

ACI Education Bulletin E4-12

Chemical Admixtures for Concrete

Developed by ACI Committee E-701



American Concrete Institute®



American Concrete Institute®
Advancing concrete knowledge

First Printing
January 2013

Chemical Admixtures for Concrete

Copyright by the American Concrete Institute, Farmington Hills, MI. All rights reserved. This material may not be reproduced or copied, in whole or part, in any printed, mechanical, electronic, film, or other distribution and storage media, without the written consent of ACI.

The technical committees responsible for ACI committee reports and standards strive to avoid ambiguities, omissions, and errors in these documents. In spite of these efforts, the users of ACI documents occasionally find information or requirements that may be subject to more than one interpretation or may be incomplete or incorrect. Users who have suggestions for the improvement of ACI documents are requested to contact ACI via the errata website at www.concrete.org/committees/errata.asp. Proper use of this document includes periodically checking for errata for the most up-to-date revisions.

ACI committee documents are intended for the use of individuals who are competent to evaluate the significance and limitations of its content and recommendations and who will accept responsibility for the application of the material it contains. Individuals who use this publication in any way assume all risk and accept total responsibility for the application and use of this information.

All information in this publication is provided "as is" without warranty of any kind, either express or implied, including but not limited to, the implied warranties of merchantability, fitness for a particular purpose or non-infringement.

ACI and its members disclaim liability for damages of any kind, including any special, indirect, incidental, or consequential damages, including without limitation, lost revenues or lost profits, which may result from the use of this publication.

It is the responsibility of the user of this document to establish health and safety practices appropriate to the specific circumstances involved with its use. ACI does not make any representations with regard to health and safety issues and the use of this document. The user must determine the applicability of all regulatory limitations before applying the document and must comply with all applicable laws and regulations, including but not limited to, United States Occupational Safety and Health Administration (OSHA) health and safety standards.

Participation by governmental representatives in the work of the American Concrete Institute and in the development of Institute standards does not constitute governmental endorsement of ACI or the standards that it develops.

Order information: ACI documents are available in print, by download, on CD-ROM, through electronic subscription, or reprint and may be obtained by contacting ACI.

Most ACI standards and committee reports are gathered together in the annually revised ACI Manual of Concrete Practice (MCP).

American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331
U.S.A.
Phone: 248-848-3700
Fax: 248-848-3701

www.concrete.org

CHEMICAL ADMIXTURES FOR CONCRETE

Prepared under the direction and supervision of ACI Committee E-701 Materials
for Concrete Construction

Thomas M. Greene
Chair

Corina-Maria Aldea
Richard P. Bohan
David A. Burg
Darrell F. Elliot

Darmawan Ludirdja
Mark R. Lukkarila
Clifford N. MacDonald
Charles K. Nmai

David M. Suchorski
Lawrence L. Sutter
Joseph E. Thomas
Paul J. Tikalsky

Kari L. Yuers*
Robert C. Zellers
*Chair of documents subcommittee.

The committee would like to thank Jeff Bowman, Kryton International, for his assistance in preparing this document.

This document discusses commonly used chemical admixtures for concrete and describes the basic use of these admixtures. It is targeted at those in the concrete industry not involved in determining the specific mixture proportions of concrete or in measuring the properties of the concrete. Students, craftsmen, inspectors, and contractors may find this a valuable introduction to a complex topic. The document is not intended to be a state-of-the-art report, user's guide, or a technical discussion of past and present research findings. More detailed information is available in ACI Committee Report 212.3R, "Chemical Admixtures for Concrete" and 212.4R, "Guide for the Use of High-Range Water-Reducing Admixtures (Superplasticizers) in Concrete."

CONTENTS

Chapter 1—Introduction

- 1.1—History
- 1.2—Definitions and glossary

Chapter 2—Overview

- 2.1—Function
- 2.2—Effectiveness and compatibility
- 2.2—Standards

Chapter 3—Air-entraining admixtures

- 3.1—History
- 3.2—Mechanism
- 3.3—Use of air-entraining admixtures
- 3.4—Properties of entrained air
- 3.5—Handling and testing of air-entrained concrete

Chapter 4—Water-reducing and set-controlling admixtures

- 4.1—Types and composition
- 4.2—Type A, water-reducing admixtures
- 4.3—Type B, retarding, and Type D, water-reducing and retarding admixtures
- 4.4—Type C, accelerating, and Type E, water-reducing and accelerating admixtures
- 4.5—High-range, water-reducing admixtures
- 4.6—Low-range, water-reducing admixtures
- 4.7—Admixtures for self-consolidating concrete
- 4.8—Admixtures for slump and workability retention

Chapter 5—Specialty admixtures

- 5.1—Corrosion-inhibiting admixtures
- 5.2—Shrinkage-reducing admixtures
- 5.3—Admixtures for controlling alkali-silica reactivity
- 5.4—Admixtures for underwater concrete
- 5.5—Admixtures for cold weather
- 5.6—Permeability reducing admixtures

Chapter 6—Admixture dispensers

- 6.1—Industry requirements and dispensing methods
- 6.2—Accuracy requirements
- 6.3—Application considerations and compatibility
- 6.4—Field and truck mounted dispensers
- 6.5—Dispenser maintenance

Chapter 7—Conclusion

Chapter 8—References

- 8.1—Cited references
- 8.2—List of relevant ASTM standards

The Institute is not responsible for the statements or opinions expressed in its publications. Institute publications are not able to, nor intended to, supplant individual training, responsibility, or judgement of the user, or the supplier, of the information presented.

ACI Education Bulletin E4-12. Supersedes E4-03. Adopted in 2012 and published in 2013.

Copyright © 2013, American Concrete Institute.

All rights reserved including rights of reproduction and use in any form or by any means, including the making of copies by any photo process, or by electronic or mechanical device, printed, written, or oral, or recording for sound or visual reproduction or for use in any knowledge or retrieval system or device, unless permission in writing is obtained from the copyright proprietors.