

Stakeholder Responsibilities in Quality Control / Assurance Testing



CONCRETE
ALBERTA



Stakeholder Responsibilities in Quality Control/Assurance Testing

As the importance of sustainability grows within the industry, the margins of overdesign in concrete mix designs become thinner.

CSA Concrete Test Methods are specified to ensure consistency between tests completed by different qualified testers and different qualified laboratories.

It is important that all stakeholders work together to ensure that quality testing is held to the level mandated in the test standards.

Now more than ever, test results need to be truly representative of the concrete as delivered to the job site.





Stakeholder Engagement in Quality Control/Assurance Testing

Every party can be an engaged resource to contribute to success.

- Owners can provide clear expectations and specifications
- Consultants can evaluate qualifications
- Contractors can share successful experiences
- Producers can be engaged early to collaborate and may provide their own quality testing qualifications.
- When all parties participate and collaborate from the start of the project, the team can focus on resolution and continuation instead of allocation and remediation.

Stakeholder Responsibilities in Quality Control/Assurance Testing

Owner/Consultant

- What testing is required?
 - Prequalification (24C)
 - Acceptance (25C)
- How much testing required?
 - Volume and Frequency
 - Fresh Properties
 - Hardened Properties
- Who should be testing
 - Prequalification of Labs?
 - Qualifications of Labs?



<https://dailyengineering.com/concrete-slump-test-definition-procedure-and-types-of-slump-test/>

Stakeholder Responsibilities in Quality Control/Assurance Testing

Contractor

- Prepare a Quality Plan
 - QC vs. QA or Combined
 - Testing Responsibilities
- Identify construction needs and identify qualified supplier
 - Select concrete mixes
 - Prepare prequal. docs.
- Coordinate with parties to provide for testing needs
 - Facilities for all parties including testing lab



Stakeholder Responsibilities in Quality Control/Assurance Testing

Producer

- Select mix designs to comply
 - Prequalification to satisfy owner/contractor needs.
- Provide certification of production.
 - Plant Capability
 - Delivery Vehicles
 - Materials for production.
- May demonstrate internal testing for consideration of QC test results.



Stakeholder Responsibilities in Quality Control/Assurance Testing

Testing Agency

- Comply with CSA A283
 - Qualified Laboratory
 - Qualified testers.
- Report Test Results.
 - Timely distribution of test results to all parties.
 - Comply with standards including identifying non-compliances.
- Actively participate in compliance activities.





Stakeholder Resources for Quality Control/Assurance Testing

Concrete Alberta Concrete Field-Testing Stakeholder
Series

[Concrete Field Testing & Reporting](#)

[Concrete Field Test Reporting & Field Test Strength Results](#)

Stakeholder Resources for Quality Control/Assurance Testing

Field Testing Firms (Contractor's or Owner's Consultant):

The Testing Firm shall have lab and field personnel certified to CSA A283 by an industry recognized program such as:

Canadian Council of Independent Laboratories (CCiL) or CAN/CSA ISO 9001 with equivalent scope to CSA A283 or other equivalent certification approved by the project owner.

ACI CSA Standards Concrete Field Testing Technician certification program

Testing Agencies can participate in the Concrete Alberta Comparative Test Program. This is for their due diligence and results should not be considered for qualification.

Stakeholder Resources for Quality Control/Assurance Testing

Concrete Producer:

Sampling and testing carried out in accordance with CSA A23.2 by personnel certified to CSA A283 by an industry recognized program such as:

Canadian Council of Independent Laboratories (CCiL) or
CAN/CSA ISO 9001 with equivalent scope to CSA A283

or

ACI's CSA Standards Concrete Field Testing Technician

or

A Concrete Lab with lab and field personnel certified to CSA A283 by an industry recognized program such as:

Canadian Council of Independent Laboratories (CCiL) or
CAN/CSA ISO 9001 with equivalent scope to CSA A283 or other equivalent
certification approved by the project owner.

Stakeholder Takeaways for Quality Control/Assurance Testing

Even when everyone is doing everything in full compliance with standards,

there are still variations in test results observed.

- 11 Labs
- Same concrete.



Compressive Strength Data Analysis

Is one test enough?

- Proper analysis of how the concrete is performing on the site requires looking at more than a single test, and more than simply collecting the tests for the record.
- Things happen and any single test can be subject to a non-compliance even if everything was in place to prevent it.
- Analyzing a spectrum of tests is more representative because isolating a single result may be misleading when the results of many tests present a different picture.
- Two labs testing the same concrete may not have identical compressive strength test results and this is not necessarily an indicator of non-compliant or poor testing.

Compressive Strength Data Analysis

Is one test enough?

- To make sure we aren't acting on poor quality data or testing, the acceptance for compressive strength should be based on the requirements of CSA A23.1-24 Clause 4.4.2.3.1.1.

Specified Strength	ATR
35 MPa	$35 - 3.5 = 31.5 \text{ MPa}$
40 MPa	$40 \times 0.90 = 36.0 \text{ MPa}$
45 MPa	$45 \times 0.90 = 40.5 \text{ MPa}$

A sample concrete project		
Set Number	Average 28 Day Compressive Strength (MPa)	3 Test Moving Average (MPa)
1	37.6	
2	38.4	
3	38.2	38.1
4	38.6	38.4
5	37.8	38.2
6	39.1	38.5
7	39.0	38.6
8	34.8	37.6
9	33.1	35.6
10	37.2	35.0
11	40.2	36.8
12	40.7	39.4

Compressive Strength Data Analysis

Some factors which may affect concrete cylinder strength that may or may not be commonly reported in the compressive strength reports:

- Poor sample molding or improper consolidation – not reported, unless it is severe enough to require the lab to discard the sample
- Poor sample finishing (top surface) – not reported
- Poor sample handling or transportation practices – not necessarily reported.
 - Age at time of demoulding to be 28 ± 8 hours for concrete with a design compressive strength equal to or greater than 35 Mpa
 - Date and time of casting of the cylinder specimens
 - Date and time of receipt in the concrete lab.
- Poor initial curing or storage conditions – temperatures reported

Compressive Strength Data Analysis

Some factors which may affect concrete cylinder strength that may or may not be included with compressive strength reports:

- There may be things which happened to influence the compressive strength results that you would have no way of knowing about from a fully compliant test report.
- How do stakeholders determine if the report is likely accurate, or may have been negatively influenced somehow? Is it representative of my concrete?
 - Statistical analysis of the compressive strength results can help to identify trends and outliers.
 - This requires more effort involved than merely ordering and collecting the test results.

Stakeholder Engagement and Collaboration

How can we tackle field testing issues?

- Proactive specifications to ensure clear expectations for all parties.
- Specify pre-qualification and acceptance testing that is appropriate for the scope, size, and nature of the project.
- Collaborate with all stakeholders to identify specific testing needs and ensure that all parties understand the roles and expectations.



https://cdn11.bigcommerce.com/s-zgzol/images/stencil/1280x1280/products/49197/127234/forney-lag-0050-fresh-concrete-field-test-kit-for-6in-x-12in-concrete-test-cylinders__74267.1673820361.jpg?c=2

Stakeholder Engagement and Collaboration

How can we tackle field testing issues?

- Confirm that the testing agency is certified (E.g. CCIL)
- Confirm that the tester on site is qualified (CCIL or ACI)
- Understand what good testing looks like and what may be a non-compliance
- Any observed potential non-compliance is an opportunity to improve the outcome of the project.



<https://api.army.mil/e2/c/images/2017/05/11/477617/original.jpg>

Stakeholder Engagement and Collaboration

How can we tackle field testing issues?

- Be engaged and educated on the process.
- Participate in pre-construction meetings and raise concerns early.
- Ensure that stakeholders have appropriate competence to execute their roles.
- Understand non-compliances and how to interpret test results for acceptance or rejection.



Stakeholder Engagement and Collaboration

How can we tackle field testing issues?

- Consistent testing is mandatory for high demand concrete applications.
- All stakeholders share a role in creating a successful project outcome.
- Consistent testing is obtained by strict adherence to the test methods and everyone can help to ensure this occurs.
- Consider all valid test results when results are in question.

