

ACI 524R-16

Guide to Portland Cement-Based Plaster

Reported by ACI Committee 524



American Concrete Institute
Always advancing

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



Guide to Portland Cement-Based Plaster

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, 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
Phone: +1.248.848.3700
Fax: +1.248.848.3701

www.concrete.org

Guide to Portland Cement-Based Plaster

Reported by ACI Committee 524

Timothy S. Folks, Chair

Andrew J. Boyd
Paul W. Brown
Boyd A. Clark
David A. Crocker
Jonathan E. Dongell
Randy Dukes
James A. Farny

Russell T. Flynn
Gregory C. Garrett
Damian I. Kachlakev
Jeffrey M. Kohlhas
Christopher Kerry Little
Michael M. Logue
Mark R. Lukkarila

Frank E. Nunes
Robert C. O'Neill
Paul H. Owen
David A. Rothstein
Larry Rowland
Kim A. Skinner
Terry J. Willems

Consulting Members
Robert Drury
John M. Melander
Edward K. Rice
Claude B. Trusty Jr.
Dean J. White II

This guide provides information on the plastering process, including prequalification of materials, plaster tool and equipment suggestions, mixture proportions, application procedures, finish types, and troubleshooting and repair. This guide is intended for architects, engineers, designers, specification writers, contractors, plasterers, laboratory personnel, and public authorities. Portland cement-based plastering processes and properties differ in many ways from those used in the concrete trade. The equipment used to mix plaster, the methods of curing, preparation of substrates, mixture design components, material application, finishing techniques, and methods of controlling cracking are only applicable to plaster and are not appropriate for concrete. Likewise, literature specific to concrete trade practice should not be assumed exchangeable or applicable to common plastering trade practice. Differences in plastering terminology are of key importance and, therefore, an extensive list of them is provided in this guide.

Keywords: base; bonding agents; brown coat; cracking; finish coat; fresh plaster; furring; hardened plaster; scratch coat; sheathing; stucco; texture.

CONTENTS

CHAPTER 1—INTRODUCTION AND SCOPE, p. 2

- 1.1—Introduction, p. 2
- 1.2—Scope, p. 2

ACI Committee Reports, Guides, 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—DEFINITIONS, p. 3

CHAPTER 3—DESIRABLE PROPERTIES OF PORTLAND CEMENT-BASED PLASTER, p. 6

- 3.1—Fresh plaster, p. 6
- 3.2—Hardened plaster, p. 6

CHAPTER 4—PORTLAND CEMENT-BASED PLASTER MATERIALS, p. 7

- 4.1—General, p. 7
- 4.2—Cements, p. 7
- 4.3—Lime, p. 7
- 4.4—Aggregates, p. 7
- 4.5—Water, p. 8
- 4.6—Admixtures, p. 8
- 4.7—Fibers, p. 8
- 4.8—Bonding agents, p. 8
- 4.9—Polymers, p. 9

CHAPTER 5—DESIGN CONSIDERATIONS FOR PLASTER BASES, p. 9

- 5.1—General, p. 9
- 5.2—Ceilings, p. 9
- 5.3—Spacing considerations for supports, p. 9
- 5.4—Sheathing, p. 9
- 5.5—Stress relief, p. 9
- 5.6—Design considerations for reduction of water intrusion, p. 12
- 5.7—Plaster sustainability, p. 13

ACI 524R-16 supersedes ACI 524R-08 and was adopted and published February 2016.

Copyright © 2016, 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.

CHAPTER 6—METAL LATH PLASTER BASES, p. 14

- 6.1—Lath, p. 14
- 6.2—Water-resistive barrier, p. 15

CHAPTER 7—LATHING ACCESSORIES, p. 15

- 7.1—General, p. 15
- 7.2—Outside corner reinforcements, p. 16
- 7.3—Inside corner accessory, p. 16
- 7.4—Casing beads, p. 16
- 7.5—Screeds, p. 17
- 7.6—Stress-relief joints, p. 18

CHAPTER 8—METAL LATH INSTALLATION, p. 18

- 8.1—General, p. 18
- 8.2—Installation of metal lath plaster base, p. 18
- 8.3—Attachment of metal lath to framework, p. 19
- 8.4—Attachment of metal lath to solid base, p. 19

CHAPTER 9—SOLID SUBSTRATE PLASTER BASES, p. 19

- 9.1—Substrate preparation, p. 19
- 9.2—Concrete, p. 20
- 9.3—Concrete masonry, p. 20
- 9.4—Clay masonry, p. 20
- 9.5—Surface-applied bond coatings, p. 20
- 9.6—Surface-applied bonding agents, p. 20
- 9.7—Integrally mixed bonding agents, p. 20

CHAPTER 10—PROPORTIONING AND MIXING OF PORTLAND CEMENT-BASED PLASTER, p. 21

- 10.1—Mixture proportions, p. 21
- 10.2—Batching and mixing, p. 21

CHAPTER 11—APPLICATION OF PORTLAND CEMENT-BASED PLASTER, p. 23

- 11.1—Approval and acceptance of plaster base, p. 23
- 11.2—Plaster application, p. 23
- 11.3—Application of coats, p. 23

CHAPTER 12—PLASTER FINISHES, p. 25

- 12.1—General, p. 25
- 12.2—Color finishes, p. 25
- 12.3—Finish-coat textures, p. 25

CHAPTER 13—CURING, p. 31**CHAPTER 14—PAINTS, SEALANTS, AND CAULKING MATERIALS, p. 32**

- 14.1—Paints, p. 32
- 14.2—Sealers, p. 32
- 14.3—Sealants and caulking, p. 32

CHAPTER 15—TESTING, p. 33

- 15.1—General, p. 33
- 15.2—Evaluating materials, p. 33
- 15.3—Test methods for evaluating hardened plaster, p. 33
- 15.4—Evaluating workmanship, p. 34

CHAPTER 16—TROUBLESHOOTING AND REPAIR, p. 34

- 16.1—General, p. 34
- 16.2—Cracking, p. 34
- 16.3—Weak plaster, p. 36
- 16.4—Debonding and delamination, p. 36
- 16.5—Discoloration of plaster, p. 37
- 16.6—Long-term deterioration, p. 38

CHAPTER 17—REFERENCES, p. 39

- Authored references, p. 40

CHAPTER 1—INTRODUCTION AND SCOPE**1.1—Introduction**

Portland cement-based plaster is a versatile and weather-resistant surfacing material. Portland cement-based plaster can be applied to flat, curved, or rusticated bases made from concrete, clay masonry, concrete masonry, woven or welded-wire mesh, or expanded metal lath. It can be applied by hand or pumped directly from a mixer hopper and sprayed onto a vertical or horizontal surface. Portland cement-based plaster has a long history of satisfactory performance ([Technical Services Information Bureau 2015](#)). Proportions and workability of the plaster mixture allow for a variety of shapes, designs, and textures to be created. When plaster hardens, these features are preserved in a rigid, permanent form.

Plaster is categorized by the type of cement binder, number of coats, and total thickness. Traditional materials include portland cement and lime, blended cement and lime, masonry cement, or plastic cement mixed with sand and water. Additives to control setting time, reduce shrinkage cracking, increase workability, or increase durability can also be present.

Portland cement-based plaster is intended to perform as a coating and not as a load-bearing element of the structural system. The terms “stucco” and “portland cement-based plaster” are often used interchangeably in the trade. This guide, however, refers to stucco as plaster that is applied to an exterior surface, and Portland cement-based plaster as plaster that is applied to either an interior or exterior surface.

1.2—Scope

This guide provides information and recommends minimum expectations for satisfactory lathing and plastering. Architects, engineers, designers, specification writers, contractors, plasterers, and public authorities can use this guide to familiarize themselves with the plastering processes and also as an aid in specification writing. Stricter requirements based on long-term successful field service or controlled laboratory experimentation and documentation can be imposed when warranted. This guide also addresses the prequalification of plaster materials, tool and equipment requirements, mixture proportions, application procedures, types of finishes, and troubleshooting and repair.

Exterior insulation and finish systems are exterior wall-cladding systems that consist of an insulation board covered with an integrally reinforced base coat and a textured

protective finish coat. Portland cement may be used in these systems, but their application and suitability are not covered in this guide. **Robert (1997)** provides useful information on this class of product.

The use of one-coat portland cement-based plastering systems and other such proprietary portland cement-based systems are acknowledged; however, they are beyond the scope of this document, which addresses only traditional two- or three-coat portland cement-based plastering systems. Alternative nontraditional and proprietary portland cement-based plastering systems are addressed by **ICC Evaluation Service, Inc. (2006)**. One-coat systems and other proprietary systems typically rely on a proven performance history within the environment and region in which they are intended to be used. Where required by code, proprietary products can get special approval with a published evaluation services report that specifies the installation procedure and allowed locations for its use.

Swimming pool plastering is considered an alternative, nontraditional form of portland cement-based plastering in this guide. While many aspects of this guide are relevant to swimming pool plastering, information specific to swimming pool plastering can be found in the American National Standard for the Plastering of Pools and Spas (**ANSI/APSP/ICC/NCP-12**) and in reports by the Portland Cement Association (**PCA EB049**) and the **National Plasterers Council (2011)**.

CHAPTER 2—DEFINITIONS

ACI provides a comprehensive list of definitions through an online resource, “ACI Concrete Terminology,” <https://www.concrete.org/store/productdetail.aspx?ItemID=CT13>. Definitions provided herein complement that resource.

acid etching—partial removal of a cementitious surface through controlled dissolution to expose sand or aggregates, roughen a smooth cementitious surface in preparation for cementitious coating material application, or create art or an architectural finish.

acid washing—cleansing of the plaster surface through controlled dissolution of surface deposits to remove efflorescence, dirt, or other unwanted stains.

adhesion—ability of a fresh plaster coat to adhere to a plaster base.

arch corner bead—corner bead designed so that it can be job-shaped for use on arches.

atomizer—device that introduces air into plaster during machine-applied plaster placement; can be adjusted at the nozzle of the gun to regulate the spray pattern, which in turn alters the texture or pattern of the plaster that is sprayed onto the surface.

bedding coat—thick plaster coat that receives aggregate or other decorative materials that are manually placed or shot into the surface; used to produce exposed aggregate finish or seeding (marblecrete) finish.

blended cement—hydraulic cement essentially consisting of portland cement, slag cement, or both, uniformly mixed with each other or a pozzolan through intergrinding or blending.

blocking—1) method of joining or filling between two intersecting planes of plaster from the base coat plaster or substrate up to the outer surface of the finish coat; or 2) a method of joining, reinforcing, securing, or providing thermal protection between two intersecting planes; fastening a membrane or metal flashing that covers over the space between two intersecting planes.

brown coat—leveling coat plaster used as the second coat of plaster in a three-coat application or the entire base coat of plaster in a two-coat application.

buckles—1) large lifted areas of a plaster coating that failed to properly bond to the substrate or to the plaster undercoat; or 2) raised hollow spots under a plaster, usually visible before rupture by tensile stress cracks within the portion of plaster over the buckle.

bullnose—external angle that is rounded to eliminate a sharp corner; can be tool-formed during the plaster application or an accessory that is fastened to the plaster base before plastering.

butterfly reinforcement—strips of metal reinforcement placed diagonally over the plaster base at the corner of openings before plastering.

carrying channels—main runners that are supported by hangers attached to the building structure and support the furring channels or pencil rods that support the lath.

casing bead—fabricated shape preinstalled where plaster terminates, or around openings such as doors, windows, tops of walls, or dissimilar materials, to provide a stop or separation; sometimes called a plaster stop.

ceiling track—1) formed metal section anchored to the ceiling into which metal studs, or hollow or solid partitions, are set; 2) structural reinforcement section or member to which lath is attached for studless partitions; or 3) the metal channel or angle used for anchoring the partition to the ceiling.

channel—cold-rolled steel section used as structural reinforcement in construction that attaches to studs, furrings, or joists of the walls or ceilings; structural rolled metal that is attached to other channels or runners as a furring or stud, made of varying gauges of thickness that correlate directly with each channel’s structurally intended use in construction.

cohesion—ability of a cementitious mixture to hold together and remain consistent during mixing, pumping, placing, and finishing processes.

combing tool—1) used to scarify, cross-scratch, or score the surface of a scratch coat or undercoat of plaster; or 2) a tool used to create the combed plaster finish and other scored texture finishes.

control joint—1) separation joint that limits cracking of plaster by reducing stress using a designed joint that allows dimensional reduction of the plastered area or a designed joint that allows complete separation of the plaster and a dissimilar material, including the interruption of the metal lath; or 2) formed, sawed, or tooled groove in a concrete structure to create a weakened plane to regulate the location of cracking resulting from the dimensional change of different parts of the structure.

corner lath—inside corner reinforcement section for interior plastering or exterior plastering where the corner bead