ACI 523.4R-09

Guide for Design and Construction with Autoclaved Aerated Concrete Panels

Reported by ACI Committee 523

American Concrete Institute®

First Printing
June 2009

American Concrete Institute®
Advancing concrete knowledge

Guide for Design and Construction with Autoclaved Aerated Concrete Panels

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. Proper use of this document includes periodically checking for errata at **www.concrete.org/committees/errata.asp** 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.

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

ISBN 978-0-87031-332-5

Guide for Design and Construction with Autoclaved Aerated Concrete Panels

Reported by ACI Committee 523

Edward M. (Ned) Glysson
Chair

Jennifer E. Tanner*
Secretary

Ronald E. Barnett*	Keith Itzler*	Ali M. Memari	Konstantin Sobolev
Bill T. Dye	Richard E. Klingner*	Edgar Nunez	Ron Vermillion
Fouad H. Fouad†	Leo A. Legatski	John W. Rose	Peter T. Yen
Dean M. Golden	Daniel L. Liotti	Sylvester B. Schmidt	Ronald F. Zollo
Werner H. Gumpertz	Frances A. McNeal-Page	Caijun Shi	

*Subcommittee members who drafted this document.
†Chair of subcommittee that drafted this document.
The committee would like to recognize past member Felipe Babbitt for his contributions to this guide.

This guide is intended for use by architects, engineers, contractors, building officials, and manufacturers. Its purpose is to present, in a single source, information that can help those individuals design, specify, and construct with factory-reinforced panels of autoclaved aerated concrete (AAC). In this guide, introductory information on AAC is first presented, followed by a description of its manufacture, guidance on structural design using reinforced panels, and guidance on construction with such panels. The body of this guide ends with an extensive background chapter on the material characteristics of AAC, and the structural behavior and design of AAC elements.

Keywords: autoclaved aerated concrete; construction; design; panels; reinforced panels.

CONTENTS

ACI 523.4R-09 was adopted and published June 2009.

FOREWORD

This guide is intended for use by architects, engineers, contractors, building officials, and manufacturers. Its purpose is to present, in a single source, information that can help those individuals design, specify and construct with factory-reinforced panels of autoclaved aerated concrete (AAC). In this guide, introductory information on AAC is first presented, followed by a description of its manufacture, guidance on structural design using reinforced panels, and guidance on construction with such panels. The body of this guide ends with an extensive background chapter on the material characteristics of AAC, and the structural behavior and design of AAC elements.

Because design and construction provisions already exist for AAC masonry made from masonry-type units without factory-installed reinforcement, this guide touches only briefly on AAC masonry. This guide addresses design, specification, and construction needs for factory-reinforced panels for which comparable design and construction provisions do not yet exist. It does this through a combination of background material and design guidance, written in nonmandatory format.

This guide is intended as a starting point for the development of mandatory-language design provisions, under the mandate of ACI 318 or other committee so designated by ACI. To facilitate that process, the design provisions proposed in this guide, though written in nonmandatory language as required by ACI, are arranged to follow the format of ACI 318-05.

CHAPTER 1—INTRODUCTION

1.1—Definition of autoclaved aerated concrete

Autoclaved aerated concrete (AAC), a form of cellular concrete, is a low-density cementitious product of calcium silicate hydrates in which the low density is obtained by the formation of macroscopic air bubbles, mainly by chemical reactions within the mass during the liquid or plastic phase. The air bubbles are uniformly distributed and are retained in the matrix on setting, hardening, and subsequent curing with high-pressure steam in an autoclave to produce a homogeneous structure of macroscopic voids, or cells (Fig. 1.1). Material specifications for this product are prescribed in ASTM C1386.

1.2—Typical mechanical and thermal characteristics of AAC

In Table 1.1, typical mechanical and thermal characteristics of AAC are compared with those of conventional concrete, including conventional concrete made with lightweight aggregates. AAC typically has one-sixth to one-third the density of conventional concrete, and about the same ratio of compressive strength, making it suitable for cladding and infill panels and for bearing-wall components of low- to medium-rise structures. Throughout this guide, “density” is defined consistently with ASTM C1386, because AAC is defined by C1386. In C1386, what is referred to as “density” is actually a unit weight, with units of lb/ft^3 (U.S. customary) and units of kgf/m^3 (old metric). This definition is not strictly correct, nor is it consistent with ACI policy for SI units. It is maintained herein for consistency with ASTM C1386.

The thermal conductivity of AAC is 6 to 7.5% that of conventional concrete, making it energy-efficient. Its fire rating is slightly longer than that of conventional concrete of the same thickness, making it useful in applications where fire resistance is important.

AAC has excellent acoustical properties. Because of its characteristic high internal porosity, AAC has very high sound absorption. Because of its lower density, AAC is not as resistant to sound transmission as conventional concrete of the