



PRE-CONSTRUCTION CHECKLIST

Concrete Acceptance Testing

Pre-construction meetings are important to plan concrete construction work before the start of a project to avoid potential problems. This pre-construction checklist specifically addresses issues related to acceptance testing of concrete for a clear understanding of associated responsibilities between stakeholders and to establish lines of communication. This checklist is intended to be a guide and may not cover all items that need to be discussed. Notes are provided with more detail and includes references to applicable industry standards.

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Pre-Construction Checklist Concrete Acceptance Testing

Project Information							
Project Name: _____				Location: _____			
Project Representatives:							
Owner: _____				Architect: _____			
Structural Engineer: _____				Construction Manager: _____			
General Contractor: _____				Concrete Supplier: _____			
Testing Agency: _____				Other: _____			
Concrete Mixture Design Submittals							
Application / Placement location	Mix Code / Designation	Special Attributes (See codes)	Specification Requirements for Mixtures				Approved Y/N
			Strength / age	Max w/cm	Slump/Slump flow	Air (%)	

Concrete Quality Control / Assurance (NOTE 1)		(Circle Yes or No)
Does Owner's testing/laboratory comply with ASTM C1077?		Yes No
If not, explain.		
Technician(s) Certification in accordance with ASTM C1077 (NOTE 2)		(Circle Yes or No)
Concrete Field Testing Technician		Yes No
Concrete Laboratory Testing Technician		Yes No
Concrete Aggregate Testing Technician		Yes No

Concrete Sampling and Testing Requirements (NOTE 3)		
Sampling Frequency: _____		
Sampling Location: _____	At discharge from the transportation unit (C172)	Point of Placement
Method of sampling at placement		

Tests to be performed on each sample (NOTE 4)		(Circle all that apply)	
Slump	Slump Flow	Compressive Strength:	Standard Cured
Air Content: Method	_____	# cylinders / age	Field Cured
Density (unit wt.)	Temperature	Flexural Strength:	Standard Cured
Other		# beams / age	Field Cured

On-site Adjustments to Concrete (NOTE 5)	
Who can request adjustments for slump and/or air content at the project site? _____	
What methods or restrictions apply? _____	

Acceptance/Rejection of Fresh Concrete (NOTE 6):			
Who is authorized to accept/reject a concrete delivery? _____			
What criteria will be used to accept/reject a concrete delivery? _____			
Slump:	_____	Temperature:	_____
Air Content:	_____	Density (unit wt.):	_____
w/cm Ratio (method?):	_____	Time Limit / Revolutions:	_____
Other _____			

On-site Concrete Testing Monitoring	(Circle Yes or No)	
Will there be on-site monitoring of field concrete testing?	Yes	No
If yes, what tool(s) will be used? _____		
CTAC: _____ Other: _____		
CTAC (Concrete Testing Adherence Collaboration) is a tool to assist in evaluating the consistent performance of fresh concrete testing. Observations are performed by ACI Concrete Field Testing Technician Grade 1 certified individuals		

Test Specimen Storage and Transportation (NOTE 7-10)		
Standard Curing Method: (Concrete Acceptance)	(Circle Yes or No)	
Immersed in water-controlled temperature environment (Preferred)	Yes	No
Storage box-controlled temperature environment	Yes	No
Exposed to the environment (does not comply with C31)	Yes	No
Other _____		
Are field tests and jobsite curing being done by a different entity from that performing strength tests?	Yes	No
Who's responsible for providing specimen storage water tank or curing box? _____		
Who's responsible for maintaining and recording the temperature of the storage environment? _____		
What is the expected duration that cylinders will be retained at the jobsite before transportation to the laboratory? _____		
How will testing technicians access jobsite for cylinder pickup? _____		
When will specimens, cast on days preceding non-work days, be transported to the laboratory? (NOTE 11)		
Please explain: _____		
Will ASTM C31 initial curing requirements be enforced through an inspection process?	Yes	No

Field Curing of Cylinders or Beams (NOTE 12):
Purpose _____
Method _____

Contact Information for Test Results to be sent to (via email, fax, mail) to: (NOTE 13, 14)	
Owner: _____	Architect: _____
Engineer: _____	Concrete Supplier: _____
General Contractor: _____	Other: _____

Resolution of Non-conforming strength tests – based on core tests (NOTE 15):

- When strength test results comply with requirements – cost of core tests will be borne by owner or representative
- When strength test results do not comply with requirements – cost of core tests will be borne by the concrete supplier



Statement of Acknowledgement

The American Concrete Institute (ACI) and the ASTM International have established standards and practices for acceptance of concrete supplied to projects. If fresh concrete and strength tests are not performed in accordance with these standards, the results are invalid. We believe the information in this document accurately reflects the discussion(s) between all attendees.

Circle (Yes or No)			Circle (Yes or No)		
Owner	Yes	No	General Contractor	Yes	No
Engineer	Yes	No	Construction Manager	Yes	No
Architect	Yes	No	Concrete Supplier	Yes	No
Owner Testing Agency	Yes	No	Other Testing Agency	Yes	No
Meeting Location and Date					

Additional Discussion Items:

Subgrade prep, Scheduling, Delivery, Washout Location, Jointing, Curing (evaporation control, moisture protection, hot/cold weather)

Notes

Note 1: MS*, ACI 318-19 (26.12.1.1(c)), ACI 301-20 (Section 1.7.3.1), and ACI 311.6-18, *Specification for Testing Ready Mixed Concrete* (Section 1.2.2) require that the agency performing acceptance testing comply with ASTM C1077 *Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation*. Documentation of compliance can be through an inspection or accreditation entity. Documentation should be provided to the entity hiring the testing agency for acceptance testing.

Note 2: ACI 318-19 (26.12.1.1 (d) and (e)) states that certified field and lab testing technicians shall perform tests. MS*, ACI 301-20, and ACI 311.6-18 state that field tests shall be performed by an ACI Field Testing Technician Grade I and lab tests by ACI Lab Testing Technician Level 1, ACI Concrete Strength Testing Technician, or equivalent that includes a written and performance evaluation. These certification requirements are also required by testing agencies that conform to ASTM C1077.

Note 3: MS*, ACI 318-19, ACI 301-20, and ASTM C94 require that concrete be sampled in accordance with ASTM C172 at the point of discharge from the transportation unit. This practice does not address sampling at the point of placement, such as from the discharge from a pump. ACI 318-19 (19.3.3.2 and R19.3.3.2) and ACI 301-20 (4.2.2.4(c) and optional requirement checklist) indicate that if the designer requires sampling at the point of placement, the method of sampling should be described and indicates that acceptance criteria may need to be changed. Samples should also be obtained at discharge from the transportation unit to consider the impact of the placement method on specified properties. The concrete supplier will be responsible for compliance with specification requirements when tests are performed on samples obtained in accordance with ASTM C172 and tests are in accordance with applicable ASTM standards.

Note 4: ASTM C172 (4.1.1) states: *Transport the individual samples to the place where fresh concrete tests are to be performed or where test specimens are to be molded.* Section 4.1.2 states: *Start tests for slump, temperature, and air content within 5 min. after obtaining the final portion of the composite sample.* ACI 301-20 and ASTM C94 require the density to be measured in accordance with ASTM C138. This test provides useful information about the quality of concrete and potentially causes for low strength test results. The density is also used to determine yield that can be compared to the quantity ordered.

Note 5: ASTM C94 Section 12.7, allows a water addition from the truck tank system or water addition by an automated system during transit provided the maximum water content for the batch as established by the designed mixture has not been exceeded. Water can be added as several distinct additions provided no concrete has been discharged except for a preliminary sample for slump or air content tests. When air content is below the specified level, Section 8.3 allows the concrete supplier to adjust the level with additional air-entraining admixture. It is also permitted to increase slump by using admixtures when the limit of water addition has been reached.

Note 6: ASTM C94, (7.2) states, *the producer shall not be responsible for the limitation of minimum slump or slump flow after 30 min. have elapsed starting either on arrival of the vehicle at the prescribed destination or at the requested delivery time, whichever is later.*

Note 7: ASTM C31 states: *Immediately after molding and finishing, the specimens shall be stored for a period up to 48h in a temperature range from 60 and 80°F and in an environment the controls moisture loss from the specimens. For concrete mixtures with a specified strength of 6000 psi or greater, the initial curing temperature shall be between 68 and 78°F.* ASTM C31 also states: *The storage temperature shall be controlled by use of heating and cooling devices, as necessary. Record the temperature using a maximum-minimum thermometer.*

Note 8: MS* and ACI 301-20 (1.7.2) addresses contractor's responsibilities regarding testing:

- Allow access to the project site or to the source of materials to perform testing and inspection activities and assist Owner's testing agency in obtaining and handling samples at the project site or at the source of materials. MS* specifically states daily access to project site should be provided.
- Advise Owner's testing agency at least 24 hours in advance of operations to allow for scheduling of quality assurance tests, review of project requirements, and for the assignment of personnel.
- Provide secure location and source of water and electrical power on the project site for the Owner's testing agency to be used for initial curing of concrete test specimens as required by ASTM C31. MS* specifically states secure space, security and protection of test samples and source of water and continuous electrical power for initial curing at project site should be provided.

Note 9: Testing Agency Responsibilities are as follows:

- MS*, ACI 318-19 (26.12.1.1), ACI 301-20 (1.7.3.3(e)), and ACI 311.6-18 (2.5.1) state that cylinders for acceptance based on compressive strength tests shall be made and standard cured in accordance with ASTM C31.
- MS* and ACI 311.6-18 (2.5.1) requires the testing agency verifies that the specimens are stored under the ASTM C31 requirements, that temperature controls are provided to maintain ASTM C31 requirements, and calibrated temperature recording devices are used to record maximum and minimum temperatures of the initial curing environment.
- ASTM C31 (12.1.5) and ACI 311.6-18 require that the maximum and minimum temperatures during the initial curing period of the standard cured cylinders be reported. ACI 301-20 (1.7.3.2.c) states that concrete test reports should include detailed information of storage and curing of specimens before testing. MS* specifically states that test reports include reporting requirements of ASTM C31, ASTM C39, and ACI 301 including Information on storage and curing of samples before testing, curing method, and maximum and minimum temperatures during initial curing period.

- MS* requires the testing agency to provide the on-site curing facility (container) and verify that test specimens are maintained in accordance with ASTM C31 at the jobsite. ACI 311.6-18 requires the testing agency to verify that the specimens are stored under conditions in accordance with ASTM C31.

Note 10: ASTM C31 requirement for final curing: *Upon completion of initial curing and within 30 min after removing the molds, cure specimens with free water maintained on their surfaces at all times at a temperature of $73.5 \pm 3.5^{\circ}\text{F}$ using water storage tanks or moist rooms conforming to ASTM C511.*

Note 11: ASTM C31 (11.1) states: *Specimens shall not be transported until at least 8 h after final set. During transporting, protect the specimens with suitable cushioning material to prevent damage from jarring. During cold weather, protect the specimens from freezing with suitable insulation material. Prevent moisture loss during transportation by wrapping the specimens in plastic, wet burlap, by surrounding them with wet sand, or tight fitting plastic caps on plastic molds. Transportation time shall not exceed 4 h.*

Note 12: Refer to ASTM C31 Section 4 that outlines the distinct purposes of strength results from standard-cured and field cured specimens. Field cured specimens should not be used for acceptance of concrete supplied on a project. Field cured specimens are used to estimate the strength of concrete in the structure – to determine when the structure can be put in service (open to traffic, time to post-tension, etc.; compare with test results of standard cured specimens or in-place tests; determine the adequacy of curing and protection of the structure; and to determine time for removal of forms or shoring.

Note 13: MS*, ACI 318-19 (26.12.1.1 (f)), ACI 301-20 (1.7.3.2 (c)), and ACI 311.6-18 (3.2) require the Owner's testing agency to report ALL test results to the Architect/Engineer, Contractor, Concrete Supplier, and Owner. ACI 301 also requires that the testing agency issue the report to the parties within 7 days, but immediately when it appears that furnished material is not compliant with the specifications. MS* specifically states that test reports be provided within 48 hours of testing. Test results from standard-cured strength specimens should be evaluated separately for each concrete mixture. Test results are considered to be valid if are conducted in accordance with standardized procedures. Establishing validity of test results not conducted in accordance with specified procedures will be the responsibility of the Owner's testing agency.

Note 14: The strength of concrete is satisfactory based on standard-cured strength specimens if the following criteria are met (ACI 301-20):

1.7.6.1 a *Every average of three consecutive strength tests equals or exceeds the specified compressive strength f'_c .*

1.7.6.1 b *No strength test result falls below f'_c by more than 500 psi when f'_c is 5000 psi or less, or by more than $0.10 f'_c$ when f'_c is more than 5000 psi.*

These criteria are in ACI 318-19 (26.12.3.1)

Note 15: NRMCA publication 133 describes a recommended sequence of steps when low strength results occur. The publication can be obtained from www.nrmca.org. Strength of cores cannot be expected to achieve the same strength level as standard-cured cylinders or the associated acceptance criteria. Strength of cores are also influenced by factors beyond the quality of concrete supplied. Some of these include handling, placing, finishing, curing and protection of the constructed structure, age since the pour and adverse environmental conditions that the structure has been exposed to. Cores should be obtained and conditioned in accordance with the procedures outlined in ASTM C42. Core strengths are also affected by the location of concrete in the structure and the orientation of the core relative to how concrete was placed. ACI 318-19 (26.12.6.1(e) and ACI 301-20 (1.7.6.3) state that the concrete represented by core tests is considered satisfactory if the following criteria are met:

- The average of three cores is equal to at least 85 percent of the specified strength, f'_c*
- No single core is less than 75 percent of f'_c*

MS* - AIA MasterSpec June 2023 version

Suggested Special Attribute Codes

AE	Air Entrained	CLR	Color Addition	NCA	Non-Chloride Accelerator
NAE	Non-Air Entrained	CI	Corrosion Inhibiting	SF	Silica Fume
LTWT	Lightweight Agg.	SRA	Shrinkage Reduction	UFFA	Ultra Fine Fly Ash
SCC	Self-Consolidating	FP	Fiber Product	HVWT	Heavy Weight Aggregate
HRWR	High Range WRA	HE	High Early Strength	RE	Retarder
HS	Hydration Stabilizer	Other			