CITY OF MARINA

DEPARTMENT OF PUBLIC WORKS

QUALITY ASSURANCE PROGRAM (QAP)

Approved By:

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Date:

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THE PURPOSE OF THIS PROGRAM IS TO PROVIDE ASSURANCE THAT THE MATERIALS INCORPORATED INTO THE CONSTRUCTION PROJECTS CONFORM WITH THE CONTRACT SPECIFICATIONS.

- This Quality Assurance program and document shall be *updated every **five** years minimum*
- This program and document shall be updated if changes are made to the test methods or to the testing sampling and frequencies.

I. 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.

II. MATERIALS ACCEPTANCE PROGRAM

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

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)

1. *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.
- The test results for materials incorporated into the work shall be in compliance with the contract specifications.
- Actions taken regarding material with failing test results will 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.

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; the time of such 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 table, the Agency tests under the corresponding test shown:

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

Acceptance Testing Laboratory:

- Acceptance testing will be performed by certified materials testing personnel utilizing an accredited materials laboratory.

- The materials laboratory 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.
- Laboratories shall be properly accredited.
- 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 Test Results:

- Test results shall be reported 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

If the material is sampled...	*and the test performed is....*	*submit results to the RE within ...*
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	96 hours
	Asphalt extraction	

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 by salient feature (structure backfill, subgrade, etc…)
  - **Attachment 2** , *Test Result Summary Log* form shall be used.
  - The logs shall be used by the RE to track that acceptance tests are performed at the required frequencies, that tester certifications are on file, and that all failing tests have been mitigated.

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 if 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:

In accordance with the CTSS 2006, the materials listed in the following table may be accepted by Certificate of Compliance. This list may be supplemented or amended by the contract Special Provisions or Technical Provisions

CONSTRUCTION MATERIALS ACCEPTED BY A CERTIFICATE OF COMPLIANCE
as per the 2006 CT 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

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 (source inspected.)
- Structural items categorized as "catastrophic consequences of failure" or "significant safety concern" may be source inspected. Materials that might be source inspected: structural steel , precast prestressed 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 determined is deemed not acceptable. For example:
    - Material damage in shipment or installation.
    - Defective material; source inspection is usually a random sampling and may not have checked 100% of the material.

ACCEPTANCE OF MINOR QUANTITIES WITHOUT TESTING (VISUAL INSPECTION):

General:

- Relatively minor quantities of construction materials may be accepted without testing.
- The following 3 conditions must be met:

1. Visual examination of the material is performed.
2. The manufacturer or supplier has recently furnished similar materials found to be satisfactory using normal sampling and testing requirements.
3. The manufacturer (or supplier in the case of HMA or concrete) provides certification that the material furnished complies with the contract specifications.

Approximate quantities that may be accepted by visual inspection:

- *Aggregates* other than for use in Portland Cement Concrete, not to exceed:
    - 100 tons per day, nor
    - 500 tons per project
- *Bituminous mixtures* (example: HMA), not to exceed
    - 50 tons per day.
    - If project total is less than 500 tons., sample at engineer's discretion
- *Bituminous material* (example: Liquid Asphalt), not to exceed:
    - 100 gallons per project

INDEPENDENT ASSURANCE PROGRAM (IAP)

- The IAP shall verify that:
    - Sampling and testing procedures are being performed correctly
    - All testing equipment is in good condition and properly *calibrated.*
    - All AT performed on the project uses a *qualified laboratory and* certified *testing personnel.*
- A complete review of AT shall be performed by IAP 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.

LABORATORY TO PERFORM INDEPENDENT ASSURANCE TESTING AND DUTIES:

- The IAP, including certification of testers and qualification of lab, shall be executed by:
  - ☐ Caltrans (for CT test methods only)
  - ☐ Consultant (this consultant shall be different from AT consultant)

- IA shall be performed on every type of materials test required for the project.
- IAP 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)
  - Nationally recognized organizations such as the American Concrete Institute
  - National Institute of Certification of Engineering Technologies
  - 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 devises 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. CERTIFICATION OF PROJECT MATERIALS:

- The RE shall complete and sign **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 (DLAE).

V. PROJECT QAP RECORDS:

- Each project shall have the following 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 Accreditation of Testing Lab (TL-0113)
    - Notice of Materials to be Used (Exh. 1`6-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 and up to three years following the date of final project voucher.

VI. ATTACHMENTS

ATTACHMENT NO. 1 - Acceptance Sampling and Testing Frequencies

ATTACHMENT NO. 2 - Test Results Summary Log

ATTACHMENT 1
CITY OF MARINA

Sampling and Testing Frequency Table for projects ***off*** the SHS.

(See note 1 and 2 regarding sampling and sample size.)

ASPHALT CONCRETE (Note, sampling and testing is performed on the aggregates and asphalt, AND on the HMA.)

Quality Characteristic	Test Method (See note 2)	Acceptance Test Frequency	Location of Sampling
Aggregate			
Aggregate Gradation (Sieve)	CT 202	Production start up evaluation. Minimum 1 per day of paving of at least 300 tons per day.	HMA plant.
Sand Equivalent	CT 217		
Asphalt Binder			
Various properties based on asphalt type (see Standard Specifications Section 92)	See Standard Specifications Section 92	Sample daily for placement over 300 tons per day; store; no test required unless warranted by concern	Asphalt feed line connecting to palnt storage tanks.
In place Type A HMA			
Moisture Content	AASHTO T 329	Production start up evaluation, and minimum 1 per project.	Loose mix from behind the paver.
Asphalt Binder Content	AASHTO T 308, Meth. A	Production start up evaluation; minimum 1 per day of paving of at least 300 tons per day.	
Maximum Theoretical Density	AASHTO T 209		
Air Void Content	AASHTO T 269	Production start up evaluation; minimum 1 for every 25,000 tons of paving.	
Voids in Mineral Aggregate	SP-2 Asphalt Mixture Volumetrics		
Dust Proportion	SP-2 Asphalt Mixture Volumetrics		
Hamburg Wheel Tracker	AASHTO T 324 (Modified)	Production start up evaluation; minimum 1 for every 10,000 tons of paving.	Loose mix at plant, truck or windrow.
Moisture Susceptibility	AASHTO T 283	Production start up evaluation; minimum 1 random for every 50,000 tons of paving.	
Pavement Density			
Density of cores (See note 3)	California Test 375	1 for each 250 tons (for thickness of 0.15' or greater)	Final layer, total paved thickness
Pavement Smoothness			
Straightedge	See Standard Specifications Section 36-3.01D9(b)(i)	Entire surface Per Standard Specifications Section 36-3.01D(4).	Final Pavement Surface
Inertial Profiler			

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	At site of in-place density test hole.

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	At site of in-place density test hole.

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	At site of in-place density test hole.

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

COARSE AGGREGATE (Note, aggregates are tested *and* wet mix is tested.

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Location/Time of Sampling
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
Cleanness Value	CT 227		

FINE AGGREGATE

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Location/Time of Sampling
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		

WET MIX

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Location/Time of Sampling
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.	

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ATTACHMENT 2

QAP LOG SUMMARY

Project Name: _____ Fed Proj./Grant #: _____

Testing Material/Quantity: _____ Tester Name: _____

Date	Caltrans Test	Station	Elevation	Test Results	Min. Specs.	Pass/Fail	Action Taken

Test Descriptions:	

Notes: