

Structural Concrete Quality Assurance

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Structural Concrete Quality Assurance

- History / Background
- Work in Progress
- QCQA Specifications for Concrete
- Question and Answer Session



History

- **December 2010 – Decision Document**
 - Chief Engineer Rick Land and Steve Takigawa Deputy Director of Maintenance and Operations
 - Provided direction to shift responsibility for QC of Structural Concrete away from Caltrans and to the Contractor
- **Rock Products Committee**
 - Materials and Quality Assurance sub-task group
 - QC/QA Project Team

QC/QA Project Team

- **CALTRANS**

- Division of Engineering Services
 - METS-OSM, QAM, IA
 - Structure Construction
 - SQM (Specifications)
- Division Of Construction
- District Material Engineers
- Division of Pavement

- **INDUSTRY**

- Association of General Contractors (AGC)
- California Council of Testing & Inspectors Agencies (CCTIA)
- California Construction & Industrial Material Assoc. (CAICIMA)

Transition to QA Specifications

- Complete Pilot CIP Structural Concrete QA specifications Specifications (July 2012)
- 10 +/- pilot projects (2012 - 2013)
- Lessons learned
- Refinement and Statewide implementation (Spring 2014)



Pilot Specification

11-4 CAST-IN-PLACE STRUCTURAL CONCRETE MATERIALS

Applies to cast-in-place concrete members constructed under Sections 49 and 51 (except minor concrete)

- Quality Control Program
- Department Acceptance
 - Verification testing



Quality Control Program

- Develop, implement, and maintain a QC program that includes inspection, sampling, and testing
 - Quality Control Manager
 - Quality Control Plan
 - Laboratory Accreditation
 - Testing Personnel Certification
 - Concrete Plant Certification
 - Electronic and paper submittal of test results



Contractor Quality Control Submittal Requirements

- **Submittals**

- QC Plan
- Concrete Mix Design
- QC Test Results
 - Electronic and Paper
- QC Inspection Reports
- Concrete Materials QC Summary Report



Contractor Quality Control – Quality Control Manager

- **Responsibilities**
 - Develop and implement QC Plan
 - Ensure that all QC personnel adhere to QC plan
 - Ensure that all materials meet Contract requirements
 - Ensure accuracy of all correspondence, submittals, reports,
 - Sign QC plans
 - Maintain QC Records
- **Licensing and certification requirements for QC Manager**
 - PE, ACI Concrete Tester Level 1, NICET Level II, ICC Reinforced Concrete Inspector, ASQ Certified Quality Manager
- **Must be employed by the prime or subcontractor providing only QC services**

Quality Control Program

- **Quality Control Plan**
 - Submitted and approved prior to starting work
 - Pre-job meeting prior to plan submittal
 - Must detail methods in the QC program to ensure quality.
 - Minimum requirements listed
 - Names, certifications, forms, methods, frequencies, procedures, etc.



Quality Control Program

- **Quality Control Testing**
 - Specified Minimums (Aggregate, Plastic Properties compressive strength)
 - Certification and Accreditation Requirements for:
 - Testing Laboratories
 - Inspection Personnel
 - Concrete Plants



QC Tests

	Test	Minimum Testing Frequency
Aggregates	Aggregate Gradation Sand Equivalent % finer than 75 micron	Once a Day
	Moisture Content	1 to 2 Times Daily
Concrete	Slump and Density	Once Every 100 yd³ or each day
	Air Content	Once Every 30 yd³ (When Air is Specified)
	Compressive Strength	Once Every 100 yd³ or each day

Concrete Plant Requirements

- Have current certification from National Ready Mixed Concrete Association (NRMCA)
- Be tested and authorized under California Test 109
- Have plant manual including
 - Equipment
 - Testing Procedures
 - Safety Plan
 - Names, Qualifications, and Certs for all personnel



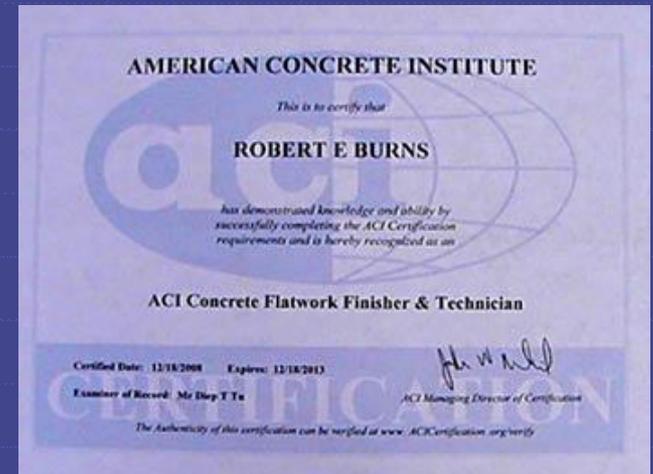
National Standards & Accreditations for Laboratories

- Laboratory - AASHTO Accreditation Program (AAP)
 - Aggregate tests
 - Compressive Strength tests
 - Other QC tests performed during mix design
- ASTM test methods instead of CTMs



Personnel Certifications

- ACI Certification rather than Caltrans IA
- Lab Testing
 - Lab Grade I (Aggregate test Require Grade II)
- Field Sampling & Testing
 - Field Grade I



Online Submission: DIME – Data Interchange for Materials Engineering

Home XML Schema Search

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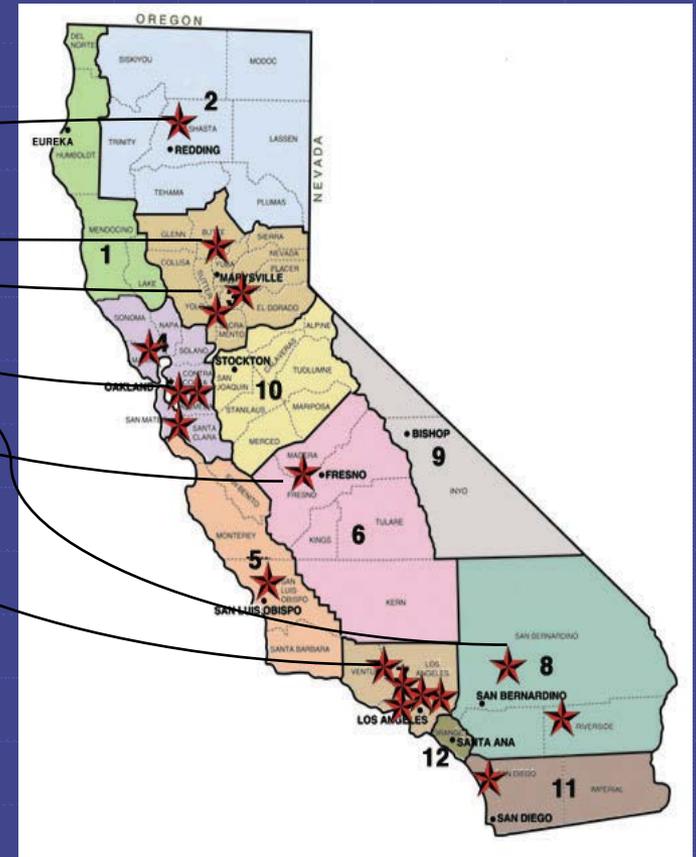
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Electronic data collection from all QC and Verification testing

Department Acceptance

- Department makes acceptance decision for structural concrete based on:
 - Verified QC test results
 - Submittal Review
 - Inspection
- If QC test result is verified, Dept. uses QC test results for lots represented



Specified Verification Testing (CT)– at Reduced Frequency

Test		Specified Frequency
Aggregate	Aggregate Gradation	None specified
	Sand Equivalent	
	% finer than 75 micron	
Concrete	Slump	1 per 3 QC test
	Air Content	
	Compressive Strength	

Department Acceptance

Department takes a separate sample from the same load of concrete

- Compares the QC test result and the verification test result
- Must not exceed following values:

Quality Characteristic	ASTM Test Method	Difference
Slump	C 143/C 143M	1 inch
Air content	C 231/C 231M or C 173/C 173M	32 percent of the average of the two test results
Compressive strength	C 172/C 172M, C 31/C 31M, and C 39/C 39M	14 percent of the average of the two test results

Department Acceptance

- Dispute Resolution – If difference between QC and verification test results exceeds values in table, Contractor and Engineer must investigate:
 - Sampling Method
 - Test Procedure
 - Equipment Condition
 - Equipment Calibration
 - Any other Factors
- Once cause of the difference is resolved, verification testing process is restarted



Guidance Material & Training

- QA Guidance Document
- Construction Manual
- Bridge Construction Records and Procedures

Training

ACI certification

- Continued Outreach



Questions? Comments?

