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

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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

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Edward M. (Ned) Glysson
Chair

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Secretary

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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.

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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