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Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete

Reported by ACI Committee 214

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The purpose of this report is to introduce the use of a simplified version of the statistical concepts as outlined in ACI 214 for the specification, control, and evaluation of the production of concrete. For a more elaborate discussion of the concepts, see the "Recommended Practice for the Evaluation of Strength Test Results of Concrete" (ACI 214).

Keywords: coefficient of variation; compression tests; compressive strength; concrete construction; concretes; cylinders; evaluation; quality control; sampling; standard deviation; statistical analysis; variations.

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INTRODUCTION

The strength test is widely used in specifying, controlling, and evaluating concrete quality. Quality concrete must be able to: 1) carry loads imposed upon it; 2) resist deterioration; and 3) be dimensionally stable.

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There are several tests that can be made with plastic and hardened concrete, but the strength test is generally accepted as a measure of the quality of concrete being placed on a project.

Although the strength test is not a direct measure of concrete durability or dimensional stability, it provides an indication of the water-cement ratio of the concrete. The water-cement ratio, in turn, directly influences the strength; durability; wear resistance; dimensional stability; and other desirable properties of concrete. The strength test is also used to measure the variability of concrete. By using statistical methods based on the strength test, realistic specifications can also be prepared.

VARIABILITY OF CONCRETE

Portland cement concrete is subject to numerous factors that affect its strength and other properties. These may include variations in the manufacture of portland cement; preparation of aggregates; batching, mixing, and curing of concrete; and finally in the preparation, handling, and testing of the cylinders. The major variables are listed in Table 1.

These variables must be considered when specifying, producing, or controlling the strength of concrete.

NORMAL DISTRIBUTION

Test data from large concrete projects with many tests show a grouping around the average strength. A

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