Standard Specifications or job special provisions and Section 6-3 of this manual
		Air Content	504			Min. once every 4 hours of production and when test specimens are fabricated	Where air is specified for freeze-thaw resistance, a min. of 1 per each 25 m^3
		Coarse aggregate per m^3 of concrete	529			As required to assure uniformity of concrete, see Standard Specifications, Section 90	

Table 6-1.4 PORTLAND CEMENT CONCRETE (6) - BRIDGES & MAJOR STRUCTURES (R.C.B., P.C.C. Arch Culverts, Retaining Walls) (3 of 3)

PRESTRESSED TENDON GROUT	Efflux time	541	1-125 x 250 mm cylinder mold can	From batch immediately after mixing for prequalification, thereafter from outlet end of tendon and/or storage tank	At the start of each day's work and thereafter 1 test per each 5% of ducts	Repeat acceptance tests whenever source of material is changed
PIGMENTED CURING COMPOUND	Compliance (See Standard Specifications and special provisions)		1-L Can		Periodically to ensure compliance	

Note:

(1) Not required if P.C.C. from same source is used on other work and test is being made there. No need to duplicate the test just for the sake of record. The actual test results may be used anywhere they are applicable.

(2) From material site or stockpile; 60 days prior to use.

(3) 70 kg of 63 mm x 37.5 mm - 45 kg of 37.5 mm x 19 mm - 35 kg of 19 mm x No.4 - 35 kg of pea gravel - 25 kg of sand. This material for test numbers 202, 206, 207, 211, 213, 217, 227 229 and 515.

(4) See California Test No. 528 or contact the Office of Materials Engineering and Testing Services (METS).

(5) Contact district materials engineer for special sampling procedures at least 120 calendar days before intended use.

(6) For lightweight concrete, see Standard Specifications and special provisions.

(7) When prior test results are acceptable and material appears to be of uniform composition, a max. of 2 tests per day will satisfy acceptance test requirements for this material. Adjustments to testing frequencies shall be documented in the project files.

(8) No deductions for cement content will be made based on the results of California Test No. 518.

(9) See California Test No. 125 for sampling procedures.

Table 6-1.5 PORTLAND CEMENT CONCRETE MISCELLANEOUS CONCRETE

PORTLAND CEMENT CONCRETE MISCELLANEOUS CONCRETE, See Notes (6) (9) (10)

MATERIAL OR PRODUCT		TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
AGGREGATE	COARSE AGGREGATE	LA Rattler (500 Rev.) See Note (6)	211	See Note (3)	See Note (2)		
		Cleanness value	227			1 for every 400 m^3, 1 per day min. See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	Recommend 1 acceptance test per day if 3 consecutive test over 80
	FINE AGGREGATE	Colorimetric Test	213	See Note (3)	See Note (2)	Only if initial test shows critical or contamination is suspected	
		Mortar Strength	515				
		Sand Equivalent	217			1 for every 400 m^3, See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	Recommend 1 acceptance test per day if 3 consecutive tests over 80
		Durability	229				
	COARSE & FINE AGGREGATE	Specific Gravity & Absorption	206, 207	See Note (3)	See Note (2)	When aggregate source changes, See Note (7)	
		Soundness	214				Soundness for Fine Aggregate waived if durability is > 60
		Sieve Analysis	202			1 for every 400 m^3, See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	
		Freeze-Thaw	528	See Note (4)	See Note (5)		
		Moisture	223 &/or 226		Not applicable	1 for every 400 m^3, See Notes (1) (7). If production is less than 250 m^3, 1 per accumulative 250 m^3	Sample must be in an airtight container
CEMENT See Note (6)		Various Properties		3.5 kg	None with Certificate of Compliance (See REMARKS)	1 for each 400 m^3 used. 1 per day min., 2 per day max. See Note (1). See Section 6-2 of this manual.	If no certificate of Compliance, sample at least 14 days prior to use for previously tested brands, 35 days for untested brands

WATER		Chlorides, Sulfates	405, 422, 417	Clean 2-L plastic jug with lined, sealed lid.	At point of use (See REMARKS)	As required for acceptance (See REMARKS)	City water supplies for domestic use usually need not be tested unless suspected of high chloride or sulfate content. On-job-wells are to be tested
ADMIXTURES	AIR ENTRAINING AGENT	Air entraining properties, chloride identification	ASTM C260	1-L can or plastic bottle of liquid, 1 kg of powder	Samples must reach METS at least 1 week prior to use	As new supplies arrive on the job or each time brand is changed	Prior to sampling and testing, check with METS for brands that may be used when properly certified
	WATER REDUCERS OR SET RETARDERS	Claimed properties, chloride identification	ASTM C494	1-L can of liquid, 1 kg of powder	Samples must reach METS at least 1 week prior to use, untested brands require 5 weeks prior to use		
CONCRETE		Yield, Cement Factor	518	See test method, See Note (8)	See ASTM C172	As necessary to assure accuracy of mix design, min. 2 per each mix design	If yield test used for payment, 1 per each 1200 m^3, min. of 2 per mix design per job
		Ball Penetration	533			When test specimen is fabricated & when consistency or uniformity is questionable, Min. 2 per day	
		Slump	ASTM C143				Concrete placed underwater
		Compressive Strength	ASTM C172, 540	1 set of 125 x 250 mm cylinders		One set for each day when volume exceeds 20 m^3, See Note (1). None if total days run less than 20 m^3	
		Air Content	504			As required. See specifications.	Where specified for freeze-thaw resistance

Note:

(1) Not required if P.C.C. from same source is used on other work and test is being made there. No need to duplicate the test just for the sake of record. The actual test results may be used anywhere they are applicable.

(2) From material site or stockpile; 60 days prior to use.

(3) 70 kg of 63 mm x 37.5 mm - 45 kg of 37.5 mm x 19 mm - 35 kg of 19 mm x No.4 - 35 kg of pea gravel - 25 kg of sand. This material for test numbers 202, 206, 207, 211, 213, 217, 227 229 and 515.

(4) See California Test No. 528 or contact the Office of Materials Engineering and Testing Services (METS).

(5) Contact district materials engineer for special sampling procedures at least 120 calendar days before intended use.

(6) Form in or concrete, sample and test only at resident engineer's discretion.

(7) When prior test results are acceptable and material appears to be of uniform composition, a max. of 2 tests per day will satisfy acceptance test requirements for this material. Adjustments to testing frequencies shall be documented in the project files.

(8) No deductions for cement content will be made based on the results of California Test No. 518.

(9) For lightweight concrete, see Standard Specifications and special provisions.

(10) See California Test No. 125 for sampling procedures.

Table 6-1.6 ASPHALT CONCRETE

ASPHALT CONCRETE, See Notes (2) (3)

MATERIAL OR PRODUCT	TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
AGGREGATE PRIOR TO MIXING	LA Rattler (500 Rev.)	211	Type A & B UNPROCESSED 115 kg	Materials site, stockpile, or plant, See Note (7)	As necessary for acceptance, See Note (8)	
	Specific Gravity (coarse and fine aggregate)	206, 208	PROCESSED 25 kg of each bin size			
	CKE	303				
	% Crushed Particles	205	Open graded 25 kg			
	Sieve Analysis	202, 105			1 for each 450 tonnes, 1 per day min., 2 per day max, See Notes (1) (4) (5). If production is less than 750 m^3, 1 per accumulative 250 m^3	
	Sand Equivalent	217				
	Film Stripping	302			As necessary for acceptance	Made on open graded asphalt concrete only
PAVING ASPHALT, LIQUID ASPHALT, ASPHALTIC EMULSION	In accordance with applicable section of Standard Specifications		Asphalt 1-L can	Test if no Certifications of Compliance. Asphalt line, See Note (6)	Once daily, See Note (6)	
			Emulsion 2-L plastic jug	Test if no Certification of compliance. Emulsion Storage Tank	Each Shipment	

COMPLETE MIXTURE	Swell	305	DGAC 7 KG CARTON OGAC 1-L can		As necessary for information and/or acceptance	When less than a total of 450 tonnes is to be placed, sample and test only at resident engineers discretion Total Sample: DGAC: Four Cartons (about 30 kg) OGAC: Four 1-L cans (about 6 kg)
	Moist, Vapor Susceptibility	307				
	Stabilometer	366				
	Sieve Analysis	202				
	Asphalt Content	310, 362, 379			1 for each 450 tonnes, 2 per day min.	
	Moisture	310, 370				
	In-Place Density	375	As specified or lot size		1 sample representing each 4 hours of production	
	Max. Density	375	Two 7-kg cartons		As per California Test 375	

Note:

(1) On smaller projects being supplied from sources currently in use on larger projects, a copy of the acceptance test information on asphalt concrete aggregate is all that is required.

(2) See California Test No. 125 for sampling procedures.

(3) When special provisions state that production shall be "from commercial quality asphalt and aggregate", sample and test only at resident engineers discretion.

(4) Not required if P.C.C. from same source is being used on other work and test is being made there. No need to duplicate tests, results may be used anywhere they are applicable.

(5) When prior test results are acceptable and material appears to be of uniform composition, a max. of 2 tests per day will satisfy acceptance test requirements for this material. Adjustments to testing frequencies shall be documented in the project files.

(6) When continuous mixing plants used, sample and test for specific gravity at least monthly.

(7) When sampling for AC mix design (California Test No. 367), aggregate samples must be taken from the combined feed in advance of mixing, for batch mixing, samples from hot bins.

(8) Refer to Standard Specifications 39-3.03, "Proportioning" for frequency of AC mix design (California Test No. 367) sampling.

Table 6-1.7 LEAN CONCRETE BASE

LEAN CONCRETE BASE, See Note (2)

MATERIAL OR PRODUCT		TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
AGGREGATE		Sand Equivalent	217	45 kg for aggregate qualification	Materials site or stockpile	1 sample for each 2500 tonnes or 1500 m^3, See Note (1)	
		Sieve Analysis	202, 105				
		Compressive strength of laboratory mixtures, recommended min. cement content	548				
CEMENT		Various Properties		3.5 kg	None with Certificate of Compliance (See REMARKS)	Each 100 tonnes of cement, 2 per day max.	If no Certificate of Compliance, sample at least 14 days before use for previously tested brands, 35 days for untested brands
WATER		Chlorides, Sulfates	405, 422, 471	Clean 2-L plastic jug with lined, sealed lid	At point of use (See REMARKS)	As required for acceptance (See REMARKS)	City water supplies for domestic use need not be tested unless suspected of high chloride or sulfate content. On-the-job wells are to be tested
ADMIXTURES	AIR ENTRAINING AGENTS	Air entraining properties, chloride identification	ASTM C260	1-L can or plastic bottle of liquid, 1 kg of powder	Samples must reach METS at least 1 week prior to use, untested brands require 5 weeks prior to use	As new supplies arrive on the job or each time brand is changed	Prior to sampling and testing, contact METS for brands which may be used prior to sampling and testing when properly certified
	WATER REDUCERS OR SET RETARDERS	Claimed properties, chloride identification	ASTM C494	1-L can of liquid, 1 kg of powder			

Table 6-1.7 LEAN CONCRETE BASE cont.

COMPLETED MIXTURE	Ball Penetration	533		See ASTM C172	At least once for every 4 hours of production	
	Air Content	504			At least once for each day's production	
	Dimensions				As required	
CURING COMPOUND	Compliance with specifications		1-L can		As new shipments arrive on job or each time brand is changed	

Note:

(1) If material is uniform and well within specification limits, the frequency is decreased to 1 a day unless source is changed. Adjustments to testing frequencies shall be documented in the project files.

(2) See California Test No. 125 for sampling procedures.

Table 6-1.8 CEMENT TREATED BASE ROAD MIX OR PLANT MIX

CEMENT TREATED BASE ROAD MIX OR PLANT MIX, See Note (2)

MATERIAL OR PRODUCT	TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
AGGREGATE	R-Value (with & without cement)	301	45 kg for aggregate qualification	Materials site or stockpile		Class B only
	Compressive Strength	312				Class A
	Sieve Analysis	202, 105			1 sample for each 2750 tonnes or 1500 m^3, See Note (1)	Minimum 1 acceptance test per project on smaller projects
	Sand Equivalent	217				
COMPLETED MIX	Compressive Strength	312	See California Test 312 Part II		See Section 4-27 of this manual	
	Cement Titration	338	See California Test 338 Part I		As necessary for acceptance (See REMARKS)	Use min. of 1 person full time during full-time operation
	Relative Compaction	312, 216, 231			1 sample for each 2750 tonnes or 1500 m^3, See Note (1)	
	Thickness				As necessary for information	
CEMENT	Various Properties		3.5 kg	None with Certificate of Compliance (See REMARKS)	Each 100 tonnes of cement, 2 per day max.	If no Certificate of Compliance, sample at least 14 days before use for previously tested brands, 35 days for untested brands
WATER	Chlorides, Sulfates	405, 422, 417	Clean 2-L plastic jug with lined, sealed lid	At point of use (See REMARKS)	As required for acceptance (See REMARKS)	City water supplies for domestic use need not be tested unless suspected of high chloride or sulfate content. On-the-job wells are to be tested
LIQUID ASPHALT	In accordance with special provisions & Standard Specifications		1-L can	None with Certificate of Compliance. If no Certificate of Compliance, then from storage tank of distributor truck	Each Shipment	

Note:

(1) If material is uniform and well within specification limits, the frequency is decreased to 1 per day unless source is changed. Adjustments to testing frequencies shall be documented in the project files.

(2) See California Test No. 125 for sampling procedures.

Table 6-1.9 ASPHALT TREATED PERMEABLE BASE (ATPB)

ASPHALT TREATED PERMEABLE BASE (ATPB), See Note (1)

MATERIAL OR PRODUCT	TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
AGGREGATE	Grading	202	25 kg	Materials site, stockpile or plant bins	2 times daily	
	% Crushed Particles	205			As necessary for acceptance	
	LA Rattler (500 Rev.)	211			Once per 4 hours of production	
	Cleanness Value	227			1 for every 5 days paving, for 1st 10 days	Recommend 1 acceptance test per day if 3 consecutive test over 62
	Film Stripping	302				
ASPHALT	In accordance with specifications		1-L can	Test only if no Certification of Compliance	One daily	
COMPLETED MIX	Asphalt Content	310, 362	Two 1-L cans		1 for every 4 hours of production	

Table 6-1.10 CEMENT TREATED PERMEABLE BASE (CTPB)

CEMENT TREATED PERMEABLE BASE (CTPB)

AGGREGATE	Grading	202	See Note (2)	See Note (3)	Once for each 4 hours of production, See Note (4)	
	LA Rattler (500 Rev.)	211				
	Cleanness Value	227			One for each 4 hours of production, See Note (4)	Recommend 1 acceptance test per day if 3 consecutive test over 80
CEMENT	Various tests		3.5 kg	None with Certificate of Compliance	Once for each 100 tonnes, 2 per day max.	
WATER	Chlorides, Sulfates	405, 422, 417	Clean 2-L plastic jug with lined, sealed lid	At point of use (See REMARKS)	As required for acceptance (See REMARKS)	City water supplies for domestic use need not be tested unless suspected of high chloride or sulfate content. On-the-job wells are to be tested

Note:

(1) See California Test No. 125 for sampling procedures.

(2) 35 kg of 0.30 m No. 19 mm x No. 4. This material for test number 202, 211 and 227.

(3) From materials site or stockpile, 60 days prior to use.

(4) Not required if P.C.C. from same source is used on other work and test is being made there. No need to duplicate the test just for the sake of record. The actual test results may be used anywhere they are applicable.

Table 6-1.11 MISCELLANEOUS MATERIALS

MISCELLANEOUS MATERIALS, See Note (3)

MATERIAL OR PRODUCT	TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
AGGREGATE BASE	% Crushed Particles	205	45 kg for initial samples, 25 kg for control samples	Materials site or stockpile	As necessary for acceptance	Minimum 1 acceptance test per project
	Sieve Analysis	202			Every 2500 tonnes or 1500 m^3, See Note (1)	
	Durability Index	229			If initial source changes or new source developed	
	R-Value	301			Every 2500 tonnes or 1500 m^3, See Notes (1) (2)	
	Sand Equivalent	217			Every 2500 tonnes or 1500 m^3, See Note (1)	
	Moisture	226			2 times daily if paid for by weight	
	Relative Compaction	216 or 231	15 kg		As necessary for acceptance	
	Dimensions					
AGGREGATE SUBBASE	Sieve Analysis	202	25 kg	Materials site or stockpile	Every 2500 tonnes or 1500 m^3, See Note (1)	Minimum 1 acceptance test per project
	R-Value	301			Every 2500 tonnes or 1500 m^3, See Notes (1) (2)	
	Sand Equivalent	217			Every 2500 tonnes or 1500 m^3, See Note (1)	
	Relative Compaction	216 or 231	15 kg		As necessary for acceptance	
	Dimensions					

Note:

(1) If material is uniform and well within specification limits, the frequency is decreased to 1 per day unless source is changed. Adjustments to testing frequencies shall be documented in the project files.

(2) R-Value testing may be waived when test records demonstrate that material from the same source, and having comparable grading and sand equivalent values, meets the minimum R-Value requirements.

(3) See California Test No. 125 for sampling procedures.

MISCELLANEOUS MATERIALS, See note (2)

MATERIAL OR PRODUCT		TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
IMPORTED BORROW		Relative Compaction	216, 231	15 kg		As required for acceptance	
BASEMENT SOIL		R-Value	301	25 kg	Test material below grading plane both in cut and in fill		
		Relative Compaction	216, 231	15 kg		As necessary for acceptance	
		Grade Tolerance					
EMBANKMENT		Relative Compaction	216, 231	15 kg		As necessary for acceptance	
LIME TREATMENT, See Note (1)	SOIL OR AGGREGATE TO BE TREATED	Unconfined Compressive Strength	373	45 kg	Native soils, test each type of material to be treated	If initial source changes	To determine appropriate lime content
	COMPLETED MIX	Lime Content	338	10 kg		As necessary for acceptance	
		Relative Compaction	216, 231			In place after compaction	
		Dimensions					
	LIME	Various Properties		2-L can with friction lid	None with Certificate of Compliance	Each load delivered	
	EMULSION (CURING SEAL)	Various Properties		2-L plastic jug	None with Certificate of Compliance. If no Certificate of Compliance, then from storage tank of distributor truck	Each shipment	

Note:

(1) Not to be used for the lime treatment of AC aggregates.

(2) See California Test No. 125 for sampling procedures.

Table 6-1.13 MISCELLANEOUS MATERIALS

MISCELLANEOUS MATERIALS, See Note (2)

MATERIAL OR PRODUCT		TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
PENETRATION TREATMENT	LIQUID ASPHALT	Various Properties		1-lCAN	None with Certificate of Compliance	Each shipment	
PENETRATION TREATMENT	SAND	Sieve Analysis	202	2.5 kg	Materials site or stockpile	As necessary for acceptance	
BITUMINOUS SEALS	PAVING ASPHALT	Various Properties		Asphalt 1-L can, Emulsion 2-L plastic jug	None with Certificate of Compliance	Each shipment	
BITUMINOUS SEALS	LIQUID ASPHALT, ASPHALTIC EMULSION	Binder Distribution	339				
BITUMINOUS SEALS	SCREENINGS	LA Rattler	211	25 kg	Stockpile	As necessary for acceptance	
		% Crushed Particles	205				
		Sieve Analysis	202, 105			Twice daily	
		Film Stripping	302			As necessary for acceptance	
		Cleanness Value	227			Once daily	
BITUMINOUS SEALS	SLURRY SEAL AGGREGATE	Sand Equivalent	217	12.5 kg	Stockpile	As necessary for acceptance	
		Sieve Analysis	202				
		Film Stripping	302				
		Durability Index	229				
SOLID OR SEMI SOLID AIR REFINED ASPHALT		In accordance with Standard Specifications		1.5 kg	Barrels or sacks	Each 29 barrels or sacks	
PERMEABLE MATERIAL		Sieve Analysis	202	70 KG	Stockpile	1 daily or as required for acceptance	
		Durability Index	229			If initial source changes or new source developed	
		Sand Equivalent	217			1 daily or as required for acceptance	

Table 6-1.13 MISCELLANEOUS MATERIALS cont.

STRUCTURE BACKFILL	Sieve Analysis	202	25 KG	Materials site	As required for acceptance	
	Sand Equivalent	217				
	Relative Compaction	216 or 231				
SLOPE PROTECTION	Size			Quarry	As required for acceptance (See REMARKS)	Adequate size of slope protection documented by measuring or weighing the material
	Apparent Specific Gravity	206				
	Absorption	206				
	Durability Index	229	35 kg			
ASBESTOS SHEET PACKING			300 x 300 mm		1 each lot	Sample and test if not previously inspected at the source
ASPHALT PLANK			Contact METS for instructions		Contact METS for instructions	Sample and test if not previously inspected at the source
BARBED WIRE			1 m length		Each 50 rolls or fraction	Sample and test if not previously inspected at the source. If less than 150 m of fence, See Note (1)
BOLTS AND HARDWARE			2 samples each diameter		Each lot	Sample and test if not previously inspected at the source

Note:

(1) Resident engineer may accept on the basis of visual examination provided the source has recently furnished similar material found to be satisfactory under the normal sampling and testing procedures of the Department. Place resident engineer's written approval in the project file.

(2) See California Test No. 125 for sampling procedures.

Table 6-1.14 MISCELLANEOUS MATERIALS

MISCELLANEOUS MATERIALS

MATERIAL OR PRODUCT	TEST FOR	TEST NO.	SAMPLE SIZE & CONTAINER TYPE	POTENTIAL SOURCE TESTS: LOCATION OR TIME OF SAMPLING	ACCEPTANCE TESTS: FREQUENCY OF SAMPLING	REMARKS
BRICK	Compliance with specifications		10 full size		Contact METS for instructions	
CHAIN LINK FENCING			0.6 m width		Each 50 rolls or fraction	Sample and test if not previously inspected a source. If less than 105 M of fence, See note (1)
CONCRETE AND CLAY PIPE			Contact METS for instructions		Contact METS for instructions	Sample and test if not previously inspected a source. If less than 30 M of fence, See note (1)
JOINT FILLER EXPANSION			150 mm long full width of sheet		Each 100 m^2 not less than 2 per shipment	Sample and test if not previously inspected a source. If less than 10 M^5 of fence, See note (1)
ELECTRICAL CONDUCTOR			2 each 75 mm long, include markings		Each type each lot	Sample and test if not previously inspected at source. Certificate of Compliance required for 5000 V cable.
GALVANIZED PIPE			300 mm length from each end of length tested of each size		Each 500 lengths or fraction	Sample and test if not previously inspected at the source
GEO-SYNTHETICS FILTER, REINFORCED & PAVING FABRIC S/R FENCE, ETC.			1 piece, 1 m x full width of roll		Each lot	Certificate of Compliance required for each lot. Unroll at least 1 circumference before sampling.
JOINT SEAL, TYPE B			Contact METS			Sample and test if not previously inspected at the source
JOINT SEALING COMPOUND 2-COMPONENT POLYSULFIDE POLYURETHANE			1-L of each component		1 sample from each component of each batch	
MOPPING ASPHALT			1-L		Each lot	

Table 6-1.14 MISCELLANEOUS MATERIALS cont.

PAINT	Compliance with specifications		For bridge or major structure, send an unopened 20-L can. For miscellaneous pointing, 1-L (see Section 6-2 in this manual)		Each batch	Unused portion of 20-L sample will be returned to job. See Section 6-2 in this manual. If less than 75-L, See Note (1).
PAVEMENT MARKERS			20 Markers		1 sample (20 markers) from each lot of 10,000	Sample and test if not previously inspected at the source
PLASTIC CONDUIT			50 mm long from center of length		2 samples each size	
RAISED BARS (PRECAST)			1 unit or full size bar		Each lot	
REINFORCING STEEL			2 samples 0.75m except 1m or #14 & #18		As necessary for acceptance	Sample and test at job site
STEEL PRODUCTS			Contact METS for instructions		Contact METS for instructions	Sample and test if not previously inspected at the source
STRUCTURAL STEEL AND MISCELLANEOUS IRON AND STEEL			2 samples, 0.75 m cut parallel to direction of rolling		Each heat or melt or 10 tonnes or fraction	
WATER-PROOFING MATERIALS		ASTM D173	1 m^2 of asphalt saturated cotton fabric		1 sample from each lot	Meshes of fabric shall be substantially open
		ASTM D449	2.5 kg of asphalt			Contractor's stock must be kept covered
		ASTM D41	1-L of asphalt primer			
WIRE MESH REINFORCING			1 m^2		Each 10 tonnes or fraction	
WIRE ROPE OR CABLE			Per special provisions or as instructed		Per special provisions or as instructed, at time of use	

Note:

(1) Resident engineer may accept on the basis of visual examination provided the source has recently furnished similar material found to be satisfactory under the normal sampling and testing procedures of the Department. Place resident engineer's written approval in the project file.