



## Conduct of Engineering Formal Clarification or Interpretation Request

Assigned by Responder:  Clarification  Interpretation Tracking number \_\_\_\_ESM-CIR-2012-008\_\_\_\_

<b>Clarify</b>	To make the CoE document or its references understandable and free from confusion
<b>Interpret</b>	To formally provide an acceptable method of compliance with the document or references

### 1.0 Request

Brief Title:
Affected Document Title, Number, and Rev. No. LANL Master Specification Division 3 3001, Reinforced Concrete
Section/Article/Para and Existing Wording  PART 3, EXECUTION  1.1 GENERAL  A. Conform to applicable provision of ACI 301 unless otherwise specified herein.  B. Mix, test, and deliver concrete, along with test records in accordance with ASTM C 94. Mixing water must be added with the use of a calibrated measuring device, such as a mechanical water meter. Tank sight glasses are not acceptable.
Inquiry (describe ambiguity or issue)  <b>Summary:</b> Job site addition of water is done to temper the concrete by adding the portion of the design mixing water which is held back during initial mixing. The amount of water added at the job site has to be controlled. The addition of water in excess of the design mixing water will affect the concrete properties, such as reducing strength and increasing its susceptibility to cracking. Concrete acceptance, for slump, is in accordance with ASTM C 94, Standard Specification for Ready Mixed Concrete. For decades the commercial industry has been measuring the amount of water added at the job site by use of a graduated site glass. Mechanical measuring equipment can be added to ready mix trucks as an option for measuring the amount of water dispensed.  This clarification is requested to allow the use of a graded approach to the use of measuring the amount of water used to slump in the field. For ML3/4 concrete placements site glass or mechanical methods may be used in accordance with standard industry practices. For ML 1/2 concrete placements mechanical methods and a graduated cylinder are used for greater accuracy.  <b>Discussion:</b> When concrete arrives at the jobsite with a slump that is lower than that allowed by design or specification and/or is of such consistency so as to adversely affect the placeability of the concrete, water is added to the concrete to bring the slump up.  The requirements for slump adjustment are given in ACI 301-05, "Specifications for Structural Concrete." Section 4.3.2.1, states: "When concrete arrives at the point of delivery with a slump below that which will result in the specified slump at the point of placement and is unsuitable for placing at that slump, the slump may be adjusted to the required value by adding water up to the amount allowed in the accepted mixture proportions unless otherwise specified by the Architect/Engineer. Addition of water shall be in accordance with ASTM C 94/C 94M. Do not exceed the specified water-cementitious material ratio or slump."

User's Guide to ASTM Specification C 94 on Ready-Mixed Concrete, recommend one addition of water at the job site as good standard practice. The ready-mixed concrete producer often 'holds back' some water at the batch plant to accommodate water addition at the job site by the contractor to achieve greater consistency. The target slump at the batch plant and the nominal slump specification usually will be identical therefore the addition of water is needed only if the slump falls below the target value during transport."

The National Ready Mixed Concrete Association has established an NRMCA Fleet Inspection Reporting Spreadsheet that requires inspection of the water Gage or Meter Accuracy which states "On units equipped to batch mixing water, equipment to be in proper working condition: gauge glasses or water meters clean and legibly graduated; water pump or injection system in good working order with nozzles unobstructed and without leakage into mixer; water measurement spot-checked and found accurate to within  $\pm 1$  gallon for sight gauges;  $\pm 2$  percent of target water for water meters on truck mixers. Discussions with Mike Schweitzer, an engineer with Schwing USA, indicates that even Digital Totalizes have an accuracy of  $\pm 5\%$  over a flow range of 3-30gpm.

Would the following statements constitute a correct clarification?

### PART 3, EXECUTION

#### 1.1 GENERAL

- A. Conform to applicable provision of ACI 301 unless otherwise specified herein.
- B. Mix, test, and deliver concrete, along with test records in accordance with requirements established in ASTM C 94. ~~Mixing water added at the batch plant must be added with the use of a calibrated measuring device, such as a mechanical water meter.~~ Concrete acceptance for slump shall be based on testing in accordance with ASTM C 94, and compared to the requirements established in design documents.
- C. For ML-3/4 concrete – Adding mixing water in the field is only permitted if the ready-mix producer held back water at the batch plant and the slump after transport is less than that specified in the design documents.

Care must be taken not to exceed the water-cement ratio. To adjust for measuring technique accuracy, the amount of water that can be added shall be reduced by 10% from the maximum calculated water holdback volume.

In addition, mixing water added in the field to adjust slump is permitted only when the water measuring device used is as follows:

- A LANL approved mechanical measuring device; or
- The ready mix truck sight glass may be used if the following conditions are met:
  - The trucks must have a current NRMCA certification
  - There must be a pass (i.e. "P") entry on the NRMCA Fleet Inspection Reporting Spreadsheet - Truck Mixers under Section/Column 5.1.6, Water Gage or Meter. The aforementioned spreadsheet shall be part of a current NRMCA certification of the ready-mix producer and its facilities and its trucks.

- D. For ML-1/2 concrete - Adding mixing water in the field is only permitted if the ready-mix producer held back water at the batch plant and the slump after transport is less than that specified in the design documents.

Care must be taken not to exceed the water-cement ratio. To adjust for measuring technique accuracy, the amount of water that can be added shall be reduced by 10% from the maximum calculated water holdback volume.

In addition, mixing water added in the field to adjust slump is permitted only when the water measuring device used is as follows:

- A LANL approved mechanical calibrated device; or
- The ready mix truck sight glass may be used if the following conditions are met:
  - The trucks must have a current NRMCA certification
  - There must be a pass (i.e. "P") entry on the NRMCA Fleet Inspection Reporting Spreadsheet - Truck Mixers under Section/Column 5.1.6, Water Gage or Meter. The aforementioned spreadsheet shall be part of a current NRMCA certification of the ready-mix producer and its facilities and its trucks.
  - The water-measuring device shall be manually verified prior to the addition of water. This requirement need not exceed one verification per set of water additions by a given truck in a given project-site visit. The intent of the verification to ensure that the measuring device is accurate within a tolerance of  $\pm 5\%$ . This can be accomplished by dispensing water in a graduated cylinder/container and the measuring device reading compared to the graduation marks in the cylinder/container. The amount of water added to the concrete mix is adjusted to consider the verification.

Requestor (LANL employee) Patrick Rowe	Z Number 217330	Organization ES-PE	Date 1/9/2012
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**2.0 Response by Safety (or Security) Management Program Owner Representative (SMPOR/POC)**

Name Glen Pappas	Z Number 194518	Signature Signature on file	Date 1/17/12

**3.0 SMPO Approval (Standards Manual and code and regulation matters only, otherwise N/A)**

Comments			
Name Daniel Steinberg	Z Number 219039	Signature Signature on file	Date 1/17/12

Distribution (may be electronic): Requestor, SMPOR, SMPO, CENG-OFF Program POC