



ICBO Evaluation Service, Inc.

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5360 SOUTH WORKMAN MILL ROAD

• WHITTIER, CALIFORNIA 90601

• (213) 699-0543, 4 or 5
FAX (213) 695-4694

ACCEPTANCE CRITERIA FOR EXTENDED SET CONTROL CHEMICAL ADMIXTURE SYSTEM

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PREFACE

Evaluation reports issued by the ICBO Evaluation Service, Inc. (ICBO ES), are based upon performance features of the Uniform Building Code,[™] Uniform Mechanical Code, Uniform Plumbing Code and related codes. Section 105 of the Uniform Building Code is the primary charging section upon which evaluation reports are issued. Section 105 reads as follows:

The provisions of this code are not intended to prevent the use of any material or method of construction not specifically prescribed by this code, provided any alternate has been approved and its use authorized by the building official.

The building official may approve any such alternate, provided he finds that the proposed design is satisfactory and complies with the provisions of this code and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in suitability, strength, effectiveness, fire resistance, durability, safety and sanitation.

The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency.

The attached acceptance criteria for the general code sections noted have been issued to provide all interested parties with guidelines on implementing performance features on the codes. The attached acceptance criteria were developed and adopted following public hearings conducted by the Evaluation Committee. These criteria may be revised from time to time as the need dictates.

ICBO ES may consider alternate criteria, provided the proponent submits valid data demonstrating that the alternate criteria are at least equivalent to the attached criteria and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a material, type or method of construction, or equipment, meets the attached acceptance criteria, or it can be demonstrated that valid alternate criteria are equivalent and otherwise meet the applicable performance requirements of the codes, if the material, product, system or equipment is such that either unusual care with its installation or use must be exercised for satisfactory performance, or malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use thereof, ICBO ES retains the right to refuse to issue or renew an evaluation report.

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I. SCOPE

These criteria establish the basis for ICBO ES recognition in an evaluation report of extended set control chemical admixture systems.

II. DEFINITIONS

A. **Concrete Chemical Admixture Systems** are two-component systems added to concrete. The first component is a stabilizer which retains concrete in its plastic state for a specified period. The second component is an activator which, when added to a stabilized concrete mixture, allows the hydration process to continue.

B. **Proponent** is the sponsor of an evaluation report.

III. BASIC INFORMATION

Basic information to be submitted with an application for an evaluation report is as follows:

A. **Product Description:** Description of material including weight, packaging, labelling and shelf life.

B. **Installation Instructions:** Instructions pertinent to the two-component chemical admixture system, including dosage rates for each component, and restrictions on use.

General restrictions include the proportion by volume of at least two parts of fresh concrete to one part of stabilized activated concrete.

C. **Test Data:** Testing as outlined in Section IV must demonstrate that the chemical admixture system has no deleterious effect on concrete.

D. **Quality Control:** The proponent must approve users (ready-mix concrete plants) of the admixtures and provide quality control program guidelines for these users. The user must agree to follow the quality control program as a condition of recognition under the evaluation report. The program requires inspection and review by an independent quality control agency approved by the building official. Delivery tickets must be accompanied by documentation that includes information specified in U.B.C. Standard No. 26-13, Section 26.1311 (a) and the following:

1. Time the stabilized activated concrete was originally mixed.
2. Amount and specified compressive strength of stabilized activated concrete (cubic yards).
3. Amount and specified compressive strength of fresh concrete (cubic yards).
4. Amount of total concrete (cubic yards). The lesser of the specified compressive strengths in Items Nos. 2 and 3 will be the specified compressive strength for the total batch.
5. Admixtures and amount of same.
6. Signature of weighmaster.

IV. TEST REQUIREMENTS

A. **Testing Agency:** All tests must be conducted by a testing agency recognized by ICBO ES. As an alternate, tests may be conducted in the proponent's facilities, provided an independent testing agency witnesses all phases of the test program including sampling, test specimen preparation, testing and reporting. Sampling must comply with Section 26.905 of U.B.C. Standard No. 26-9.

B. **Test Reports:** All reports of tests must be signed by the appropriate independent agency. The report must include proportions and preparation of concrete, dosage of admixture components, test procedures, and results of tests.

C. **Comparative Test Data:** Comparative tests must be conducted, using a reference concrete mix outlined in Sections 26.908 through 26.912 of U.B.C. Standard No. 26-9, to evaluate the effects of the chem-

ical admixture system on concrete. Specimens with the chemical admixture system must utilize both admixture components at the recommended quantities. Except as specifically noted, three specimens must be prepared for each test outlined in this criteria.

1. **Compressive Strength:** Compressive strength is evaluated in accordance with ASTM C 39 at 3 days, 7 days, 28 days, 6 months and 1 year.

Conditions of Acceptance: Concrete specimens treated with the chemical admixture system must exhibit average compressive strengths that comply with the specified strength and are at least 90 percent of untreated control specimen's strengths.

2. **Flexural Strength:** Flexural strength is evaluated in accordance with ASTM C 78 at 3 days, 7 days and 28 days.

Conditions of Acceptance: Concrete specimens treated with the chemical admixture system must exhibit flexural strengths that are at least 90 percent of the strengths for untreated control specimens.

3. **Length Change:** Length change is evaluated in accordance with ASTM C 157.

Conditions of Acceptance: If length change of control concrete is 0.030 percent or greater, the length change of concrete containing the admixture cannot exceed 135 percent of the length change of control concrete specimens. Otherwise, the length change permitted in concrete containing the admixture is 0.01 percent maximum over control specimens.

4. **Freeze-thaw Durability:** Freeze-thaw durability is evaluated in accordance with ASTM C 666.

Conditions of Acceptance: The durability factor for the concrete treated with the chemical admixture system must be at least 80 percent.

5. **Concrete Bond to Steel:** Concrete bond to steel is evaluated in accordance with ASTM C 234. Steel bars must be evaluated horizontally in accordance with Section 4.3

Conditions of Acceptance: Average bond strength for concrete specimens prepared with the chemical admixtures system must be at least 90 percent of the average bond strength for untreated control specimens.

6. **Water Absorption:** Water absorption is evaluated in accordance with ASTM C 642.

Conditions of Acceptance: The water absorption for concrete prepared with the chemical admixture system cannot exceed 105 percent of the values for untreated control specimens.

7. **Corrosion Evaluation:** Corrosion evaluation is conducted in accordance with ASTM C 876 or alternative by anodic polarization tests.

Conditions of Acceptance: Voltage ratings must indicate that a protective oxide film is developed on the steel and maintained in both treated and untreated control specimens.

D. **Chemical Stability:** Test specimens are prepared with portland cement, water and the chemical admixture system in accordance with ASTM C 305. Except as specifically noted, specimens are tested at an age of 28 days to determine the effect of the chemical admixture system on the cement hydration process in the following manner:

1. **Nonevaporable Water:** The amount of water chemically combined is evaluated to express the degree of hydration of the cement. Tests are conducted when specimens reach an age of 21 days. Specimens are placed in a vacuum oven to be dried and ignited at a temperature of 1050°C.

Conditions of Acceptance: No significant differences in loss on ignition are observed between untreated control specimens and specimens treated with the chemical admixture system.

2. **X-Ray Diffraction:** Specimens are ground to powder and then exposed to an x-ray beam. The resulting crystalline reflection patterns are then recorded.

Conditions of Acceptance: No significant differences in crystal line patterns between specimens treated with the chemical admixture system and control specimens.

3. **Thermo-gravimetric Analysis (TGA):** This method evaluates the chemical changes and transformation resulting from temperature rise. Specimens are heated at a rate of 2°C. per minute to 200°C. and then at a rate of 10°C. per minute to 600°C.

Conditions of Acceptance: No difference in rate of weight loss per degree Celsius temperature rise between specimens treated with the chemical admixture system and untreated control specimens.

4. **Specific Surface Area:** Specific surface area measures the area of surface on one gram of the specimen. The specific surface is determined by weighing the amount of water vapor absorbed by the specimen surface at a relative humidity of 33 percent over a 10 week period.

Conditions of Acceptance: The specific surface for the specimens treated with the chemical admixture system must be equal or greater than the specific surface for control specimens.

5. **Pore-size Distributions:** Pore-size distribution is determined by forcing mercury into the pores of material by external pressure. The amount of mercury intruded can be converted to a pore-size distribution.

Conditions of Acceptance: No significant differences in porosity between specimens prepared with the chemical admixture system and untreated control specimens.

6. **Differential Thermal Analysis (DTA):** This method evaluates the amount of heat absorbed or liberated when material is heated.

Conditions of Acceptance: The pattern of heat flow versus temperature for specimens treated with the chemical admixture system must be equivalent to the pattern produced from untreated specimens.