

Report on Chemical Admixtures for Concrete

Reported by ACI Committee 212

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Report on Chemical Admixtures for Concrete

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Report on Chemical Admixtures for Concrete

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This report reviews several categories and types of chemical admixtures and their use in unique concrete technologies. They are classified into 12 groups: air-entraining; normal, mid- and high-range water-reducing; accelerating; set-retarding; extended set-control; workability-retaining; viscosity- and rheology-modifying, shrinkage-reducing and shrinkage-compensating, and corrosion-inhibiting; lithium admixtures to reduce deleterious alkali-silica reaction; permeability-reducing; and miscellaneous.

Chemical admixtures are used on a daily basis in the cast-in-place and precast concrete industries. Mixture designs using multiple chemical admixtures are more common today. Their successful use requires compatibility, setting times, and early strengths that are appropriate to the placing environment.

Each category of admixture addresses common use and the potential benefits of a properly proportioned concrete mixture to various professionals, including the concrete contractor, concrete producer, and design professional. The sustainability of chemical admixtures and their role in sustainable construction is addressed. Finely divided mineral admixtures, such as fly ash or raw and processed natural pozzolans, are addressed in ACI 232.2R and ACI 232.1R, respectively.

Keywords: accelerating; admixture(s); admixture system; air-entraining; alkali-aggregate reaction; batching order; cold weather concrete; corrosion-inhibiting; extended set control; finishing concrete; high-range water-reducing admixture; mid-range water-reducing admixture; permeability-reducing admixtures; pervious concrete; self-consolidating concrete; set-retarding; rheology-modifying; shrinkage-reducing; water-reducing; viscosity-modifying; workability-retaining.

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CONTENTS

CHAPTER 1—INTRODUCTION, p. 3

- 1.1—Introduction, p. 3
- 1.2—Scope, p. 3

CHAPTER 2—DEFINITIONS, p. 5

- 2.1—Definitions, p. 5

CHAPTER 3—GENERAL, p. 5

- 3.1—Admixture benefits, p. 5
- 3.2—Specifications for admixtures, p. 5
- 3.3—Sampling and testing, p. 5
- 3.4—Cost effectiveness, p. 6
- 3.5—Selection and evaluation, p. 6
- 3.6—Proportioning and batching, p. 6
- 3.7—Batching order for adding chemical admixtures in concrete, p. 7
- 3.8—Chapter reference chart, p. 8

CHAPTER 4—SUSTAINABILITY, p. 8

- 4.1—Sustainability of chemical admixtures, p. 8
- 4.2—Use of chemical admixtures in sustainable construction, p. 8

CHAPTER 5—AIR-ENTRAINING ADMIXTURES, p. 10

- 5.1—Introduction, p. 10
- 5.2—Materials for air entrainment, p. 10
- 5.3—Mechanism of entrained air, p. 11
- 5.4—Selection and evaluation, p. 12
- 5.5—Applications, p. 12

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- 5.6—Dosage, p. 13
- 5.7—Proportioning concrete, p. 13
- 5.8—Effects on fresh and hardening concrete, p. 13
- 5.9—Effects on hardened concrete, p. 14
- 5.10—Quality assurance and batching, p. 14

CHAPTER 6—NORMAL, MID-, AND HIGH-RANGE WATER-REDUCING ADMIXTURES, p. 15

- 6.1—Introduction, p. 15
- 6.2—Materials, p. 15
- 6.3—Selection and evaluation, p. 15
- 6.4—Applications, p. 16
- 6.5—Dosage, p. 16
- 6.6—Proportioning concrete, p. 17
- 6.7—Effects on fresh and hardening concrete, p. 17
- 6.8—Effects on hardened concrete, p. 18
- 6.9—Quality assurance and batching, p. 19

CHAPTER 7—ACCELERATING ADMIXTURES, p. 19

- 7.1—Introduction, p. 19
- 7.2—Materials, p. 19
- 7.3—Selection and evaluation, p. 20
- 7.4—Applications, p. 21
- 7.5—Dosage and proportioning concrete, p. 21
- 7.6—Effects on fresh and hardening concrete, p. 21
- 7.7—Effects on hardened concrete, p. 22
- 7.8—Corrosion of metals, p. 22
- 7.9—Quality assurance and batching, p. 23

CHAPTER 8—SET-RETARDING ADMIXTURES, p. 24

- 8.1—Introduction, p. 24
- 8.2—Materials, p. 24
- 8.3—Selection and evaluation, p. 24
- 8.4—Applications, p. 25
- 8.5—Dosage, p. 25
- 8.6—Proportioning concrete, p. 25
- 8.7—Effects on fresh and hardening concrete, p. 25
- 8.8—Effects on hardened concrete, p. 26
- 8.9—Quality assurance and batching, p. 26

CHAPTER 9—EXTENDED SET CONTROL ADMIXTURES, p. 26

- 9.1—Introduction, p. 26
- 9.2—Materials, p. 26
- 9.3—Selection and evaluation, p. 26
- 9.4—Applications, p. 26
- 9.5—Dosage and proportioning concrete, p. 27
- 9.6—Effects on fresh and hardening concrete, p. 27
- 9.7—Effects on hardened concrete, p. 27
- 9.8—Quality assurance and batching, p. 28

CHAPTER 10—WORKABILITY-RETAINING ADMIXTURES, p. 28

- 10.1—Introduction, p. 28
- 10.2—Materials, p. 28
- 10.3—Dosage and effect on fresh and hardened concrete, p. 29

- 10.4—Applications, p. 30
- 10.5—Quality assurance and batching, p. 31

CHAPTER 11—VISCOSITY- AND RHEOLOGY-MODIFYING ADMIXTURES, p. 31

- 11.1—Introduction, p. 31
- 11.2—Materials, p. 31
- 11.3—Selection and evaluation, p. 31
- 11.4—Applications, p. 32
- 11.5—Dosage and proportioning concrete, p. 32
- 11.6—Effects of fresh and hardened concrete, p. 32
- 11.7—Anti-washout admixtures, p. 32
- 11.8—Rheology-modifying admixtures, p. 32
- 11.9—Quality assurance and batching, p. 33

CHAPTER 12—SHRINKAGE-REDUCING AND SHRINKAGE-COMPENSATING ADMIXTURES, p. 33

- 12.1—Introduction, p. 33
- 12.2—Materials, p. 34
- 12.3—Mode of action, p. 34
- 12.4—Applications, p. 34
- 12.5—Dosage and proportioning concrete, p. 34
- 12.6—Effects on fresh and hardening concrete, p. 35
- 12.7—Effects on hardened concrete, p. 35
- 12.8—Quality assurance and batching, p. 35

CHAPTER 13—CORROSION-INHIBITING ADMIXTURES, p. 35

- 13.1—Introduction, p. 35
- 13.2—Materials, p. 36
- 13.3—Selection and evaluation, p. 38
- 13.4—Applications, p. 39
- 13.5—Dosage and proportioning concrete, p. 39
- 13.6—Effects on fresh and hardening concrete, p. 40
- 13.7—Effects on hardened concrete, p. 40
- 13.8—Quality assurance and batching, p. 41

CHAPTER 14—LITHIUM ADMIXTURES TO REDUCE DELETERIOUS EXPANSION FROM ALKALI-SILICA REACTION, p. 41

- 14.1—Introduction, p. 41
- 14.2—Materials, p. 41
- 14.3—Mechanism, p. 41
- 14.4—Dosage, p. 42
- 14.5—Effects on concrete properties, p. 42
- 14.6—Performance tests for effectiveness, p. 43
- 14.6—Quality assurance and batching, p. 43

CHAPTER 15—PERMEABILITY-REDUCING ADMIXTURES, p. 43

- 15.1—Introduction, p. 43
- 15.2—Materials, p. 44
- 15.3—Selection and evaluation, p. 46
- 15.4—Applications, p. 47
- 15.5—Dosage and proportioning concrete, p. 47
- 15.6—Effects on fresh and hardened properties, p. 48
- 15.7—Quality assurance and batching, p. 48

CHAPTER 16—MISCELLANEOUS ADMIXTURES, p. 48

- 16.1—Bonding admixtures, p. 48
- 16.2—Coloring admixtures, p. 49
- 16.3—Flocculating admixtures, p. 49
- 16.4—Fungicidal, germicidal, and insecticidal admixtures, p. 49
- 16.5—Air-detraining admixtures, p. 49
- 16.6—Expansive/gas forming admixtures, p. 50
- 16.7—Admixtures for cellular concrete/flowable fill, p. 50
- 16.8—Shotcrete admixtures, p. 50
- 16.9—Admixtures for manufactured concrete products, p. 51

CHAPTER 17—ADMIXTURES FOR FLOWING CONCRETE, p. 52

- 17.1—Introduction, p. 52
- 17.2—Materials, p. 52
- 17.3—Selection and evaluation, p. 52
- 17.4—Applications, p. 52
- 17.5—Proportioning concrete, p. 53
- 17.6—Effects on fresh and hardening concrete, p. 53
- 17.7—Effects on hardened concrete, p. 54
- 17.8—Quality assurance and batching, p. 55

CHAPTER 18—ADMIXTURES FOR SELF-CONSOLIDATING CONCRETE (SCC), p. 55

- 18.1—Introduction, p. 55
- 18.2—Materials for self-consolidating concrete admixtures, p. 55
- 18.3—Selection and evaluation, p. 58
- 18.4—Proportioning concrete, p. 58
- 18.5—Effects on fresh and hardening concrete, p. 59
- 18.6—Effects on hardened concrete, p. 59
- 18.7—Quality assurance and batching, p. 59

CHAPTER 19—ADMIXTURES FOR WET, COLD WEATHER CONCRETE, p. 59

- 19.1—Introduction, p. 59
- 19.2—Materials, p. 60
- 19.3—Selection and evaluation, p. 60
- 19.4—Proportioning concrete, p. 60
- 19.5—Batching, p. 60
- 19.6—Trial placement, p. 60
- 19.7—Placing and finishing, p. 61
- 19.8—Effects on fresh and hardening concrete, p. 61
- 19.9—Effects on hardened concrete, p. 61
- 19.10—Quality assurance, p. 61
- 19.11—Cost benefit, p. 62

CHAPTER 20—ADMIXTURES FOR VERY-HIGH-EARLY-STRENGTH CONCRETE, p. 62

- 20.1—Introduction, p. 62
- 20.2—Materials for very-high-early-strength concrete, p. 62
- 20.3—Selection and evaluation, p. 63
- 20.4—Proportioning concrete, p. 64
- 20.5—Effects on fresh and hardening concrete, p. 64
- 20.6—Effects on hardened concrete, p. 64

- 20.7—Quality assurance and batching, p. 64

CHAPTER 21—ADMIXTURES FOR PERVIOUS CONCRETE, p. 65

- 21.1—Introduction, p. 65
- 21.2—Materials, p. 65
- 21.3—Selection and evaluation, p. 65
- 21.4—Applications, p. 65
- 21.5—Proportioning, p. 65
- 21.6—Effects on fresh and hardening concrete, p. 65
- 21.7—Effects on hardened concrete, p. 66
- 21.8—Quality assurance and batching, p. 66

CHAPTER 22—REFERENCES, p. 66

- Authored documents, p. 67

CHAPTER 1—INTRODUCTION**1.1—Introduction**

Chemical admixtures are primarily water-soluble substances used to modify the properties of concrete, mortar, or grout in the plastic state, hardened state, or both. The effects include increased compressive and flexural strength at all ages, decreased permeability and improved durability, corrosion reduction, shrinkage reduction, initial set adjustments, extended set control, increased slump and workability, improved pumpability, finish and finishability, rheology modification, improved cement efficiency, alkali-silica reaction (ASR) reduction, and concrete mixture economy.

An admixture or combination of admixtures may be required to achieve the specific desired results. Proper mixture proportions, however, are required for optimum benefits. In some cases, a desired objective is best achieved by mixture changes in addition to proper admixture usage. Chemical admixtures are not a substitute for suitable concrete mixture proportions and acceptable construction practices.

1.2—Scope

This report deals with state-of-the-art and commonly used admixtures. Materials such as supplementary cementitious materials that are used to produce concrete are only referred to in regards to their interaction with chemical admixtures.

Chapters 1 through 4 address topics that typically apply to all admixtures, Chapters 5 through 16 categorize chemical admixtures generically or with respect to their performance characteristics, and Chapters 17 through 21 provide information on the use of multiple combinations of admixtures in the production of some unique concretes. Information characterizing each category is presented with brief statements of the general purposes and expected effects for each group of materials. The wide scope of admixture technology, the continued entrance of new or modified materials, and the variations of effects with different concreting materials and conditions preclude a complete listing of all admixtures and their effects on concrete. Table 1.2 lists the admixture types addressed in this document and summarizes their effects and benefits in concrete, and typical materials used in their manufacture.