

IN-LB

Inch-Pound Units

SI

International System of Units

Fiber-Reinforced Shotcrete—Guide

Reported by ACI Committee 506

ACI PRC-506.1-21



American Concrete Institute
Always advancing

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



Fiber-Reinforced Shotcrete—Guide

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 <http://concrete.org/Publications/DocumentErrata.aspx>. 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, 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 the ACI Collection of Concrete Codes, Specifications, and Practices.

American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331
Phone: +1.248.848.3700
Fax: +1.248.848.3701

www.concrete.org

Fiber-Reinforced Shotcrete—Guide

Reported by ACI Committee 506

Simon Reny, Chair

James A. Ragland[†], Secretary

John Aidoo
IyaLars F. Balck
Louis-Samuel Bolduc
Chris D. Breeds
Wern-Ping Nick Chen^{*}
Scott R. Cumming

William T. Drakeley Jr.
Randle M. Emmrich
Charles S. Hanskat^{*}
Marc Jolin
Mark R. Lukkarila
Axel G. Nitschke^{*}

Ryan Oakes
Ryan E. Poole
Raymond C. Schallom III^{*}
William L. Snow Sr.
Jason P. South
Lawrence J. Totten

Frank Townsend
Marcus H. von der Hofen
Ezgi Wilson
Peter T. Yen
Lihe Zhang^{*}

Consulting Members

Jean-François Dufour
Richard A. Kaden

Dudley R. Morgan^{*}
H. Celik Ozyildirim

Harvey W. Parker
Philip T. Seabrook

^{*}Subcommittee members who prepared this guide.

The committee would like to thank A. Gagnon, Subcommittee Chair.

This guide describes the technology and applications of fiber-reinforced shotcrete (FRS) with a focus on synthetic and steel macrofibers. It serves as a bridge between information given in documents reported by ACI Committee 506 and ACI Committee 544. Proportions of typical mixtures, batching, mixing, and application procedures are described, including modification of mixture proportions and equipment needed for FRS. General performance criteria of FRS, particularly postcracking flexural strength and toughness, are described along with other typical properties and benefits, such as increased resistance to shrinkage cracking and impact resistance. Corresponding test methods are also discussed. The document presents general FRS design considerations. Applications of FRS are described, including construction and repair of tunnel and mining linings, slope stabilization, retaining structures, fire-explosive-spalling-resistant linings, and architectural structures. The report also gives guidance on the specification and quality control of FRS.

ACI Committee Reports and Guides 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.

Keywords: fiber-reinforced shotcrete; fibers; linings; mining; repair; shotcrete; steel fibers; synthetic fibers; tunneling.

CONTENTS

CHAPTER 1—INTRODUCTION AND SCOPE, p. 2

- 1.1—Introduction, 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, p. 3

- 3.1—General, p. 3
- 3.2—Fibers, p. 3
- 3.3—Supplementary cementitious materials and chemical admixtures, p. 4

CHAPTER 4—MIXTURE PROPORTIONS, p. 4

- 4.1—General, p. 4
- 4.2—Wet-mix shotcrete, p. 4
- 4.3—Dry-mix shotcrete, p. 4
- 4.4—Shift of mixture proportions, p. 4

ACI PRC-506.1-21 supersedes ACI 506.1R-08 and was adopted and published August 2021.

Copyright © 2021, 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 granted by the American Concrete Institute.