The Power Within

10 Steps to Concrete Cylinder Care

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THE POWER WITHIN: 10 STEPS TO CONCRETE CYLINDER CARE

Concrete cylinders are cast on a project site for a variety of reasons and are essential for the success of the overall structure. Consistency in testing and ultimately the care taken to cast, transport and cure these cylinders will determine the true quality of the concrete delivered. The following **10 steps** will aid contractors to work in collaboration with the testing labs they have hired, to ensure that all proper testing procedures are followed. In addition, to simplify each requirement and to know what to look out for, "**ACTION**" items have been included for each step.

HERE ARE THE CRITICAL 10 STEPS:

1 CERTIFICATION.

Technical certification is the cornerstone of standardized and consistent testing practices. Having a certified testing technician on site ensures that they are capable of producing reliable and consistent results.

Acceptable Concrete Testing Technician Certifications:

a) CCIL Certified Concrete Testing Technician

b) ACI CSA Standards Concrete Field-Testing Technician

ACTION: Ensure that all testing is performed or directly supervised by a certified Testing Technician on site.

2 SAMPLING.

For any concrete testing, a representative sample must be taken from the ready mixed truck. Samples of concrete for casting cylinders must be taken after 10% of the truck volume has been discharged, but less than 90% of the overall volume. Commonly this means discharging approximately 1 cubic meter of concrete before taking a sample. The concrete sampled shall be protected from the elements.

ACTION: Discharge the required volume from the truck before taking a representative sample.

3 CASTING.

The cylinders shall be moulded on a level, rigid surface, free of vibration and other disturbances, and as close as possible to the initial curing location. All proper casting and consolidation methods must be followed to ensure consistency across all specimens.

ACTION: Propose a suitable casting location to meet all necessary requirements.

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4 PROTECTION.

To minimize moisture loss, the finished specimens shall be immediately covered with a non-absorptive, non-reactive cap or plastic sheet secured to prevent evaporation of water from the specimens.

ACTION: Confirm that specimens are covered immediately after the top surface has been struck off.

5 TRANSPORTING.

When moving the specimens from the casting area to the initial curing location, avoid all jarring, striking, tilting, and deformation of cylinders. Cylinders must be transported immediately or shorty after casting.

ACTION: Minimize distance and disturbances when transporting cylinders from the casting area to the storage location.

6 STORAGE.

The cylinders must be stored on a rigid horizontal surface free from vibration during the initial curing phase. Common storage locations include site trailers and curing boxes.

ACTION: Designate an appropriate storage area for the initial cylinder curing period.

7 CURING.

Adequate facilities for the safe storage and proper curing of concrete test specimens on the project site are critical for the initial curing period. The concrete cylinders shall be stored in a designated and temperature-controlled environment that maintains the temperature between 15 and 25°C immediately adjacent to the specimens.

ACTION: Provide a temperature-controlled environment for initial curing of cylinders.*

8 REPORTING.

Cylinder strength reports must indicate that proper procedures have been followed and any deviations recorded. The records of the maximum and minimum temperature within the curing enclosure during the initial curing period shall be reported.

ACTION: Confirm the usage of a temperature logging device during initial curing.

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9 TRANSFERRING.

The test specimens shall be transported from the field to the laboratory only after curing for a minimum of 20 hours. During transportation, cylinders must be protected from any shocks or exposure to adverse conditions.

ACTION: Ensure the protection of cylinders prior to final transportation.

10 COLLABORATION.

Concrete construction is a collaborative environment requiring ongoing improvement and therefore it is vital for test results to be provided to the owner, contractor, and concrete supplier within five working days of completion of the test. Both field and laboratory test reports shall include all information required by the applicable test methods.

ACTION: Ensure collaboration and distribution of test results as they become available amongst all relevant parties for continuous quality improvement.

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* Contactor Responsibilities as per CSA A23.1 Clause 4.4.1.8

To facilitate testing, the contractor shall provide and maintain, for the sole use of the testing agency, adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the initial curing period. Adequate facilities shall include a protected and temperature-controlled designated area to comply with CSA A23.2-3C.

References:

1. CSA A23.1/2:19 – Concrete materials and methods of concrete construction/Test methods and standard practices for concrete

COMMON CYLINDER TESTING SHORTCOMINGS

Inadequate testing practices play a major role in not only the validity of the test results but also in the overall success of the project. Some of the most common concrete cylinder field testing oversights are outlined in the examples below. Colour-coded pictures are also supplied to aid in distinguishing appropriate testing methods (depicted in green) from insufficient ones (depicted in red).

CERTIFICATION.

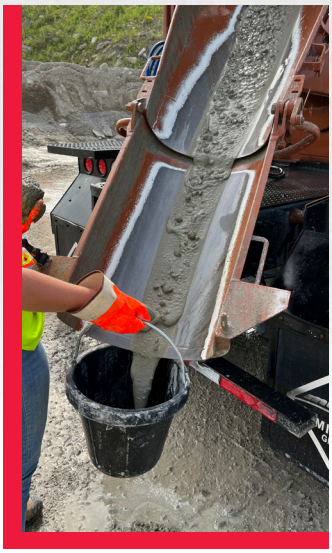
Certified technicians commonly have available a certification card which proves their certification status and can be requested.

Uncertified technicians can have a detrimental impact on both the test results and project.

SAMPLING.

The sampling of concrete can be conducted off the chute directly into a wheelbarrow or a sampling container. The required 10% of the volume for a representative sample must first be discharged.

Improperly sampled concrete can lead to cylinders which will not be representative of the overall concrete quality.



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COMMON CYLINDER TESTING SHORTCOMINGS

CASTING.

All applicable casting procedures must be followed when the cylinders are being cast. This includes having a level, rigid surface and proper consolidation. Common practice is to use a slump board for proper casting as well as easy cleanup.

Avoid casting cylinders on uneven or rough terrain.

PROTECTION.

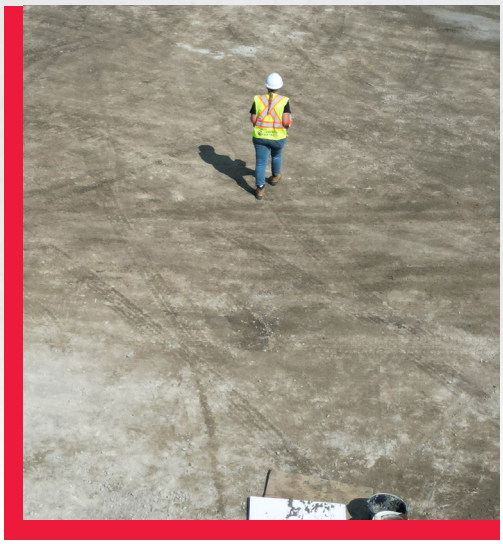
Moisture loss is detrimental to the strength development of concrete specimens and must be prevented at all costs. This may include covering the cylinders using plastic bags or more commonly capping them.

Cylinders must be properly protected and not be exposed to the elements.

TRANSPORTATION.

The specimens should be cast as close as possible to the initial curing location to avoid any disturbances during transportation.

Typically, cylinders are cast either beside a site trailer or wherever a curing box will be stored. Walking long distances with cylinders is to be avoided at all costs.



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COMMON CYLINDER TESTING SHORTCOMINGS

STORAGE.

A safe area must be designated for the storage of the specimens to minimize any unintended impact on the quality.

Site trailers and curing boxes are commonly used and their location should be discussed before any concrete is placed.

CURING.

The curing of concrete is fundamentally critical to achieving the desired performance criteria. Specimens must be maintained in an environment which is temperature controlled between 15-25°C. This includes providing additional heat to the curing box in the winter (ex. light-bulb) and cooling in the summer (ex. cool water).

The contractor is responsible in providing a designated initial curing location.

REPORTING.

To ensure that the curing requirement outlined previously is achieved, temperature logging devices must be used, and the actual temperature monitoring information included on the compressive strength report.

Commonly a min/max thermometer is employed which can be replaced with automatic temperature logging sensors for further efficiency.

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TRANSFERRING.

Transferring the cylinders from the initial curing location to the certified laboratory must be conducted after the minimum 20 hour period.

During transportation, specimens shall be secured to minimize any adverse shock or impact which could negatively affect strength results. Typically, cylinders are transported in crates and must not be loose in the back of trucks.

COLLABORATION.

All parties benefit from the transfer of information, and this includes the sharing of test results. Within 5 business days of the completion of the test, the reports should be made available for review and to determine whether any adjustments should be made to achieve optimal performance of the concrete.

PROJECT IMPACT:

By not following all applicable testing requirements including the ones outlined above, unnecessary additional testing may be required which can have negative impacts on construction projects. It can lead to delays, increased costs, increased waste generation and higher carbon contents and potential disruptions to the project timeline. Additional testing can also create inefficiencies, diverting resources away from other critical tasks. Moreover, it can cause frustration and strain relationships between project stakeholders, leading to a breakdown in communication and collaboration. Striking a balance between adequate testing for quality assurance and avoiding unnecessary redundancy is essential for ensuring efficient and successful construction projects. **Enforcing the 10 steps outlined in this document** will help all stakeholders to be more mindful of the concrete testing being performed on site and will help to prevent any setback in the future.

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A **CSA Standards Concrete Field Testing Technician** is an individual who has demonstrated the knowledge and ability to properly perform and record the results of eight basic field test methods and standard practices on freshly-mixed concrete as prescribed by Canadian Standards Association methods.

Please contact Concrete Ontario at **info@concreteontario.org** for more information.