Concrete Tech Tip # 24

Jobsite Addition of Water

1. WHAT is Jobsite Addition of Water?

This the addition of water to ready-mixed concrete in a truck mixer after arrival at the location of the concrete placement. Such tempering of concrete may be done with a portion of the design mixing water which was held back during the initial mixing, or with water in excess of the design mixing water, at the request of the purchaser.

2. WHY is Water Added at the Jobsite?

When concrete arrives at the jobsite with a slump that is lower than allowed by design or specification, water can be added to the concrete to bring the slump up to an acceptable or specified level. This can be done when the truck arrives on the jobsite, as long as no more than 60 minutes have elapsed from the time of batching as shown on the delivery ticket to the start of discharge, and the specified slump and/or water-cementing ratio is not exceeded. In some circumstances, set retarders or hydration stabilizers may be used to extend the elapsed time allowed for water addition as permitted by the owner. Finally not more than the lesser of 16 L/m^3 or 10% of the design mix water shall be added. Such an addition of water is in accordance with CSA A23.1-14, Concrete Materials and Methods of Concrete Construction (Clause 5.2.5.3.2).

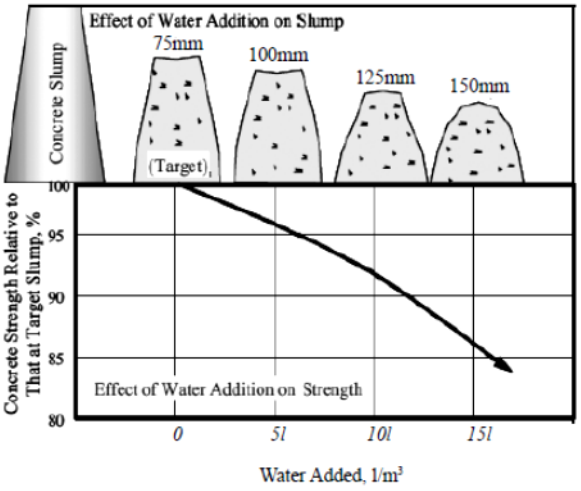

Figure 1. Example of effect of water addition on slump and strength of concrete.

The jobsite addition of water is often used to compensate for a real or perceived lack of workability which makes the concrete difficult to place and/or consolidate. The ready mixed concrete supplier designs the concrete mixture according to industry standards to provide the intended performance. Addition of water in excess of the design mixing water will affect concrete properties, such as reducing strength (Figure 1) and increasing its susceptibility to cracking. If the purchaser requests additional water, in excess of the design mix, the purchaser assumes responsibility for the resulting concrete quality. The alternative of using a water reducing admixture or super-plasticizer to increase concrete slump should be considered. Provided segregation is avoided, increasing the slump of concrete using admixtures usually will not significantly alter concrete properties. When adding water to a load of concrete, you may affect the air content. Refer to Concrete Tech-Tip 15 for further information.

3. HOW to Add Water at the Jobsite.

a. The maximum allowable slump of the concrete must be specified or determined from the specified nominal slump plus tolerances.

References:
1. CSA A23.1-14/A23.2-14 *Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete*, The CSA Group, Mississauga, ON, Canada.
2. NRMCA Publication 186 *Ready Mixed Concrete*, Richard D. Gaynor and Colin Lobo, NRMCA, Silver Spring, MD
3. *Checklist for Pre-construction Conference*, Joint Publication of ASCC and NRMCA,, NRMCA, Silver Spring, MD
4. NRMCA Publication 188, *Truck Mixer Driver's Manual*, NRMCA, Silver Spring, MD
5. *Adding Water to the Mix: It's Not All Bad*, Eugene O. Goeb, *Concrete Products*, January 1994.
6. *Adjusting Slump in the Field*, Bruce A. Suprenant, Concrete Construction, January 1994.
7. *Slump Retention of Fly Ash Concrete With and Without Chemical Admixtures*, Dan Ravina, ACI Concrete International, April 1995.
8. CIP 26 *Jobsite Addition of Water*, NRMCA with permission, Silver Spring, MD

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CSA A23.1-14 Clause 4.3.2.3.2 specifies the following tolerances:

Specified Slump:	Tolerance:
80 mm or less	± 20 mm
80 mm to 180 mm	±30 mm
180 mm or more	± 40 mm
Slump flow	± 70 mm

b. Prior to discharging concrete on the job, the actual slump of the concrete must be estimated or determined. If the slump is measured, it should be on a sample from the first 20L of discharged concrete. This result is used as an indicator of concrete consistency, it is not an acceptance test. Tests for acceptance of concrete should be made in accordance with CSA A23.2 - 1C. The sample should not be taken from the first or last 10% of the load.

c. At the jobsite, water should be added to the entire batch so that the volume of concrete being retempered is known. A rule of thumb that works reasonably well is 5 litres, or 5 kg, of water per cubic meter for 25 mm increase in slump.

d. The amount of water added and by whose authority shall be recorded on the delivery ticket.

e. CSA A23.1 requires 30 or more revolutions of the mixer drum at mixing speed after the addition of water.

f. The amount of water added should be controlled so that the maximum slump and/or water-cementing ratio, as indicated in the specification, is not exceeded. After more than a small portion of the concrete is discharged, no further water addition is permitted.

g. Upon obtaining the desired slump and/or maximum water-cementing ratio, no further addition of water on the jobsite is permitted.

h. A pre-construction meeting should be held to establish proper procedures to be followed, to determine who is authorized to request a water addition, and to define the method to be used for documentation of water added at the jobsite.

Jobsite Water Addition

1. Establish the maximum allowable slump and water content permitted by the job specification.
2. Estimate or determine the concrete slump from the first portion of concrete discharge from the truck.
3. Add an amount of water such that the maximum slump and water-cementing materials ratio, according to the specification, is not exceeded.
4. Measure and record the amount of water added. Water in excess of that permitted above should be authorized by designated representative of the purchaser.
5. Mix the concrete at least 30 revolutions at mixing speed to produce uniform mix.
6. Do not add water if:
    a. The maximum water-cementing materials is reached.
    b. The maximum slump is obtained.
    c. The load has already been retempered.

If super-plasticized concrete falls below the specified slump, special precautions should be taken when retempering the load.

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