

# QUALITY ASSURANCE PROGRAM (QAP)

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## City of Gilroy DEPARTMENT OF PUBLIC WORKS

**The purpose of this program is to provide assurance that the materials incorporated into each construction project conform to the contract specifications.**

- This QAP shall be *updated every five years* minimum
- This QAP shall be updated if changes are made such to the test methods or to the testing sampling and frequencies.
- This QAP is incomplete without attachments 1 through 3.

Approved By:



*Riek Smelser, Director of Public Works*

Date:

*3/4/2016*

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**Projects OFF the State Highway System, follow the QA procedures outlined in this document**

**Projects ON the State Hwy System, follow the QA procedures outlined in the following Caltrans manuals:**

- *Construction Manual*
- *Local Agency Resident Engineer Construction Manual Supplement*
- *Bridge Construction Records and Procedures Manual*
- *Local Assistance Structure Representative Guidelines*

## DEFINITION OF TERMS

**Quality Assurance Program (QAP):** A sampling, testing and inspection program to provide assurance that the materials and workmanship incorporated into the project conform to the contract specifications. The main elements of a QAP are the Material Acceptance Program and the Independent Assurance Sampling and Testing Program.

**Material Acceptance Program:** Sampling, testing, inspection, and certification of project materials to determine compliance with the contract specifications. Materials shall be accepted by one or more of the following methods, as allowed for in this document and the contract specifications: *Acceptance Testing, Manufacturer's Certificate of Compliance, Source Inspection, or field inspection.*

**Acceptance Testing (AT):** Testing of project materials to determine compliance with the contract specification criteria.

**Certificate of Compliance:** A signed document from the materials manufacturer committing that the delivered goods meet the contract specifications.

**Source Inspection:** Sampling, testing and/or inspection of manufactured or prefabricated structural materials at a location other than the job site, generally at the manufactured location.

**Independent Assurance Program (IAP):** A program that verifies that AT is being performed correctly by certified testers using qualified laboratories and calibrated equipment.

## **I. MATERIALS ACCEPTANCE PROGRAM**

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Material incorporated into the work shall be accepted by one or more of the following methods, as specified in the contract specifications and this document:

1. *Field Sampling and Acceptance Testing*
2. *Source Inspection and Testing*
3. *Manufacturer's Certificate of Compliance* (with attachments if required)
4. *Visual Inspection* (for minor quantities)

### **FIELD SAMPLING AND ACCEPTANCE TESTING:**

#### ***General:***

- Acceptance sampling and testing shall be performed by certified materials personnel.
- Acceptance testing will be performed utilizing accredited materials laboratories and properly calibrated equipment.
- Certifications and accreditations shall be specific to the tests being performed.
- A materials testing results log shall be maintained for any test method performed more than once on a project.
- Test results for materials incorporated into the work shall be in compliance with the contract specifications.
- Actions taken regarding material with failing test results shall be fully documented, including details documenting remove/replace, rework/re-test, and deduction/CCO.
- Justification shall be provided for any failing material allowed to remain in place.

#### ***Acceptance Sampling and Testing Locations and Frequencies:***

- Sample and testing locations and frequencies shall be in accordance with the contract specifications.
- If not specified in the contract documents, sampling and testing locations and frequencies shall be as shown in **Attachment No. 1, Acceptance Sampling and Testing Frequencies**.
- When sampling products such as Portland cement concrete, cement-treated base, hot mix asphalt, or similar materials; sampling shall be varied with respect to the time of the day, insofar as possible, in order to *avoid a predictable sampling routine*.

**Acceptance Test Methods:**

- The test methods used shall be *as specified in the contract documents*.
- For a material specified to comply with a property shown in the following tables, the Agency uses one of the corresponding tests (or the equivalent):

**Caltrans standard specifications**

Test Property	Test
Relative compaction	CT 216 or 231
Sand equivalent	CT 217
Resistance (R-value)	CT 301
Grading (sieve analysis)	CT 202
Durability index	CT 229
Cleanness Value	CT 227

**Green book standard specifications**

Test Property	Test
Relative compaction	ASTM D1557 and D2922 or D1556
Sand equivalent	CT 217
Resistance (R-value)	CT 301
Grading (sieve analysis)	CT 202
Durability index	CT 229
Cleanness Value	CT 227

Test method equivalent to the tests listed above requires prior written approval or other documented authorization by the City of Gilroy Public Works Director and/or the City of Gilroy (internal only) Project Manager.

**Acceptance Testing Laboratory:**

- Acceptance testing shall be performed as applicable, by one or more of the following:
  - Materials Laboratory specified by City of Gilroy Public Works
  - Consultant Materials Laboratory
  - Other (as specified and authorized by City of Gilroy Public Works)
- The materials lab shall be under the responsible management of a *California Registered Engineer* with experience in sampling, inspection, and testing of construction materials.
- The Engineer shall *certify* the results of all tests performed by laboratory personnel under the Engineer's supervision.
- The Laboratory shall be properly qualified.
- The Laboratory testing personnel shall be appropriately certified.
- Testing equipment shall be properly calibrated.
- Laboratories shall comply with Section IV, *Independent Assurance Program*, of this document.

**Reporting Acceptance Test Results:**

- The laboratory shall report test results to the RE as soon as possible by email or telephone.
- Copies of complete material test result reports, including data and calculation sheets, shall be provided to the RE in accordance with the following timetable:

**Timetable for Providing Full Test Results to the RE**

<i>If the material is sampled...</i>	<i>and the test performed is....</i>	<i>submit results to the RE within ...</i>
at the material plant	Sieve Analysis, or Sand Equivalent (SE), or Cleanness Value (CV)	24 hours
at the job site	Compaction and/or maximum density	24 hours
	Sieve Analysis, or Sand Equivalent (SE), or Cleanness Value (CV)	72 hours
	R value, or Asphalt extraction	96 hours

*Hours shown in this table above may be reduced as required and/or specified by City of Gilroy Public Works Department via job specification, contract, or other written authorization.*

**Acceptance Testing Summary Logs**

- The RE shall maintain a testing summary log for each test method performed more than once on the project (CT 217, CT 202 etc...), and for each salient feature (structure backfill, subgrade, etc...).
- **Attachment 2 (or the equivalent), Test Result Summary Log** form shall be used.

The Test Result Summary Log shall include, at minimum, the following:

- Name and ID Number of the Test Method Performed
- Date Tested
- Name Of Tester
- Location
- Approximate Quantity of Material Represented by the Test
- Required Passing Result
- Actual Test Result
- Resolution of any Failing Results

- The RE shall use the log to track that:
  - Sampling is performed at the required frequencies;
  - Acceptance tests are performed at the required frequencies;
  - Tester certifications are current and on file; and
  - all failing tests have been mitigated and documented.

**MANUFACTURER'S CERTIFICATES OF COMPLIANCE:**

***General:***

- Various manufactured materials may be accepted for incorporation into the work without sampling or testing, on the basis of a certificate from the manufacturer.
- *Where required by the contract specifications*, the contractor shall submit a certificate of compliance.
- Where required by the contract, the contractor shall *attach test data or other documents* to the certificate of compliance.
- The RE may perform sampling and testing on such materials at any time.
- Certificates of compliance **shall**:
  - Be submitted by the Contractor before the material is incorporated into the work;
  - Accompany the material to the job site.
  - Identify the lot (or heat) number for each lot delivered;
  - Include the contract number;
  - Include test data and other documents when required.
  - State that the material complies with the contract specifications; and
  - Be signed by the producer of the material.

***List of Materials Accepted by Certificate of Compliance:***

- This agency uses one of the following Standard Specifications: Caltrans 2010, Caltrans 2006, 2012 Green book, or the equivalent (as authorized by City of Gilroy).
- In accordance with the 2010 CTSS, the 2006 CTSS, or the 2012 Green book, or the equivalent Standard Specifications, the materials listed in Appendix 3 may be accepted by Certificate of Compliance.
- This list may be supplemented or amended by the contract Special Provisions or Technical Provisions



### **SOURCE INSPECTION AND TESTING:**

- Some manufactured or pre-fabricated structural materials will be inspected or tested prior to arrival at the jobsite, generally at the manufacturer's location (a.k.a. source inspected.)
- Structural items categorized as "catastrophic consequences of failure" or "significant safety concern" may be source inspected. Materials that might be source inspected include: structural steel, precast pre-stressed concrete girders and pilings; RCP greater than 60", joint seals, bearing pads, lighting and signal poles, sign structures, electrical items.
- The RE may reject source inspected material at the job site if deemed not acceptable, including:
  - Material damage in shipment or installation;
  - Defective material (source inspection is usually a random sampling and may not have checked 100% of the material.)
- The following materials laboratories will be used to perform source inspection and testing.
  1. Laboratory specified by City of Gilroy Public Works
  2. Consultant Materials Laboratory
  3. Other (as specified and authorized by City of Gilroy Public Works)

### **ACCEPTANCE OF MINOR QUANTITIES WITHOUT TESTING (VISUAL INSPECTION):**

Unless otherwise specified in the contract or by the City of Gilroy, visual inspection shall be used for acceptance. Larger or structural type projects shall all require acceptance testing as specified herein.

### **INDEPENDENT ASSURANCE (IA) PROGRAM**

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#### **GENERAL:**

- The IA program shall verify that:
  - Sampling and testing procedures are being performed correctly
  - All AT performed on the project uses a *qualified laboratory and certified testing personnel*.
  - All testing equipment is in good condition and properly *calibrated*.
- A complete review of AT shall be performed by IA program personnel, or an independent materials laboratory chosen by the agency, when unresolved discrepancies related to poor correlation between acceptance tester's results and other test results occur.
- The IA program duties, including certification of testers and qualification of lab, shall be executed by:
  1. Local Agency designated IA person (this person shall not perform any AT)
  2. Caltrans (for CT test methods only)
  3. Consultant (this consultant shall be different from AT consultant)

- IA shall be performed on every type of materials test required for the project.
- IA samples and tests shall *not* be used for determining compliance with contract requirements.

**LABORATORY QUALIFICATION:**

- The AT materials laboratory shall participate and comply with one or more of the following Correlation Testing Programs:
  - a. AASHTO Materials Reference Laboratory (AMRL)
  - b. Cement and Concrete Reference Laboratory (CCRL)
  - c. Caltrans' Reference Samples Program (RSP)
- The AT Laboratory qualification shall occur *annually*.
- A copy of the current laboratory qualification shall be kept in the project records.

**TESTER CERTIFICATION:**

- Sampling and testing personnel shall be certified for a maximum of two years by one or more of the following Personnel Certification Programs:
  - CT Materials Engineer and/or CT METS IA Representative (for CT tests only)
  - American Concrete Institute
  - National Institute of Certification of Engineering Technologies
  - Other nationally recognized organization
  - City designated and qualified IA person (IA person may not perform AT)
  - A consultant lab qualified for such purposes.
- Proficiency tests shall be performed for testers to be certified on Sieve Analysis, Sand Equivalent, and Cleanness Value tests. All other types shall be witness tests.
- A copy of each tester's current and applicable certifications shall be kept in the project files.

**EQUIPMENT CERTIFICATION/CALIBRATION:**

- Laboratory testing equipment shall be:
  - Capable of performing the tests required.
  - Be in good working order.
  - Be calibrated at least *once each year*.
  - Be calibrated by impartial means using devices of accuracy traceable to the *National Institute of Standards and Technology*.
  - Have a *decal* firmly affixed to each piece of equipment showing the date of the last calibration.

**IV. RESIDENT ENGINEER'S CERTIFICATION OF PROJECT MATERIALS:**

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- The RE shall complete and sign LAPM **Exhibit 17-G**, "Materials Certificate" of the Local Assistance Procedures Manual (LAPM), upon completion of a federal-aid project,
- The form shall *explain and justify* all materials incorporated into the work which did not conform to specifications, including changes by virtue of contract change orders.
- The form shall be filed in the project records.
- The form shall be included in the Report of Expenditures submitted to the Caltrans District Local Assistance Engineer.

## **V. PROJECT QAP RECORDS:**

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- Each project shall have the quality assurance documents on file, organized, and indexed in the following categories:
  - Copy of Quality Assurance Plan
  - Certs. of Proficiency-Testers and Samplers (Exh. 16-D TL-0111)
  - Cert. of Qualification for Testing Laboratory (TL-0113)
  - Notice of Materials to be Used (Exh. 16-I)
  - Acceptance Testing Summary Logs and Test Results
  - Certificates of Compliance, including Buy American Certificates
  - Source inspection records and reports.
  - Materials Certification (Exh. 17-G)
- All project records shall be available in a single locations for inspection by auditors and reviewers:
  - At any time during the project
  - For three years following the date of final project voucher.

## **VI. ATTACHMENTS**

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- ATTACHMENT NO. 1 - Acceptance Sampling and Testing Frequencies
- ATTACHMENT NO. 2 - Test Results Summary Log
- ATTACHMENT NO. 3 - List of Materials Accepted by Certificate of Compliance

**Sample for Local Agency QAPs**

**Sampling and Testing Frequency Table**  
**for projects OFF the SHS**

**HOT MIX ASPHALT (HMA) / ASPHALT CONCRETE (AC)**

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Location/ Time of Sampling
Aggregate Gradation (Sieve)	CT 202	1 Per 1000 Tons or Part Thereof ; Minimum 1 per day during production/ placement of at least 300 tons per day.	At Plant Per CT 125 (a)
Sand Equivalent	CT 217		
Asphalt Binder Content	CT 382		
In-Place Density and Relative Compaction (Nuclear )	Nuclear (b) CT 375 or ASTM D2950 (c)	1 Per 1000 Tons or Part Thereof ; Minimum 1 per day during production/ placement of at least 300 tons per day. (b)	Loose Mix Behind Paver Per CT 125 Random Locations Per CT 375 (c)
Theoretical Maximum Specific Gravity and Density (Rice)	CT 309	1 Per Day During Production/ Placement of At Least 300 Tons Per Day	Loose Mix Behind Paver Per CT 125
HMA Moisture Content	CT 226 or CT 370		
Stabilometer Value (d)	CT 366		
Asphalt Binder	Sample per Section 92	Sample 1 min. per day for production over 300 tons per day; See (f) regarding testing.	At Plant Per CT 125
Smoothness	12-foot Straightedge	As necessary to confirm contract compliance.	Final Pavement Surface

**Attachment 1:**  
**Sampling and Testing Frequency Table -**  
**For projects OFF the State Hwy System, page 1 of 3.**

- (a) Exact tonnage of sample location to be determined by Random Sampling Plans
- (b) Compaction determined by Nuclear Density Device. Core testing required if compaction fails the nuclear test
- (c) Correlation between core densities and nuclear device required only if compaction fails the nuclear test
- (d) Report the average of 3 tested briquettes from a single split source
- (e) Use CT 309 to determine maximum theoretical density in lieu of CT 367 calculated maximum theoretical density
- (f) No testing required unless warranted by concern ; sample and store until completion of project

**SUBGRADE (DISTURBED BASEMENT SOIL) OR EMBANKMENT**

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Location/Time of Sampling
Maximum Density and Relative Compaction	CT 216/CT 231	1 Min. Test per 5000 sq ft under vehicle traveled way and shoulder 1 Min. Test Per 300 linear foot under sidewalk	Random locations as determined by the Engineer in place after compaction.

**AGGREGATE BASES AND SUBBASES, IMPORTED BORROW**

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Location/Time of Sampling
Sieve Analysis	CT 202	1 Min. Test Per Material Source	Sample from site stockpile/plant prior to placement.
R-Value	CT 301		
Sand Equivalent	CT 217		
Maximum Density and Relative Compaction	CT 216/CT 231	1 Min. Test per 5000 sq ft	Random locations as determined by the Engineer in place after compaction.

**STRUCTURE BACKFILL, SELECT BACKFILL**

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Location/Time of Sampling
Sieve Analysis	CT 202	1 Min. Test Per Material Source	Sample from site stockpile/plant prior to placement
R-Value	CT 301		
Sand Equivalent	CT 217		
Maximum Density and Relative Compaction	CT 216/CT 231	1 Min. Test Per 2 Vertical Lifts of Placement	Random locations as determined by the Engineer in place after compaction.

**Attachment 1:  
Sampling and Testing Frequency Table -  
For projects OFF the State Hwy System, page 2 of 3.**



**PORTLAND CEMENT CONCRETE (PCC) - STRUCTURAL AND SIGNAL/LIGHTING FOUNDATIONS**

<b>COARSE AGGREGATE</b>		<b>Minimum Sampling and Testing Frequency</b>	<b>Location/Time of Sampling</b>
<b>Quality Characteristic</b>	<b>Test Method</b>		
Sieve Analysis	CT 202	1 min. test per 500 cu yds and per each material source ; 1 min. test on smaller projects; if bridge, 1 min. set per separate pour per abutment/pier/deck.	Sample from site stockpile/plant prior to placement
Cleaness Value	CT 227		
<b>FINE AGGREGATE</b>		<b>Minimum Sampling and Testing Frequency</b>	<b>Location/Time of Sampling</b>
<b>Quality Characteristic</b>	<b>Test Method</b>		
Sieve Analysis	CT 202	1 min. test per 500 cu yds and per each material source ; 1 min. test on smaller projects; if bridge, 1 min. set per separate pour per abutment/pier/deck.	Sample from site stockpile/plant prior to placement
Sand Equivalent	CT 217		
<b>WET MIX</b>		<b>Minimum Sampling and Testing Frequency</b>	<b>Location/Time of Sampling</b>
<b>Quality Characteristic</b>	<b>Test Method</b>		
Slump/Penetration	CT 533	2 per day	Sample from truck/work site
Cylinders	CT 539/540	1 min. set of 3 per day; if bridge, 1 min. set per separate pour of abutment/pier/deck.	

**Attachment 1:  
Sampling and Testing Frequency Table -  
For projects OFF the State Hwy System, page 3 of 3.**

**Attachment 2:  
Testing Result Summary Log**

**Test Result Summary Log**

Project Name: \_\_\_\_\_  
Contract Number: \_\_\_\_\_

Test Method Name and Number: \_\_\_\_\_

Test Number	Date Sampled	Name of Tester/ Company	Production		Test Results			Remarks
			Location (Stations, depths, etc)	Production Quantity Represented	Required Result	Actual Result	Pass/Fail	
1		Tester Certification of Site?						Includes action taken for any failing test results note test number of any retests.
2								
3								
4								
5								
6								
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ATTACHMENT 3 – Addendum via reference

Please reference one or more of the following:

- A. **2010 Caltrans Standard Specifications Materials Accepted by COC**
  
- B. **2006 Caltrans Standard Specifications Materials Accepted by COC (shown on the following page)**
  
- C. **2012 Green book Materials Accepted by COC**
  
- D. **Equivalent as authorized by City of Gilroy via specification, contract, or other written authorization/approval**

**CONSTRUCTION MATERIALS ACCEPTED BY A CERTIFICATE OF COMPLIANCE**  
**(based on 2006 Caltrans Standard Specifications)**

Section	Material
94-1.05	Asphaltic Emulsion
51-1.12H(1&2)	Bearing Pads (Elastomeric)
90-2.01	Cement
90-4.03	Concrete Admixtures
83-2.02D(1)	Concrete Barrier, (for the Concrete)
66-2.02	Corrugated Aluminum Pipe
66-3.02	Corrugated Steel Pipe and Corrugated Steel Pipe Arches
61-1.02	Culvert and Drainage Pipe Joints
88-1.01	Engineering fabric
95-1.03	Epoxy
20-2.03	Erosion Control and Highway Planting: Soil Amendment
20-2.07	Erosion Control and Highway Planting: Fiber
20-2.08	Erosion Control and Highway Planting: Mulch
20-2.11	Erosion Control and Highway Planting: Stabilizing Emulsion
20-2.15B(1)	Erosion Control and Highway Planting: Plastic Pipe- Supply Line
20-2.15B(2)	Erosion Control and Highway Planting: Plastic Pipe- Irrigation Line
51-1.12F(2)	Joint Seals (Type A, AL and B)
24-1.02	Lime
93-1.02	Liquid Asphalt
82-1.02D	Markers: Post Marker and Object Marker Metal Target Plates
90-10.03	Minor Concrete
84-3.02	Paint (traffic stripe)
64-1.02	Plastic Pipe (culverts, drains, conduits)
65-1.02A(2)	Reinforced Concrete Pipe
52-1.04	Reinforcing Steel (bar, wire, welded wire fabric, epoxy coating)
52-1.02B	Reinforcement (epoxy-coating patching material)
86-2.08	Signal Lighting and Electrical Systems: Conductors
86-2.16	Signal Lighting and Electrical Systems: Steel Service Equipment Enclosures (coating)
86-4.01C	Signal Lighting and Electrical Systems: Conductors, Diode Signal Modules
86-4.07D(4)	Signal Lighting and Electrical Systems: Light Emitting Diode Ped Signal Modules
86-6.01A	Signal Lighting and Electrical Systems: Luminaire Lamp Ballast
86-6.05	Signal Lighting and Electrical Systems: Sign Lighting Lamp Ballast
86-6.065	Signal Lighting and Electrical Systems: Internally Illuminated Street Name Signs
49-5.01	Steel Piles
55-1.03	Structural Steel
57-1.02A	Structural Timber and Lumber
51-1.06A	Structural Composite Lumber (use in falsework)
67-1.02	Structural Metal Plate Pipe Arches and Pipe Arches
68-1.02J	Subsurface Drains: Perforated Steel Pipe
68-1.02J	Subsurface Drains: Aluminum under drain pipe and fittings
68-1.02K	Subsurface Drains: Polyvinyl Chloride Pipe (PVC) and Polyethylene Tubing
12-3.08	Temporary Railing (Type K)
58-1.03	Treated Timber, Lumber, and Piling
69-1.02A	Overside Drains: Steel Entrance Tapers, Down Drains, Reducers, Coupling Bands and Slip Joints
69-1.02F	Overside Drains: Aluminum Entrance Tapers, Arches, Down Drains, Reducers, Couplings, Slip Joints