

Causes, Evaluation, and Repair of Cracks in Concrete Structures

Reported by ACI Committee 224



American Concrete Institute®

Causes, Evaluation, and Repair of Cracks in Concrete Structures

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.

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.

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

This is a preview. [Click here to purchase the full publication.](#)

Causes, Evaluation, and Repair of Cracks in Concrete Structures

Reported by ACI Committee 224

Robert J. Frosch*
Chair

Jeffrey S. West
Secretary

Mohamed N. Abou-Zeid

Fouad H. Fouad

Ralf Leistikow

Randall W. Poston

James P. Barlow*

David W. Fowler

Peter A. Lipphardt

Royce J. Rhoads

Florian G. Barth

Grant T. Halvorsen

Edward G. Nawy

John W. Roberts

J. Floyd Best

Will Hansen

Kamran M. Nemati

Andrew Scanlon

David Darwin†

Harvey H. Haynes*

Keith A. Pashina

Andrea J. Schokker

John F. Duntemann

*Member of task group that prepared these revisions.

†Chair of task group that prepared these revisions.

The causes of cracks in concrete structures are summarized. The procedures used to evaluate cracking in concrete and the principal techniques for the repair of cracks are presented. The key methods of crack repair are discussed, and guidance is provided for their proper application.

Keywords: alkali-silica reaction; alkali-carbonate reaction; autogenous healing; concrete; consolidation; corrosion; cracking (fracturing); drying shrinkage; epoxy resins; evaluation; grouting; heat of hydration; mass concrete; methacrylates; mixture proportion; overlay; plastic; polymer; precast concrete; prestressed concrete; reinforced concrete; repair; resins; settlement shrinkage; shrinkage; slab-on-ground; specification; thermal expansion; volume change.

CONTENTS

Preface, p. 224.1R-2

Chapter 1—Causes and control of cracking, p. 224.1R-2

- 1.1—Introduction
- 1.2—Cracking of plastic concrete
- 1.3—Cracking of hardened concrete

ACI Committee Reports, Guides, Standard Practices, and Commentaries are intended for guidance in planning, designing, executing, and inspecting construction. This document is 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. The American Concrete Institute disclaims any and all responsibility for the stated principles. The Institute shall not be liable for any loss or damage arising therefrom.

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.

Chapter 2—Evaluation of cracking, p. 224.1R-9

- 2.1—Introduction
- 2.2—Determination of location and extent of concrete cracking
- 2.3—Selection of repair procedures

Chapter 3—Methods of crack repair, p. 224.1R-13

- 3.1—Introduction
- 3.2—Epoxy injection
- 3.3—Routing and sealing
- 3.4—Near-surface reinforcing and pinning
- 3.5—Additional reinforcement
- 3.6—Drilling and plugging
- 3.7—Gravity filling
- 3.8—Grouting
- 3.9—Drypacking
- 3.10—Crack arrest
- 3.11—Polymer impregnation
- 3.12—Overlay and surface treatments
- 3.13—Autogenous healing

Chapter 4—References, p. 224.1R-18

- 4.1—Referenced standards and reports
- 4.2—Cited references

ACI 224.1R-07 supersedes ACI 224.1R-93 and was adopted and published in March 2007.

Copyright © 2007, 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.