DSA IR 19-5

MIXING WATER USED IN CONCRETE: 2022 CBC

Disciplines: Structural

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Division of the State Architect (DSA) documents referenced within this publication are available on the DSA Forms or DSA Publications webpages.

PURPOSE

This Interpretation of Regulation (IR) clarifies requirements for the acceptance and use of mixing water not from potable water sources used in concrete mixes for construction projects under DSA's jurisdiction.

SCOPE

This IR applies to all projects using mixing water not from potable water sources in concrete mixes for projects submitted to DSA under the California Building Code (CBC). This IR is not applicable to masonry grout mixing water required to have mixing water that is clean and potable in accordance with ASTM International (ASTM) C476.

BACKGROUND

The ready-mix concrete industry in California uses millions of gallons of water each year. Some of this water is used to batch the concrete and is necessary for the concrete to properly mix, hydrate and gain strength. The balance of this water is used for the concrete plant production operations, which could be recycled and used as mixing water. Water sources collected at ready-mix concrete plants generally include storm water runoff, wash water and other water that contains residual concrete ingredients.

Non-potable water sources, such as water from wells, streams, lakes, or other recycled sources, may also be used as mixing water.

Water used from non-potable water sources and water from concrete production for concrete mixing water benefits the environment by reducing wastewater and lessening the need to draw from fresh drinking water sources. Generally, these other water sources can be used as mixing water without detrimental effects to the plastic and hardened concrete.

1. MIXING WATER

Mixing water sources, defined in accordance with ASTM C1602, include:

- Potable water,
- Non-potable water sources,
- Water from concrete production operations, and
- Combined water – a mixture of two or more of the following: potable water, non-potable water, and water from concrete production operations.

For the purposes of this IR 'other water sources' as stated herein includes water from non-potable sources, water from concrete operations and combined water.

2. CONDITIONS OF USE

2.1 Water from other water sources, as defined above, shall be permitted to be used as mixing water in structural and nonstructural concrete provide all the following requirements are met:

2.1.1 The mixing water complies with ASTM C1602.

2.1.2 The mixing water shall not exceed the limits for chloride, sulfate, alkalis, and total solids of ASTM C1602 Table 2, unless more stringent limits are specified by the design professional in responsible charge. The limits of ASTM C1602 Table 2 are mandatory. The limits need not apply to nonstructural concrete unless otherwise specified by the design professional in responsible charge.

2.1.3 Compliance with further restrictions or limitations imposed by the design professional in responsible charge.

2.1.4 Records shall be maintained by the manufacturer to comply with the testing requirements and frequency of testing in accordance with ASTM C1602.

Note: Potable water is permitted as mixing water in structural and nonstructural concrete without testing or qualification.

3. SUBMITTAL TO DSA

When the DSA approved construction documents permit the use of other water sources for mixing water either by direct reference to ASTM C1602 or by general reference to American Concrete Institute (ACI) 318 or ASTM C94, no submittal is required to DSA to request its use, provided the mix design requirements in Section 4 below are followed.

When DSA-approved construction documents do not permit other water sources to be used for mixing water, and the school district and the design professional in responsible charge desire to permit its use, then a construction change document (CCD) per *IR A-6: Construction Change Document Submittal and Approval Process*, shall be submitted to DSA for approval. The CCD scope need only address permitting the use of other water sources for concrete mixing water per ASTM C1602, and any further limitations specified by the design professional in responsible charge. The mix design requirements shall comply with Section 4 below.

4. MIX DESIGN

Concrete mix designs shall comply with the provisions of ACI 318 Chapters 19 and 26 and *IR 17-13: Batch Plant Inspection, Section 2.* A registered civil engineer with experience in concrete mix designs shall select the concrete proportions and shall prepare and submit a mix design report with the associated ASTM C1602 test documentation to the laboratory of record for review.

4.1 Special Considerations

Concrete mix designs shall account for the physical and chemical properties of the mixing water when the water source is not potable, such as:

- Mix water demand.
- Chloride content of mix water.
- Temperature of the mix water.
- Concrete setting characteristics.
- Concrete slump loss.
- Concrete rate of compressive strength gain.
- Concrete drying shrinkage.
- Concrete permeability.
- Admixture compatibility.

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5. RESOURCES

For additional information, see the following resources:

- Colin Lobo & Gary Mullings, *Recycled Water in Ready Mixed Concrete Operations*, Concrete InFocus, Spring 2003.
- National Ready Mixed Concrete Association, *TIP 10 - Mixing Water Quality for Concrete*, October 2013.

REFERENCES:

2022 California Code of Regulations (CCR) Title 24
Part 2: California Building Code (CBC), Section 1903A