

ACI 211.5R-14

Guide for Submittal of Concrete Proportions

Reported by ACI Committee 211



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This guide is intended to assist both the submitter and reviewer by providing a description of necessary information to ensure that the appropriate information is provided. Information required for the preparation and review of a concrete mixture submittal is contained in reference documents such as codes and standards, project drawings and specifications, and other contract documents. These requirements depend on the intended use of the concrete, the available information, and the size of the project. Use of this guide may be limited when contract documents define the submittal format. This guide emphasizes that the concrete mixture is a unique combination of specific ingredients, from particular sources, and in quantities necessary to achieve the intended purpose.

Special note on mass versus weight: *The mass of an object is defined as the amount of matter that is present. Mass is independent of any other property; weight is the force arising from particular gravitational field or other acceleration acting on a mass. The weight is thus dependent on both the mass and the acceleration due*

to gravity rotation. In the common engineering system, a pound of mass is accelerated by gravity to be 1 lb of force. There is no need for distinction, and mass and weight are often used interchangeably in that the units are the same. A mass of 1 lb exerts a weight of 1 lb. There is a hidden gravitational constant. In the SI system, mass is expressed in grams and weight in Newtons. A mass of 1 kg exerts a weight of 9.81 N. It is correct, therefore, to use the term "mass" when determining how much material is being loaded into the plant, and when the mixtures are designed and proportioned. The industry, however, conventionally uses weight for these items. In the common measurement system, this creates no confusion. Thus, the vernacular term for the massing elements of the concrete plant is the weigh hopper. The batch record showing masses of materials in the concrete mixture are collectively referred to as batch weights. In an acknowledgement of this widespread industry practice, and in order to make the document as widely useable as possible, the term "weight" is used throughout to represent mass in the text. This is technically incorrect but is in line with common practice. In all conversions, both mass and weight are given (kilograms and Newtons).

Keywords: admixtures; aggregates; cementitious materials; durability; fine aggregates; fly ash; metakaolin; mixture proportioning; pozzolans; quality; silica fume; slag; slag cement; slump tests; water-cement ratio.

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Reference to this document shall not be made in contract documents. If items found in this document are desired by the Architect/Engineer to be a part of the contract documents, they shall be restated in mandatory language for incorporation by the Architect/Engineer.

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CONTENTS

CHAPTER 1—INTRODUCTION AND SCOPE, p. 2

- 1.1—General, p. 2
- 1.2—Scope, p. 2

CHAPTER 2—NOTATION AND DEFINITIONS, p. 2

- 2.1—Notation, p. 2
- 2.2—Definitions, p. 2

CHAPTER 3—MATERIALS AND PRODUCTION, p. 2

- 3.1—Quality of constituent materials, p. 2
- 3.2—Submittal information, p. 2

CHAPTER 4—CONCRETE MIXTURE PROPORTIONS, p. 3

- 4.1—Proportioning, p. 3
- 4.2—Quantities by weight, p. 3
- 4.3—Quantities by volume, p. 3

CHAPTER 5—DOCUMENTATION OF SPECIFIED PROPERTIES, p. 3

- 5.1—Freshly mixed concrete properties, p. 3
- 5.2—Required average strength f_{cr}' , p. 3
- 5.3—Past performance record submittal, p. 3
- 5.4—Trial batch record submittal, p. 3
- 5.5—Specific properties other than strength, p. 3
- 5.6—Resubmittals, p. 4

CHAPTER 6—ADDITIONAL SUGGESTED DOCUMENTATION, p. 4

- 6.1—Transmittal letter, p. 4
- 6.2—Submittal forms, p. 4

CHAPTER 7—REFERENCES, p. 4

APPENDIX A—PRESCRIPTIVE SUBMITTAL NO. 1 (SINGLE MIXTURE, MULTIPLE PLANTS), p. 5

APPENDIX B—PRESCRIPTIVE SUBMITTAL NO. 2 (MULTIPLE MIXTURES, MULTIPLE PLANTS), p. 11

APPENDIX C—PERFORMANCE SUBMITTAL, p. 14

CHAPTER 1—INTRODUCTION AND SCOPE

1.1—General

Project specifications, reference publications, drawings, and other contract documents contain the requirements for concrete materials, proportions, and characteristics. Concrete mixtures intended to satisfy these requirements are usually submitted based on field test results, laboratory trial mixture data, or both. The purchaser's acceptance of materials and mixtures is based on conformance of the submitted details to the criteria contained in the contract documents.

This guide provides information to assist in the submittal and review of materials and concrete mixture proportions. It is intended to benefit both the submitter and the reviewer.

1.2—Scope

This guide is limited to the preparation and review of the submittal of proposed materials or concrete mixture proportions for conformance with the requirements of the contract documents. Quantitative proportions need only to be submitted when required by the contract documents. There are two types of submittals: prescriptive and performance.

CHAPTER 2—NOTATION AND DEFINITIONS

2.1—Notation

f_c' = specified compressive strength of concrete
 f_{cr}' = required average compressive strength of concrete, used as the basis for selection of concrete proportions

2.2—Definitions

performance submittal—data provided by the concrete supplier to confirm the subject concrete mixture meets all plastic and hardened state properties specified in the contract documents; mixture constituents are not included in these data.

prescriptive submittal—data provided by the concrete supplier to confirm the subject concrete mixture meets all mixture constituent and proportion requirements of the contract documents.

CHAPTER 3—MATERIALS AND PRODUCTION

3.1—Quality of constituent materials

Cementitious materials, aggregates, admixtures, fibers, and water should comply with the requirements stipulated in the contract documents. If a substitution is deemed necessary or desired from the specified material, such deviation will be elaborated along with appropriate documentation that the concrete will be of equal or better performance.

3.2—Submittal information

A submittal is the means by which the concrete supplier confirms that the subject concrete mixture meets all mixture constituent and proportion requirements of the contract documents. Specific data to be submitted will be identified in the contract documents. This section lists items for which a submittal is often required.

3.2.1 Cement or cementitious materials—The class, grade, or type of each material proposed for use on the project should be listed. Mill test reports, manufacturer's certification of compliance, or both, should be submitted. The cement or cementitious materials should comply with the appropriate ASTM requirements.

3.2.2 Aggregates—The types, sources, and individual gradings for each aggregate fraction should be identified. The aggregates should comply with either ASTM C33/C33M or C330/C330M, or have evidence of satisfactory performance. The combined gradings of the total blended aggregate should be provided when required. For coarse aggregates, the size designation (as described in ASTM C29/