

CRD-C 400-63

REQUIREMENTS FOR WATER FOR USE IN MIXING
OR CURING CONCRETE

Requirements

1. (a) **Mixing Water.**- Water used for mixing concrete shall be free of materials that significantly affect the hydration reactions of portland cement or that otherwise interfere with the phenomena that are intended to occur during the mixing, placing, and curing of concrete. Water that is fit to drink may generally be regarded as acceptable for use in mixing concrete. If it is desired to determine whether a water contains materials that significantly affect the strength development of cement, tests may be made according to CRD-C 406. Waters containing up to several thousand parts per million of normally found mineral acids such as hydrochloric acid or sulfuric acid can be tolerated so far as strength development is concerned. Waters containing even very small amounts of various sugars or sugar derivatives should not be used. The harmfulness of such waters will be revealed in tests made according to CRD-C 406. Waters containing large amounts of dissolved sodium or potassium salts should not be used for mixing concrete made with reactive aggregate if no pozzolanic admixture has been specified when by so doing there is a danger of exceeding the condition for which low-alkali cement was specified. If the average of the results of tests, performed according to CRD-C 406, on specimens containing the water being evaluated is less than 90 percent of that obtained with specimens containing distilled water, the water represented by the sample should not be used for mixing concrete.

(b) **Curing Water.**- Water used for curing concrete shall be free of materials that significantly affect the hy-

dration reactions of portland cement or that otherwise interfere with the phenomena that are intended to occur during the curing of the concrete. Curing water intended for use on structures made with reactive aggregate and low-alkali cement but without a pozzolanic admixture should not contain sufficient amounts of dissolved sodium and potassium salts to endanger exceeding the conditions for which the low-alkali cement was specified.

(c) **Staining and Deposits Produced by Curing Water.**- Water used in curing concrete may stain the concrete surfaces or leave unsightly deposits thereon. Staining is usually produced by the presence of organic materials such as tannic acid, or iron compounds such as ferric chloride. The degree of objectionableness of the staining produced as a result of the use of waters containing such materials for curing purposes depends on:

(1) The concentration of the stain-producing material in the water,

(2) The quantity of water evaporated per unit area of concrete surface,

(3) Degree of exposure of the surface to heat and light during evaporation,

(4) Importance of preventing discoloration of the surface.

The test methods outlined in CRD-C 401 are sufficiently sensitive to indicate significant stain when waters containing as low a concentration of ferric chloride as 0.25 ppm were tested in the quantities prescribed. Relatively low concentrations of stain-producing material in curing water may produce objectionable staining especially on concrete surfaces subjected to prolonged exposure to the evaporation of such water. In evaluating the results of staining tests, care should be exercised in evaluating a source when the stain-producing materials were derived from pipes and tanks with which the water came in contact after being taken from its source, and to avoid affecting the

¹Steinour, Harold S., "Concrete Mix Water - How Impure Can It Be?" *Journal of the Research and Development Laboratories, Portland Cement Assn.*, vol 2, No. 3, Sept. 1960, pp 32-50.

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2 WATER FOR USE IN MIXING OR CURING CONCRETE (C 400-63)

results by permitting the transportation and storage of otherwise satisfactory curing water by means that add stain-producing material to it. Water that produces staining or other unsightly deposits that would be objectionable if these were allowed to remain on a concrete surface will not be considered unsatisfactory for use in curing concrete, provided satisfactory arrangements are made for removal of any such stains and deposits without damage to the concrete surfaces on which they form.

Methods of Tests

2. The following methods may be used to test water samples:

- (a) Staining properties (CRD-C 401),
- (b) Iron in water (CRD-C 402),
- (c) Sulfate ion in water (CRD-C 403),
- (d) Chloride ion in water (CRD-C 404),
- (e) Hydrogen-ion concentration of water (CRD-C 405),
- (f) Effect of mixing water on compressive strength (CRD-C 406).