

ACI 524R-16

Guide to Portland Cement-Based Plaster

Reported by ACI Committee 524



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Guide to Portland Cement-Based Plaster

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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.

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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 layer, a base coat with an integrally reinforced mesh, and a textured finish coat.

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

is cut, or is not continuous, around an internal corner or at intersecting planes.

cross furring—smaller horizontal members that attach at right angles to the underside of main runners or other structural supports.

cross scratching—scoring of the surface of a coat of plaster on a ceiling in different directions before applying the next coat of plaster to provide a better mechanical bond.

delamination—splitting, cracking, or separation of a cementitious material that occurs within a single hardened coat of plaster in a plane roughly parallel to, and generally near, the surface.

diamond mesh metal lath—a metal network, often used as reinforcement in construction, formed by suitably stamping or cutting sheet metal and stretching it to form open meshes, of either diamond-shaped or rhomboidal-shaped openings.

double-back—method of plastering that is characterized by the application of two or more coats in succession with little or no setting or drying time between coats.

double-up—two or more coats of plaster, characterized by the double-back method of plastering, that form one integral coat.

elastomer—any macromolecular material most often used as a sealant or adhesive, such as rubber or a synthetic material, which returns rapidly to approximately the initial dimensions and shape after substantial deformation.

flat rib metal lath—combination of expanded metal lath with roll-formed ribs in which the rib has a total depth of approximately 1/8 in. (3 mm) measured from top inside of the lath to the top outside of the rib, and galvanized.

float—1) flat, trowel-like tool with varying surface textures of metal, wood, plastic, or sponge that allows a plaster technician to properly work, open, level, or finish plaster; 2) soft float, typically made of sponge rubber, used to roughen or open up the plaster surface, to retemper the plaster surface, or to promote even drying time across a plaster coating; 3) hard float, typically made of hard rubber, hard plastic, or wood, used for smoothing, compacting, and fine-tuning the leveling process after a screed, straightedge, or darby is used; or 4) float that is used to create the float finish and other textured plaster surface finish.

floating—1) operation of finishing the surface of a fresh cementitious mixture using a float, preceding troweling when that is to be the final finish; or 2) the operation of finishing a plaster surface to achieve float-finish texture.

fog coat—light coat of cement and water or plaster, with or without aggregate or color pigment, rapidly and uniformly spray-applied to a plaster finish to improve texture and color consistency, level low areas, maintain a workable surface, or prevent surface drying on double-back coats.

framing—structural members such as columns, beams, girders, studs, joists, headers, and trusses.

furred ceiling—composed of lath and plaster that is attached to the structure by means of steel channels, rods, or furring strips in direct contact with the construction above.

furring channels—1) horizontal members of a suspended ceiling that support the lath and are perpendicular to and

supported by carrying channels or attached to a solid structural substrate; 2) smaller horizontal members of a furred ceiling, also known as cross furring; or 3) the channels used to create space between the lath and a solid substrate.

furring clip—metal fastener used to attach cross furrings to main runners of ceilings.

ground—wood or metal strips attached to the framing or plaster base that protrude outward, acting as a gauge to aid the plasterer in maintaining a given thickness and plane of the plaster.

hanger—1) vertical members that carry the steel framework of a suspended ceiling; 2) vertical members that support furring under concrete joist construction; and 3) wires used in attaching lath directly to concrete joist construction.

hydration—chemical reaction between hydraulic cement and water.

isolation joint—separation between adjoining parts of a plaster that allows the least interference of relative movement to the structure in three directions, usually a vertical plane, yet avoids formation of cracks in the plaster; typically, all or part of the bonded reinforcement is interrupted.

joining—juncture of two separate plaster applications of the same coat, usually within a single surface plane.

key—1) to create a mechanical bond between a plaster coat and another surface by roughening, scratching, scoring, etching, or otherwise creating a surface that the plaster can interlock into; or 2) to mechanically fasten or fix into position in a notch, score, or other recess.

lath—framework that is secured to the framing, furring, or other members of a structure, providing a base and reinforcement for the plaster.

lather—a technician who installs lath.

lubricate—act of applying moisture to a plaster surface or a trowel that enables a plasterer to perform the hard-trowel finish.

main runners—heaviest suspended ceiling supporting members, or carrying channels, that support the furring channels or rods to which the lath is fastened and that are supported by hangers attached to the building structure.

mechanical application—application of a cementitious mixture directly onto a ceiling or wall using a pumping machine that transports the fresh mixture through hoses to a nozzle or spray gun.

metal base—fabricated metal section attached to framing members or masonry to reinforce the plaster; also serves as a ground for gauging plaster thickness.

metal corner bead—fabricated metal with flanges and nosings at the juncture of flanges, used to protect or form an arris.

metal lath—galvanized steel network to which plaster can be applied. Metal lath is of three types: 1) diamond mesh (expanded or flat-expanded); 2) woven-wire mesh; or 3) welded-wire mesh.

metal lath, 3/8 in. (9.5 mm) rib—combination of expanded metal lath with roll-formed ribs of a total depth of approximately 3/8 in. (9.5 mm), measured from top inside of the lath to the top outside of the rib.

nosing—rounded edge formed by shaping freshly placed material or by attaching a preformed molding.

paper-backed—factory-assembled combination of any of the defined types of metal laths or expanded plaster mesh laths with a paper or other backing, with the assembly being used as a plaster base.

self-furring metal lath—metal lath that includes a means of holding the lath away from the supporting surface to allow for full embedment of the metal into the cementitious material.

sheet metal lath—metal lath formed from sheet metal that is slit and expanded or stamp-punched.

plaster—1) mixture consisting essentially of a cementitious material or materials, fine aggregate, and water that forms a plastic mass; when applied to a surface, the mixture adheres to it and subsequently hardens; 2) the placed and hardened mixture; or 3) the act of placing such material.

plaster base—any surface that is suitable for the application of plaster; these include metal lath, wire mesh, concrete or clay masonry units, shotcrete, and plaster undercoats

plaster bead—1) member of a runner or support track; or 2) a precast plaster molding.

plaster membrane—total thickness of all the plaster coats, including any embedded reinforcement such as metal lath or wire mesh.

plastering machinery—allows plaster to be mixed and transported directly to the placement area; plaster is first mixed in a mortar mixer that empties into a plaster pumping machine, which then forces the plaster through flexible hoses to a plastering gun or nozzle, allowing the nozzle operator to spray the plaster directly onto a wall or ceiling.

plastic cement—hydraulic cement, primarily used in portland cement-based plastering construction, consisting of a mixture of portland or blended hydraulic cement and plasticizing materials (such as limestone or hydrated or hydraulic lime), together with other materials introduced to enhance one or more properties such as setting time, workability, water retention, and durability.

plastic cracking—cracking that occurs in the surface of a fresh mixture soon after it is placed and while it is still plastic.

polymer-modified plaster—mixture of water, hydraulic cement, sand, and a monomer or polymer.

portland cement-based plaster—plaster mixture containing portland cement as the primary or only binder.

pozzolan—siliceous or siliceous and aluminous material that of itself possesses little or no cementitious value but that will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds having cementitious properties (there are both natural and artificial pozzolans).

runner—metal structural support member that is attached to the main structure or to concrete.

return—turn and continuation of a wall or projection in a different direction.

saddle tie—specific method of wrapping: 1) hanger wire around main runners; or 2) tie wire around the juncture of a main runner and a cross furring.

scarifier—tool with flexible steel tines used to scratch or rake the first coat of plaster before final set.

scoring—1) grooving, usually horizontally, of the scratch coat to provide mechanical bond between a scratch coat and a brown coat; or 2) a decorative horizontal grooving of the finish coat.

scratch coat—first coat of a plaster applied with sufficient pressure to create a good mechanical bond with the base; usually cross-raked to provide a mechanical key with the brown coat.

scratching tools—any hand tool used to scratch, notch, or roughen a coat of plaster to provide a mechanical bond for the coat of plaster that follows.

seeding—embedding aggregate into the plaster coat just after initial set or as soon as the plaster can receive the aggregate without sagging.

set—1) chemical reaction between hydraulic cement and water where the physical, chemical, or mechanical properties of a cementitious material changes from a fresh plastic phase to a hardened solid phase in the presence of adequate moisture; or 2) the condition reached by a cementitious plaster material when it has lost plasticity to a degree where the finishability of the surface changes and the plaster can resist penetration or deformation.

setting—1) time required for a cementitious material to go from being freshly mixed or plastic to rigid or hard; or 2) degree to which a cementitious material has set. For plaster, setting times of importance are initial set, midset, and final set, as the timing of each troweling or tooling is determined by the setting of the plaster.

shoe—formed metal section that is used to attach metal studs to floors and ceiling tracks.

shrinkage cracking—cracking of a cementitious material due to failure in tension caused by external or internal restraints as reduction in moisture content develops, carbonation occurs, or both.

solid base—solid cementitious or clay masonry substrate that may or may not function as a structural member. Examples of solid bases are brick, block, shotcrete, and precast or cast-in-place concrete that is able to receive a plaster coating.

sponge float—soft, trowel-like tool used for floating the plaster finish.

structural movement cracking—cracking of a plaster coat due to the structural movement of the supporting member, metal lath, wood frame, or solid substrate.

surface hardener—chemical, including certain fluosilicates or sodium silicate, applied to the surface of a hardened plaster to reduce chemical attack and dusting.

three-coat plastering—method of plastering in three successive coats: the bond or scratch coat; the double or brown coat; and the texture or finish coat.

two-coat plastering—method of plastering in two successive coats, usually by performing a double-up or double-back procedure, which can be achieved in one of two ways: the bond coat or scratch coat, followed by the double or brown coat, which also acts as the texture or finish coat; or the bond or scratch coat, which also acts as the double or brown coat followed by the finish or texture coat.

washout—1) lack of proper coverage and leveling of plaster in an area of the plaster coat of a machine-applied dash

texture caused by the mortar being too soupy; or 2) washing away of an applied plaster coating in an area where the plaster base or substrate was too fresh or continues to weep water.

water-resistive barrier—1) material that retards the transmission of liquid water; or 2) for plaster, material that can resist the transmission of liquid water for a specified amount of time.

weep screed—lath accessory used as a bottom terminus of exterior plaster walls to ensure moisture does not collect in the wall cavity.

ventilating screed—prefabricated bead accessory, also known as a draft bead or draft stop, that permits circulation of air from the outside and allows escape of water and moist air from inside while preventing air draft.

zinc alloy—metal made of 99 percent zinc and only enough alloying elements to provide durability and formability.

CHAPTER 3—DESIRABLE PROPERTIES OF PORTLAND CEMENT-BASED PLASTER

3.1—Fresh plaster

Portland cement-based plaster should have fresh properties that promote proper application and hardened properties that provide long-term service. A properly proportioned plaster will possess the fresh plaster properties of adequate adhesion, cohesion, and retain workability long enough to achieve the desired finish.

3.1.1 Adhesion—Fresh portland cement-based plaster should exhibit adequate adhesion, cohesion, and workability characteristics. Adhesion is achieved by employing proper application techniques, using appropriate mixture proportions, and properly preparing the plaster base or substrate that is to receive the fresh plaster. Proper application techniques include forcing the initial coat, or scratch coat, into the plaster base using a trowel or float. In this manner, a good mechanical bond is created with a solid substrate or around a lath or wire mesh support network. Adjusting the appropriate mixture proportions will optimize the adhesion capability of plaster. Supplemental or rettempered water may be necessary when highly absorptive solid substrates or evaporation levels cause plaster to dry before setting. Mixture proportions can be adjusted within the requirements of **ASTM C926** to optimize adhesion under various conditions. The cementitious material-to-sand ratio (*cm/s*), selection of cementitious materials, shape and gradation of sand, and quantity of lime and water can all be adjusted to produce the desired adhesion characteristics.

Preparation of a solid substrate is important. Surfaces are to be clean and free of debris. Prepare solid surface substrates by chipping, abrading, acid washing, water blasting, or sandblasting to achieve the roughness needed to create a proper bond. Moisten solid substrates that are capable of absorbing mixing water from plaster before application of the initial plaster coat. Prewetting a highly-absorptive solid substrate lowers its absorptive capacity. Prewetting also aids in initiating the absorption process, which enhances adhesion of the initial plaster coat, permitting it to absorb or penetrate into the substrate. Wetting

the substrate also allows the plaster to retain more of the mixing water for a longer period of time (3.1.3).

The preparation of a hardened undercoat that is to receive a subsequent fresh plaster coat includes cross scratching, scoring horizontally, floating, or otherwise creating roughness to permit plaster to interlock and bond to the undercoat. As with other solid substrates, the materials, mixture proportions, and preparation of the plaster-surface undercoat enhance adhesion characteristics. Ensure the undercoat is free of laitance or surface efflorescence, which can inhibit adhesion. Moisten undercoat before applying fresh plaster.

3.1.2 Cohesion—Cohesion is important during mixing, placing, and finishing applications. Application techniques having little or no time passing between placement of successive coats, such as double-back and flash-coat applications, rely on the cohesion ability of both fresh plaster coats to become integrally combined.

3.1.3 Workability—Workability is the ease with which the plaster is placed, shaped, floated, tooled, and finished. The best workability is achieved when materials used in the plaster are properly proportioned and thoroughly combined during mixing. Any changes to the mixture, such as *cm/s*, cementitious materials, shape and gradation of sand, and quantity of lime or water in the plaster mixture can influence workability. A more workable plaster can be obtained by including certain additives in the mixture proportions. Plaster having poor workability requires greater effort to properly place and finish the material, which in turn lessens the quality, durability, and aesthetic appearance of the plaster.

3.2—Hardened plaster

A hardened plaster should establish and maintain bond with the substrate and be weather-resistant and durable. The color and texture of the finish coat should be uniform in appearance. Hardened portland cement-based plaster has the following characteristics.

3.2.1 Weather resistance—Hardened portland cement-based plaster has the ability to shed most rainwater and withstand weathering, including freezing and thawing, and temperature and moisture gradients. To ensure a durable plaster finish, exposure conditions such as acid rain, aggressive chemicals, harmful soils, and other deleterious environmental factors need to be considered when selecting plaster mixture proportions. Plaster can be harmed by the same conditions discussed in **ACI 201.2R** for concrete.

Plaster should shed most rainwater and release any absorbed water or water vapor. To achieve a proper installation and reduce failures associated with moisture intrusion, the following practices are recommended:

- a) Using two layers of water-resistive barrier or other moisture barrier
- b) Installing flashing at doors and around windows, vents, and all other openings or wall penetrations through the plaster
- c) Install a weep screed or other similar drainage accessory
- d) Caulk or seal doors, windows, and other openings or penetrations through the plaster

3.2.2 Sulfate resistance—Hardened plaster exposed to a sulfate environment can experience severe deterioration.

Chemical sulfate attack is usually found where plaster is exposed to soil containing soluble sulfate. In the presence of moisture, soluble sulfate can enter a plaster directly or via a pervious solid substrate.

Resistance to sulfate environments can be enhanced using **ASTM C150/C150M** Type II or Type V portland cement, **ASTM C595/C595M** blended cement, or **ASTM C1157/C1157M** hydraulic cement designed for sulfate resistance. A suitable pozzolan, slag cement, or other supplementary cementitious material (SCM), as defined in **ACI 201.2R**, may also be used in combination with an ASTM C150/C150M portland cement to provide sulfate resistance. Where sulfate conditions are known to exist (Exposure Categories S1 to S3 in **ACI 318-14**, Chapter 19), take the additional precaution of applying a water-resistive surface coating or penetrating sealer to the solid substrate and portion of plaster below grade and within 6 in. (150 mm) of finished grade, terminate the plaster approximately 6 in. (150 mm) above grade, or both.

3.2.3 Durability—Proper plaster mixture proportions (Chapter 10), proper placement, troweling and tooling techniques (Chapter 11), additives such as pozzolans and polymers (4.6 through 4.9), and proper curing techniques (Chapter 13) are all important to the durability of plaster.

3.2.4 Tensile strength—Tensile strength is the ability of a material to resist internal stress created when an applied force is directed away from a given plane or point within the material. Hardened portland cement-based plaster must have sufficient tensile strength to resist cracking in typical service applications. It generally has a low tensile strength when compared to the tensile stress that is generated by structural movement, warping of a plaster base, or thermal expansion and contraction. Incorporate control joints into the design of the plaster base to relieve or redistribute tensile stress (5.5). The tensile strength of hardened plaster can be increased with the addition of certain polymers, pozzolans, and alkali-resistant fibers into the mixture proportioning. Increasing tensile strength can increase plaster's resistance to cracking. Proper curing is also important (Chapter 13).

CHAPTER 4—PORTLAND CEMENT-BASED PLASTER MATERIALS

4.1—General

Portland cement-based plaster materials should comply with building codes and project specifications. Packaged materials are to be labeled properly, indicating the manufacturer, brand name, and recommendations for use. Protect packaged materials that can be damaged by moisture. Mix proprietary plaster materials in accordance with manufacturer's recommendations. Confirm each ingredient of a plaster mixture is compatible with all other ingredients of the plaster mixture and are suitable for a given environment.

4.2—Cements

The binders used in a portland cement-based plaster mixture can include any of the gray or white cements conforming to the respective standards listed in Table 4.2.

Table 4.2—Gray or white cements and their respective standards

Cement used in plaster	Standards
Portland cements	ASTM C150/C150M, AASHTO M 85, or CSA A3001
Blended hydraulic cements	ASTM C595/C595M, AASHTO M 240, or CSA A3001
Hydraulic cements, performance specification	ASTM C1157/C1157M
Masonry cements	ASTM C91/C91M or CSA A3002
Plastic (Stucco) cements	ASTM C1328/C1328M
Mortar cements	ASTM C1329/C1329M or CSA A3002

Consider using sulfate-resistant cement or supplementary cementitious materials (SCMs) where a plaster or plaster substrate is in contact with an aggressive sulfate soil or aggressive sulfate groundwater condition (**ACI 201.2R**). Using low-alkali portland cements conforming to **ASTM C150/C150M**, blended cements conforming to Option R of **ASTM C595/C595M-15**, or hydraulic cement conforming to Option R of **ASTM C1157/C1157M-11** can reduce potential expansion due to alkali-silica reactivity when the aggregate to be used contains potentially reactive material. Alternatively, suitable combinations of cement and SCMs that have been proven effective against deleterious expansion caused by sulfate attack or reactive aggregates can be used as long as supporting reference documentation is available. Air-entraining cements can be used where available.

4.3—Lime

The lime used in a portland cement-based plaster mixture should be hydrated lime conforming to **ASTM C206** or **C207** Type S or Type S with air entrainment. Hydrated lime promotes plasticity, water retention, and workability, and aids in controlling shrinkage cracking. Do not use air-entrained lime in combination with air-entrained cement.

4.4—Aggregates

The aggregates used in a portland cement-based plaster mixture should be either natural or manufactured sand conforming to **ASTM C897**. Use aggregates that are clean and free of elements that cause discoloration, rust, or deleterious reaction with cementitious materials when in the presence of moisture. Lightweight aggregates, such as perlite or vermiculite, should conform to Table 1 of **ASTM C35-01(2014)**. Perlite and vermiculite can be advantageous in ceiling applications due to their lower mass-per-unit volume, and in other applications due to their sound-absorbing and insulating qualities. They should not be used in the base coat of plaster. Lightweight aggregate tends to be more absorptive than normalweight aggregate, and highly absorptive aggregate can behave poorly in freezing-and-thawing situations.

When **ASTM C897** aggregates are not available, **ASTM C144** aggregates can be substituted. The use of substandard aggregate can result in a weaker and less durable plaster. Thaw frozen aggregates before use.

4.5—Water

Potable water is generally acceptable to use as plaster mixing water. Water used in mixing and curing portland cement-based plaster should be clean and free from damaging amounts of deleterious materials such as oils, acids, alkalis, organic matter, or salts. Such substances may impair the setting or curing characteristics of the plaster. Certain minerals or metals can stain or discolor plaster when present in appreciable amounts.

4.6—Admixtures

The following admixtures can be added when permitted by the project specifications.

4.6.1 Air-entraining admixtures—Air-entraining admixtures that conform to **ASTM C260/C260M** reduce water demand, absorption, and water penetration while improving workability and resistance to freezing-and-thawing damage. Pretest combinations of cement binders and air-entraining admixtures, as certain air-entraining admixture combinations can have adverse behaviors. Do not substitute household-type soaps or detergents for appropriate air-entraining admixtures.

4.6.2 Calcium chloride—Calcium chloride should conform to **ASTM D98**. Calcium chloride is available in liquid, powder, flake, and prill (pea-sized granule) form. Dissolve calcium chloride in flake or prill form in water before adding it to the plaster mixture. Calcium chloride, or accelerating admixtures containing significant amounts of calcium chloride, can accelerate the corrosion rate of metals. Do not use calcium chloride when portland cement-based plaster will come into contact with metal lath, anodized aluminum, galvanized steel, or zinc accessory products. Prolonged embedment of metal within a high-chloride plaster can cause corrosion expansion of the metal and cracking of the plaster. Noncorrosive accelerating admixtures meeting **ASTM C494/C494M** are recommended in situations where acceleration of set is desired, but corrosion to embedded metal is a risk. Calcium chloride can also cause mottling to be more exaggerated (**16.5**).

4.6.3 Water-reducing admixtures—Water-reducing admixtures and certain plasticizers that conform to **ASTM C494/C494M** can be used to reduce the water-cementitious material ratio (w/cm) of a portland cement-based plaster. Water-reducing admixtures can potentially increase strength, increase workability, and reduce shrinkage cracking. Observe manufacturer's recommendations when using water reducers or plasticizers. Small changes in admixture quantities can have significant effects on the properties of portland cement-based plaster.

4.6.4 Water-repellent admixtures—Stearate emulsions, not to exceed 2 percent by mass of cement, can be used to improve water repellency and decrease absorption of the hardened plaster. Some of these emulsions can also entrain air. Stearates can reduce bond between plaster coats, and stearamides' water-repellent effects can degrade with time.

4.6.5 Pigments—Coloring agents should be uniform in color, free of lumps, and conform to **ASTM C979/C979M**. To avoid strength reductions, do not exceed a pigment

content of 10 percent of the cement weight. The use of lamp black or carbon black is not recommended. Use only mineral pigments as coloring agents. Darker-colored pigments tend to absorb light and heat, while lighter-colored pigments tend to reflect light and heat.

4.6.6 Supplementary cementitious materials—Supplementary cementitious materials (SCMs), such as certain clays or pozzolans conforming to **ASTM C618**, can be used as plasticizers to improve the workability of a plaster, facilitating mixing, pumping, placing, and finishing. Certain SCMs can aid in the control of plaster's set and also improve the durability characteristics of plaster by adding resistance to sulfate attack, acid attack, carbonation, leaching of cement compounds, and other durability-related properties (**ACI 232.1R**). Observe manufacturer's recommendations for all admixtures or additives that are used as new ingredients to a plaster mixture.

4.7—Fibers

When specified, fibers used in plaster should conform to **ASTM C1116/C1116M** and may consist of glass, nylon, polypropylene, or carbon fibers. Glass fibers that are used in a portland cement-based plaster mixture should be alkali-resistant. Glass fibers that are not alkali-resistant can deteriorate in the presence of alkalis that are present in plaster. Fibers are used to improve cohesion, reduce shrinkage, and reduce plastic cracking. Fibers can increase the impact resistance and tensile strength properties of a plaster. Fibers can, however, make plaster more difficult to pump and finish. Combine fibers into the mixture in the manner and amount recommended by the manufacturer.

4.8—Bonding agents

Bonding agents are used to increase the adhesive bond between a clean, structurally sound substrate surface such as concrete, brick, clay masonry, or concrete masonry units, and plaster coating. Surface-applied bonding agents can be applied directly to the substrate surface (**9.6**). Integral bonding agents are added to the plaster during mixing to increase its ability to adhere to the substrate (**9.7**). Use bonding agents in accordance with the manufacturer's instructions.

4.8.1 Surface-applied bonding agents—Surface-applied bonding agents are single-component, ready-to-use liquids that are applied by brush, roller, or spray. Use surface-applied bonding agents that conform to the requirements of **ASTM C631** for interior plaster or **ASTM C932** for exterior plaster. Refer to the manufacturer's recommendations for specific application instructions. Latex bonding agents for interior plaster should conform to **ASTM C1059/C1059M** Type I or II, **ASTM C932**, and **ASTM C631**. Surface-applied non-redispersible latex bonding agents that conform to **ASTM C1059** Type II can be used for exterior plaster or where resistance to rehydration from high humidity or water-immersion environments is needed.

4.8.2 Integral bonding agents—Integral latex-based bonding agents are generally added into the mix at the job site to promote bond. Do not use integral bonding

agent can vary among manufacturers, but are generally based on percent solids by weight of cementitious materials. Latex bonding agents should conform to **ASTM C1059/C1059M** and be of the appropriate type for the application. Type I latex bonding agents (redispersable) are restricted for use in interior work not subject to water immersion or high humidity. Type II (non-redispersable), may be used for areas subject to high humidity or immersion in water and is suitable for use in other areas. (ASTM C1059/C1059M).

4.9—Polymers

Polymers used as admixtures to modify the properties of traditional cementitious binders are within the scope of this guide. These polymers enhance water repellency (4.6.4), bonding (4.8), plasticity, and workability (3.1.3).

Polymers that are the primary binder component or a cobinder with traditional cementitious binders are not within the scope of this guide. These products are typically marketed as polymer-modified plaster or polymer-based plaster; however, the cementitious portion of the mixture proportions, if any, is generally present as a cobinder or filler. Many proprietary prepackaged products fall into this category.

CHAPTER 5—DESIGN CONSIDERATIONS FOR PLASTER BASES

5.1—General

Lath and plaster may be applied over open framing, framing with sheathing, masonry, or monolithic concrete. Evaluate structural substrates for structural integrity, compatibility with portland cement-based plaster, and ability to achieve satisfactory mechanical bond with plaster. Plaster can also be applied without lath, directly onto masonry and concrete (**Chapter 9**). Conventional open framing consists of wood or metal studs. Wood studs that are not kiln-dried can have as much as 19 percent moisture content. As moisture is lost, the wood studs could shrink and distort as they dry, resulting in deformation of the structure and cracking of the plaster. To minimize moisture content, protect wood studs and wood sheathing from prewetting operations and during jobsite storage. Conventional open-frame construction is also subject to variations in plaster thickness across a wall or panel, which increases the potential for cracking.

Install line wire to support paper backing and woven-wire mesh lath. Wherever rounded corners are desired, the edges of wood studs and beams should be chamfered to a 45-degree angle, enabling a full thickness of plaster at the corners.

Give special consideration to deep-set windowsills, tops of parapets and handrails, and any wall surface installed in a plane of less than 60 degrees from the horizontal. These surfaces are considered horizontal members, and need to be protected or otherwise treated to inhibit moisture intrusion, much like a roof. Because they will provide little or no moisture protection, lath and plaster on a horizontal (or a nearly horizontal) surface are considered only as cosmetic finish coatings.

5.2—Ceilings

Isolate non-load-bearing ceilings to prevent the transfer of movement or vibration; construct them without having direct attachment to the main structure. Allow for deflection of overhead beams and slabs. Proper hanger placement is necessary for ceiling channels to support lath and plaster while being kept free from abutting walls. Do not restrict suspended ceilings from free movement; terminate them without attaching to the walls. Various codes and standards have established support requirements. Table 5.2a gives support spacing and material requirements for ceiling tracks as specified in **ASTM C1063**. The standard also provides detailed information on materials, and permissible support spacing and fastening requirements. Refer to Tables 5.2b to 5.2d.

5.3—Spacing considerations for supports

ASTM C1063 describes allowable spans and supports. State and local building codes and other regulations may stipulate the maximum allowable span for each type of metal base based on the mass per unit area and configuration. The Uniform Building Code (**International Code Council 1997**) stipulated the maximum allowable support spacings for various types of lath and fastening attachments and the types of lath and attachment requirements, as shown in Tables 5.3a and 5.3b. Approvals by model or local building codes have been granted for longer spans as well.

5.4—Sheathing

A more uniform plaster thickness is obtained when open framing is covered with solid sheathing, such as exterior gypsum wall board, insulation board, expanded polystyrene, oriented strand board, or plywood. Plywood or oriented strand board sheathing is to be installed with a minimum 1/8 in. (3 mm) clearance on all sides, in accordance with ASTM C1063, to allow for expansion in case the plywood or oriented strand board gets damp. Sheathing board that is not water-resistive is to have an additional layer of water-resistive building paper under the paper-backed metal base to prevent the absorption of moisture from the plaster. The **Engineered Wood Association (2006)** provides recommendations for the use and installation of wood structural panel wall sheathing as a substrate for exterior plaster.

5.5—Stress relief

Control joints are required when plaster is applied over a metal base. Use control joints over existing joints in the substrate and at changes in the substrate materials. The International Building Code (**International Code Council 2015a**) and the International Residential Code (**International Code Council 2015b**) defer to **ASTM C926**, which stipulates, “Accessories shall be installed prior to the application of plaster; therefore, their type, depth, and location shall be included in the project contract documents.” Control joints divide or reduce the size of the plaster panel, which provides relief from stress, as described in 3.2.4. There are three types of control joints used in plastering.

a) *Scoring the plaster surface or cutting the base.* Scoring is the partial severing or notching of the plaster

Table 5.2a—Allowable support or hanger wire spacing (in. [mm]) and cold-rolled channel main runner spans (in. [mm])

Member size, in. (mm)	Member weight, lb/1000 ft (kg/m)	Span condition**	Uniform load = 12 lb/ft ² (0.57 kPa)				
			Member spacing, in. (mm)				
			24 (610)	36 (914)	48 (1220)	60 (1520)	72 (1830)
1-1/2 (38.1)	414 (0.615)	Single	42 (1070)	37 (940)	33 (840)	33 (840)	29 (740)
		Two or more†	59 (1500)	50 (1270)	43 (1090)	38 (970)	35 (890)
2 (50.8)	506 (0.753)	Single	45 (1140)	39 (990)	36 (914)	33 (840)	32 (810)
		Two or more†	62 (1570)	54 (1370)	49 (1240)	46 (1170)	43 (1090)
2-1/2 (63.5)	597 (0.888)	Single	47 (1190)	41 (1040)	38 (970)	35 (890)	33 (840)
		Two or more†	65 (1650)	57 (1450)	52 (1320)	48 (1220)	46 (1170)
Member size, in. (mm)	Member weight, lb/1000 ft (kg/m)	Span condition**	Uniform load = 15 lb/ft ² (0.72 kPa)				
			Member spacing, in. (mm)				
			24 (610)	36 (914)	48 (1220)	60 (1520)	72 (1830)
1-1/2 (38.1)	414 (0.615)	Single	39 (990)	34 (860)	31 (790)	28 (710)	26 (660)
		Two or more†	52 (1370)	44 (1120)	38 (970)	34 (860)	31 (790)
2 (50.8)	506 (0.753)	Single	42 (1070)	37 (940)	34 (860)	31 (790)	29 (740)
		Two or more†	58 (1470)	51 (1300)	46 (1170)	42 (1070)	39 (990)
2-1/2 (63.5)	597 (0.888)	Single	44 (1120)	39 (990)	35 (890)	33 (840)	31 (790)
		Two or more†	60 (1520)	53 (1350)	48 (1220)	45 (1140)	42 (1070)

*This table is designed for dead loads. Specific conditions such as exterior installations in high wind areas require additional engineering.

†Where uplift resistance is required for suspended ceilings to resist negative forces, the architect or engineer or record should select the method to be used.

**Refers to two or more continuous equal spans. Listed spans represent center-to-center distance between adjacent supports.

Notes:

Information adapted from ASTM C1063-15, Table 2.

Bare metal thickness of cold-rolled main runners should not be less than 0.0538 in. (1.367 mm).

Inside runner radii should not be greater than 1/8 in. (3.19 mm).

Spans based on upper flange of main runners laterally unbraced.

Maximum deflection limited to 1/360 of the span length.

Steel yield stress F_y should not be less than 33,000 psi (228 MPa).

Uniform load of 12 lb/ft² (0.479 kPa) (dry density) should be used for portland cement plaster ceilings with plaster thickness up to 7/8 in. (22 mm), and 15 lb/ft² (0.287 kPa) should be used for ceilings with plaster thickness over 7/8 in. (22 mm) and not more than 1-1/4 in. (32 mm).

Table 5.2b—United States uncoated steel wire gauge diameters

U.S. steel wire gauge	Diameter, in. (mm)
No. 20	0.0348 (0.88)
No. 19	0.0410 (1.04)
No. 18	0.0475 (1.21)
No. 17	0.0540 (1.37)
No. 16	0.0625 (1.59)
No. 14	0.0800 (2.03)
No. 13	0.0915 (2.32)
No. 12	0.1055 (2.68)
No. 11	0.1205 (3.06)
No. 10	0.1350 (3.43)
No. 9	0.1483 (3.77)
No. 8	0.1620 (4.12)

Note: Information adapted from ASTM C1063-15.

coating. Cutting is the total severing of the plaster membrane, including lath and plaster. Cutting is considered to be the more effective method.

b) *Grooving the plaster using a temporary control joint.* Grooving is used at the juncture of a solid substrate and a

Table 5.2c—Channel minimum weights in pounds per 1000 linear feet (kg/m)

Sizes, in. (mm)	Weight, lb/1000 ft (kg/m)	Flange width, in. (mm)
3.4 (19)	277 (0.412)	1/2 (13)
11.2 (38)	414 (0.616)	1/2 (13)
2 (51)	506 (0.753)	1/2 (13)
21.2 (64)	597 (0.888)	1/2 (13)

Notes: Information adapted from ASTM C1063-15. Channels should be cold-formed from steel with a minimum 33,000 psi (228 MPa) yield strength and 0.0538 in. (1.37 mm) minimum bare steel thickness. Channel should have a protective coating conforming to ASTM A653/A653M, or have a protective coating with an equivalent corrosion resistance for exterior applications, or should be coated with a rust inhibitive paint for interior applications.

frame support network or at the juncture of dissimilar plaster bases. Grooving is created by installing a temporary ground or control joint into the fresh plaster finish coat and then removing the ground or control joint when the plaster has attained sufficient strength. Fill the groove that remains with a weather-resistant caulk material.

c) *Insertion of a permanent control joint or expansion joint accessory.* Control joint accessories are typically one piece, allowing for the expansion and contraction of the plaster and minor movement of the structure. Expansion

Table 5.2d—Types and weights of metal plaster bases and corresponding maximum permissible spacing of supports (taken from ASTM C1063)

Type of metal plaster base	Minimum weight of metal plaster base, lb/yd ² (kg/m ²)	Maximum permissible spacing of supports center to center, in. (mm)				
		Walls (partitions)			Ceilings	
		Wood studs or furring	Solid partitions*	Steel studs or furring	Wood or concrete	Metal
U.S. nominal weights						
Diamond mesh†	2.5 (1.4)	16 (406)‡	16 (406)	16 (406)‡	12 (305)	12 (305)
	3.4 (1.8)	16 (406)‡	16 (406)	16 (406)‡	16 (406)	16 (406)
Flat rib	2.75 (1.5)	16 (406)	16 (406)	16 (406)	16 (406)	16 (406)
	3.4 (1.8)	19 (482)	24 (610)	19 (482)	19 (482)	19 (482)
Flab rib (large opening)	1.8 (0.95)	24 (610)	24 (610)	24 (610)	16 (406)	16 (406)
3/8 in. (9.5 mm) rib	3.4 (1.8)	24 (610)	NA	24 (610)	24 (610)	24 (610)
	4.0 (2.1)	24 (610)	NA	24 (610)	24 (610)	24 (610)
3/4 in. (19.5 mm)	5.4 (2.9)	24 (610)	NA	24 (610)	36 (914)	36 (914)
Welded wire‡	1.14 (0.62)	16 (406)	16 (406)	16 (406)	16 (406)	16 (406)
	1.95 (1.1)	24 (610)	24 (610)	24 (610)	24 (610)	24 (610)
Woven wire†	1.4 (0.6)	24 (610)	16 (406)	16 (406)	24 (610)	16 (406)
Canadian nominal weights						
Diamond mesh†	2.5 (1.4)	16 (406)	12 (305)	12 (305)	12 (305)	12 (305)
	3.0 (1.6)	16 (406)	12 (305)	12 (305)	12 (305)	12 (305)
	3.4 (1.8)	16 (406)	16 (406)	16 (406)	16 (406)	16 (406)
Flat rib	2.5 (1.4)	16 (406)	12 (305)	12 (305)	12 (305)	12 (305)
	3.0 (1.6)	16 (406)	16 (406)	16 (406)	16 (406)	13.5 (343)
3/8 in. (9.5 mm) rib	3.0 (1.6)	19 (482)	NA	16 (406)	16 (406)	16 (406)
	3.5 (1.9)	24 (610)	NA	19 (482)	19 (482)	19 (482)
	4.0 (2.1)	24 (610)	NA	24 (610)	24 (610)	24 (610)

*Where plywood is used for sheathing, a minimum of 1/8 in. (3.2 mm) separation should be provided between adjoining sheets to allow for expansion.

†Metal plaster bases shall be furred away from vertical supports or solid surfaces at least 1/4 in. (6.35 mm). Self-furring lath meets furring requirements, except furring of expanded metal lath is not required on supports having a bearing surface of 1-5/8 in. (41.28 mm) or less.

‡These spacings are based on unsheathed walls. Where self-furring lath is placed over sheathing or a solid surface, the permissible spacing of supports should be no more than 24 in. (610 mm).

Note: Information adapted from ASTM C1063-15, Table 3.

joint accessories are typically two or three pieces, allowing for moderate stress relief in areas anticipated to crack, such as intentionally designed structural movement of the substrate, unbridged framing, movement occurring in more than one direction, story shift, and thermal expansion. Lath and plaster systems cannot accommodate unexpected or excessive movements. Do not confuse expansion joint and control joint accessories used in plastering with those used in concrete or in the structure itself; they are not intended for use in structural applications and have no fire rating.

Continue the water-resistive barrier or other barrier backing uninterrupted behind stress-relief joints; however, the lath is to be interrupted and tied on each side of stress-relief joints so that the joints can function properly and completely separate the plaster membrane. Stress-relief joints are fabricated by installing casing beads back-to-back with a flexible barrier of caulking or sealant behind the casing beads and on the back side of flanges. Embed terminations or splices in stress-relief joints within a weather-resistant elastic sealant to prevent moisture penetration.

The spacing between control joints should conform to **ASTM C1063**. Install control joints for walls or vertical members so they divide the plaster into sections having a

maximum of 144 ft² (13.4 m²) of surface area. Install control joints for ceilings or horizontal members so they divide the plaster into sections having a maximum of 100 ft² (9.3 m²) of surface area. The distance between control joints should not exceed 18 ft (5.4 m) in either direction. The desired aspect ratio allows for panels to be as near to square as possible. The longer dimension of a ceiling, wall panel, or other surface area should not exceed the shorter dimension by more than a factor of two-and-a-half times.

Install stress-relief joint accessories where ceiling framing or furring changes direction and wherever joints occur in the framing or junctures between the framework and a dissimilar plaster base material. Control joints in plaster coatings that have masonry, shotcrete, or other solid substrates can be spaced farther apart than control joints in plaster coatings having a metal lath, wire mesh, or welded-wire mesh plaster base over open framing; however, place stress-relief joints over locations where existing stress-relief joints exist in the solid substrate.

Consider the plaster finish type when selecting control joint locations; certain finishes can lessen the extent to which cracks and control joints are visible or noticeable. The visibility of cracks and control joints is reduced by finishes that are rough.

Table 5.3a—Types of lath: maximum spacing of supports (taken from The Uniform Building Code [International Code Council 1997])

Type of lath*		Minimum weight per square yard (× 0.38 for kg/m ²) Gauge and mesh size, in. (× 25.4 for mm)	Vertical, in. (× 25.4 for mm)			Horizontal, in. (× 25.4 for mm)	
			Wood	Metal		Wood or concrete	Metal
				Solid plaster partitions	Other		
Diamond mesh metal lath		2.5	16 [†]	16 [†]	12	12	12
		3.4	16 [†]	16 [†]	16	16	16
Flat rib expanded metal lath		2.75	16	16	16	16	16
		3.4	19	24	19	19	19
Plaster mesh expanded metal lath		1.8 and 3.6	16 [‡]	—	—	—	—
3/8 in. (9.5 mm) rib expanded metal lath		3.4	24	24 [§]	24	24	24
		4.0	24	24 [§]	24	24	24
Sheet lath		4.5	24	24 [§]	24	24	24
Wire fabric lath	Welded	1.95 lb, 0.120 in. (No. 11 B. W. gauge), 2 x 2 in.	24	24	24	24	24
		1.16 lb, 0.065 in. (No. 16 B. W. gauge), 2 x 2 in.	16	16	16	16	16
		1.4 lb, 0.049 in. (No. 18 B. W. gauge), 1 x 1 in.	16 [§]	—	—	—	—
	Woven	1.1 lb, 0.049 in. (No. 18 B. W. gauge), 1-1/2 in. hexagonal	24	16	16	24	16
		1.4 lb, 0.058 in. (No. 17 B. W. gauge), 1-1/2 in. hexagonal	24	16	16	24	16
		1.4 lb, 0.049 in. (No. 18 B. W. gauge), 1 in. hexagonal	24	16	16	24	16

*Metal lath and wire fabric lath used as reinforcement for cement plaster shall be furred out away from vertical supports at least 1/4 in. (6.4 mm). Self-furring lath meets furring requirements. Exception: Furring of expanded metal lath is not required on supports having a bearing surface width of 1-5/8 in. (41 mm) or less.

[†]Span may be increased to 24 in. (610 mm) with self-furred metal lath over solid sheathing assemblies approved for this use.

[‡]Wire backing required on open vertical frame construction except under expanded metal lath and paperbacked wire fabric lath.

[§]May be used for studless solid partitions.

^{||}Woven wire or welded wire fabric lath is not to be used as base for gypsum plaster without absorbent paper-backing or slot-perforated separator.

have a coarse depth of texture, or a thickness variation of multileveled high and low depths of texture across the surface of the plaster. Cracks and control joints are more noticeable in a plaster coating having a smooth, consistent, and level surface finish. Closer control joint spacing may reduce the size and noticeability of cracking in some plaster finishes.

5.5.1 Details—The designer should show the selected location of stress-relief joints on the contract drawing elevations. Locate stress-relief joints as near as possible to the area or plane of greatest structural stress or weakness, where cracking is more likely to occur. Likely locations for cracking include:

- Headers and sill corners of windows, doors, and other architectural projections or penetrations into plaster
- Edges and corners of ventilation or heating vents
- Structural plate lines or concentrations of large timber members in wood construction
- Midpoints between frame supports or midpoints between maximum control-joint spacings
- Junctures where main columns or structural beams meet walls or ceilings
- Plastering over expansion joints or control joints of a solid plaster base
- Plastering over junctures of dissimilar plaster bases

Generally, plastering is completed from multistage scaffolding. Each plaster coat is generally applied one staging level at a time. Unsightly laps can be avoided if horizontal stress-relief joints are designed and placed at the scaffold staging levels. Changes in the plane of a panel or the addition of other construction materials across the panel can also serve as a stopping point between staging levels.

5.6—Design considerations for reduction of water intrusion

The designer should consider the following recommendations as a precaution against water intrusion:

- Specify and detail the installation of flashing, weep screeds, and sealant at doors and around windows, vents, and all other wall penetrations to ensure that water will be diverted or channeled to the outside of the wall assembly in accordance with **ASTM C1063** and **E2112**.
- Specify and detail measures to minimize plaster cracking, including:

- Proper location of stress-relief joints in accordance with **ASTM C1063**; additionally, control joints at reentrant corners may be recommended, though not required by code
- Proper curing in accordance with **ASTM C926** and consideration for local climate conditions