



Designation: C1063 – 21

Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster¹

This standard is issued under the fixed designation C1063; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers the minimum technical requirements for the installation of lathing and furring for the application of exterior and interior portland cement-based plaster, as in Specification C926. These requirements do not by default define a unit of work or assign responsibility for contractual purposes, which is the purview of a contract or contracts made between contracting entities.

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1.3 Where a fire resistance rating is required for plastered assemblies and constructions, details of construction shall be in accordance with reports of fire tests of assemblies that have met the requirements of the fire rating imposed.

1.4 Where a specific degree of sound control is required for plastered assemblies and constructions, details of construction shall be in accordance with official reports of tests conducted in recognized testing laboratories in accordance with the applicable requirements of Test Method E90.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 The text of this specification references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the specification.

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- C11 Terminology Relating to Gypsum and Related Building Materials and Systems
- C847 Specification for Metal Lath
- C926 Specification for Application of Portland Cement-Based Plaster
- C933 Specification for Welded Wire Lath
- C1032 Specification for Woven Wire Plaster Base
- C1280 Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing
- C1861 Specification for Lathing and Furring Accessories, and Fasteners, for Interior and Exterior Portland Cement-Based Plaster
- E90 Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

2.2 US Department of Commerce (DOC) Standards:³

- PS 1 Voluntary Product Standard PS 1, Structural Plywood
- PS 2 Voluntary Product Standard PS 2, Performance Standard for Wood-Based Structural Use Panels

¹ This specification is under the jurisdiction of ASTM Committee C11 on Gypsum and Related Building Materials and Systems and is the direct responsibility of Subcommittee C11.03 on Specifications for the Application of Gypsum and Other Products in Assemblies.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, http://www.access.gpo.gov.

*A Summary of Changes section appears at the end of this standard

3. Terminology

3.1 Definitions:

3.1.1 For definitions relating to ceilings and walls, see Terminology **C11**.

3.1.2 For definitions relating to lathing accessories, furring accessories, and fasteners, see Specification **C1861**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *building enclosure, n*—system of building assemblies and materials designed and installed in such a manner as to provide a barrier between different environments.

3.2.2 *control joint, n*—a joint that accommodates movement of plaster shrinkage and curing along predetermined, usually straight, lines.

3.2.3 *expansion joint, n*—a joint that accommodates movement beyond plaster shrinkage and curing.

NOTE 1—For design consideration of control and expansion joints, see A2.3.1.2 of Specification **C926**.

3.2.4 *framing member, n*—studs, joist, runners (track), bridging, bracing, and related accessories manufactured or supplied in wood or light gauge steel.

3.2.5 *hangers, n*—wires or steel rods or straps used to support main runners for suspended ceilings beneath floor or roof constructions.

3.2.6 *inserts, n*—devices embedded in concrete framing members to provide a loop or opening for attachment of hangers.

3.2.7 *reentrant corner, n*—a wall opening corner forming an angle of less than 180°.

3.2.8 *saddle tie, n*—see **Figs. A1.6 and A1.7**.

3.2.9 *self-furring, adj*—a metal plaster base manufactured with evenly-spaced indentations that hold the body of the lath approximately ¼ in. (6 mm) away from solid surfaces to which it is installed.

3.2.10 *water-resistive barrier, n*—a material that resists the infiltration of liquid moisture through the building enclosure system.

3.2.11 *weather-exposed surface, n*—surfaces of walls, ceilings, floors, roofs, soffits, and similar surfaces exposed to the weather except the following: (1) ceilings and roof soffits enclosed by walls, fascia, bulkheads or beams that extend not less than 12 in. (305 mm) below such ceiling or roof soffits; (2) walls or portions of walls beneath an unenclosed roof area, where located a horizontal distance from an open exterior opening equal to not less than twice the height of the opening; and (3) ceiling and roof soffits located a minimum horizontal distance of 10 ft (3048 mm) from the outer edges of the ceiling or roof soffits.

4. Delivery and Storage of Materials

4.1 Delivery of Materials:

4.1.1 Materials shall be delivered in the original packages, containers, or bundles bearing the brand-name and manufacturer's (or supplier's) identification.

4.2 Storage of Materials:

4.2.1 Materials shall be kept dry. Materials shall be stacked off the ground, supported on a level platform, and protected from the weather and surface contamination.

4.2.2 Materials shall be neatly stacked with care taken to avoid damage to edges, ends, or surfaces.

4.2.3 Metal plaster bases with a factory-attached water-resistive barrier shall be handled carefully in delivery, storage, and erection to prevent puncturing or removal of the factory-attached water-resistive barrier.

5. Materials

5.1 Metallic materials including lathing, lathing accessories, furring, furring accessories, and fasteners shall be selected for compatibility to minimize galvanic corrosion between adjacent metallic materials installed in the cement plaster cladding assembly.

5.2 Metal Plaster Bases:

5.2.1 *Expanded Metal Lath*—Specification **C847**, galvanized.

5.2.2 Wire Laths:

5.2.2.1 *Welded Wire Lath*—Specification **C933**.

5.2.2.2 *Woven Wire Lath*—Specification **C1032**.

5.3 Lathing Accessories, Furring Accessories, and Fasteners:

5.3.1 *Lathing Accessories, Furring Accessories, and Fasteners*—Specification **C1861**.

5.3.2 The selection of an appropriate type of material for lathing accessories shall be based upon applicable surrounding climatic and environmental conditions specific to the project location, such as salt air, industrial pollution, high moisture, or humidity.

6. Requirements for Substrates to Receive Metal Lathing and Furring

6.1 Framed, or Framed and Sheathed Substrates:

6.1.1 Framing member deflection shall not exceed L/360 (0.33 in. in 10 ft).

6.1.2 Substrates to receive lath shall be straight and true to line within ¼ in. in 10 ft. to receive the specified plaster thickness.

6.1.3 Plywood and oriented strand board sheathing panels shall be marked in accordance with DOC PS1 or DOC PS 2.

6.1.4 Plywood and oriented strand board sheathing panels shall be installed with ⅛ in. (3 mm) minimum panel edge gaps, and panel edges shall be offset 4 in. (10 cm) minimum from wall opening reentrant corners. (See **Fig. 1**.)

NOTE 2—This ⅛-in. (3 mm) gap is intended to accommodate expansion. Linear expansion that is not accommodated by an expansion gap can cause stress on the stucco membrane resulting in stucco cracks.

6.1.5 Wood framing members, plywood and oriented strand board sheathing panels shall have a moisture content not to exceed 19 % immediately before plastering.

6.1.6 Exterior gypsum sheathing panels shall be installed in compliance with Specification **C1280**.

7. Installation

7.1 *Workmanship*—Metal lathing, lathing accessories, furring, and furring accessories shall be erected so that the

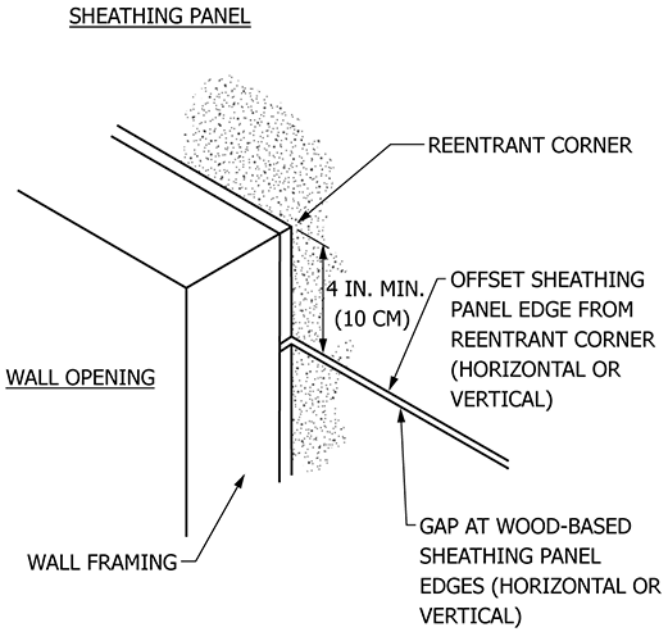


FIG. 1 Wall Opening Reentrant Corner (Isometric View Looking Up at Wall Opening Corner)

finished cement plaster surfaces are true to line (allowable tolerance of 1/4 in. (6 mm) in 10 ft (3 m)), level, plumb, square, or curved as required to receive the specified cement plaster thickness.

7.2 Installation of Metal Furring for Walls:

7.2.1 Attachments for furring accessories shall be concrete nails driven securely into concrete or into masonry joints, power-actuated fasteners, or other devices specifically designed as spacer elements, spaced horizontally not more than 2 ft (610 mm) on centers. They shall be spaced vertically in accordance with horizontal stiffener spacing so that they project from the face of the wall in order for ties to be made.

7.2.2 Horizontal stiffeners shall be not less than 3/4 in. (19 mm) cold-rolled channel furring, spaced not to exceed 54 in. (1372 mm) on centers vertically, with the lower and

upper cold-rolled channel furring not more than 6 in. (152 mm) from the ends of vertical framing members and not less than 1/4 in. (6 mm) clear from the wall face, securely tied to attachments with three loops of wire, or equivalent devices. Approved furring is not prohibited from use in this application.

7.2.3 Vertical framing members shall be not less than 3/4 in. (19 mm) cold-rolled channel furring in accordance with the requirements of Table 1. Vertical framing members shall be saddle-tied to horizontal stiffeners with three loops of 0.0475-in. 18 gauge (1.21 mm) wire, or equivalent devices, at each crossing, and securely anchored to the floor and ceiling constructions. Where cold-rolled channel furring is not in contact with the wall, cold-rolled channel furring braces shall be installed between horizontal stiffeners and the wall, spaced horizontally not more than 2 ft (610 mm) on centers.

7.2.4 Where the water-resistive barrier has been damaged during installation of attachments, the water-resistive barrier shall be repaired with the same or an alternative material, compatible with the water-resistive barrier, before proceeding with the installation of the furring.

7.2.5 Z-furring used to support lathing and lathing accessories and its fasteners for fastening to framing members or solid bases, is a customized furring system which shall be engineered.

7.3 Installation of Metal Plaster Bases:

7.3.1 General:

7.3.1.1 Metal plaster bases shall be furred away from vertical framing members or solid surfaces at least 1/4 in. (6 mm). Self-furring lath meets furring requirements; except, furring of expanded metal lath is not required on framing members having a bearing surface of 1 5/8 in. (41 mm) or less.

7.3.1.2 The spacing of framing members for the type and weight of metal plaster base shall conform to the requirements of Table 1. Metal plaster bases shall be attached to framing members at not more than 7 in. (178 mm) on center, along framing members except for 3/8-in. (10 mm) rib metal lath that shall be attached at each rib. Attachment penetrations between the framing members shall be avoided.

TABLE 1 Types and Weights of Metal Plaster Bases and Corresponding Maximum Permissible Spacing of Wall and Ceiling Framing Members or Furring

Type of Metal Plaster Base	Minimum Weight of Metal Plaster Base, lb/yd ² (kg/m ²)	Specific Installation Requirements and Maximum Permissible Spacing of Wall and Ceiling Framing Members or Furring, Center to Center, in. (mm)				
		Walls		Ceilings		
		24 (610)	16 (406)	24 (610)	16 (406)	12 (305)
Expanded Sheet Metal	2.5 (1.4)	Permitted only for self-furred lath on sheathed wall framing members or solid wall bases	Permitted	Not Permitted	Not Permitted	Permitted
	3.4 (1.8)					
Flat Rib	2.75 (1.5)	Not Permitted	Permitted only for unsheathed wall framing members	Permitted	Permitted	Permitted
3/8 in. Rib	3.4 (1.8)	Not Permitted				
	Welded Wire	4.0 (2.1)	Not Permitted		Permitted	
1.14 (0.618)		Not Permitted	Permitted	Not Permitted	Permitted	
1.95 (1.058)	Permitted		Permitted			
Woven Wire	1.4 (0.76)	Permitted only for wood wall framing members, wood furring	Permitted	Permitted only for wood and concrete ceiling framing members		
				Not Permitted	Permitted only for steel ceiling framing members	

7.3.1.3 Lath shall be installed with the long dimension at right angles to the framing members, unless otherwise specified.

7.3.1.4 Ends of adjoining plaster bases shall be staggered.

7.3.1.5 Lath shall not be continuous through control joints, but shall be stopped and tied at each side.

7.3.1.6 Where furred or suspended ceilings butt into or are penetrated by columns, walls, beams, or other elements, the edges and ends of the ceiling lath shall be terminated at the horizontal internal corners with a casing bead lathing accessory, control joint lathing accessory, or similar device designed to keep the edges and ends of the ceiling lath and plaster free of the adjoining vertically oriented, or penetrating elements. Internal corner reinforcement lathing accessories shall not be used at these locations. A clearance of not less than $\frac{3}{8}$ in. (10 mm) shall be maintained between the casing bead lathing accessory, control joint lathing accessory, or similar device and penetrating elements.

7.3.1.7 Where load bearing walls or partitions butt into structural walls, columns, or floor or roof slabs, the sides or ends of the wall or partition lath shall be terminated at the internal corners with a casing bead lathing accessory, expansion joint lathing accessory, control joint lathing accessory, or similar device designed to keep the sides and ends of the wall or partition lath free of the adjoining elements. Internal corner reinforcement lathing accessories shall not be used at these internal corners. A clearance of not less than $\frac{3}{8}$ in. (10 mm) shall be maintained from abutting walls, columns, or other vertical elements.

7.3.1.8 Where solid base materials interface with framed, or framed and sheathed base materials and are to receive a continuous coat of plaster, lathing accessories to reduce cracking, to facilitate drainage, or both, as categorized in Specification C1861, shall be installed at the interface of these base materials. Omission of these accessories shall be permitted provided the contract documents require provisions that are equivalent in function and performance to control cracking and facilitate drainage, or both.

7.3.2 Lapping of Metal Plaster Bases:

7.3.2.1 Side laps of metal plaster bases shall be secured to framing members. They shall be tied between framing members with 0.0475-in. 18 gauge (1.21 mm) wire at intervals not more than 9 in. (229 mm).

7.3.2.2 Side laps of expanded metal lath shall be lapped 2 in. (50 mm) nominal and not less than $\frac{1}{2}$ in. (13 mm). Side laps of rib lath shall be lapped 2 in. (50 mm) nominal and not less than $\frac{1}{2}$ in. (13 mm), or nest the edge ribs. End laps of expanded metal lath and rib metal lath shall be lapped 2 in. (50 mm) nominal and not less than 1 in. (25 mm). Wire lath shall be lapped minimum one mesh at the sides and ends. Where end laps occur between the framing members, the ends of the sheets of all metal plaster bases shall be laced or wire tied with 0.0475-in. (1.21 mm) wire.

7.3.2.3 Where metal plaster base with a factory-attached water-resistive barrier is installed, the vertical and horizontal lap joints shall be water-resistive barrier on water-resistive barrier and metal plaster base on metal plaster base.

7.3.2.4 Where metal plaster base with a factory-attached water-resistive barrier is installed, the water-resistive barrier shall be lapped not less than 2 in. (51 mm). On walls, the water-resistive barrier shall be lapped so water will flow to the exterior. Except for weep screeds, designated drainage screeds, and drainage flashings with solid attachment flanges, the water-resistive barrier shall not be placed between metal plaster base and lathing accessory attachment flanges. Metal plaster base to lathing accessory key attachment flange contact shall be required to ensure that the metal plaster base and lathing accessory key attachment flanges are mechanically locked together.

7.3.3 Attachments for Metal Plaster Bases to Wood Framing Members:

7.3.3.1 Diamond-mesh expanded metal lath, flat-rib expanded metal lath, and wire lath shall be attached to horizontal wood framing members with $1\frac{1}{2}$ -in. (38 mm) roofing nails driven flush with the plaster base and attached to vertical wood framing members with 6d common nails, or 1-in. (25 mm) roofing nails driven to a penetration of not less than $\frac{3}{4}$ in. (19 mm), or 1-in. (25 mm) wire staples driven flush with the plaster base. Staples shall engage not less than three strands of diamond mesh and flat rib expanded metal lath or not less than two strands of wire lath and penetrate the wood framing members not less than $\frac{3}{4}$ in. (19 mm). When metal lath is installed over sheathing, use fasteners that will penetrate the framing members not less than $\frac{3}{4}$ in. (19 mm).

7.3.3.2 Expanded $\frac{3}{8}$ in. (10 mm) rib lath shall be attached to horizontal wood framing members with nails or staples to provide not less than $1\frac{3}{4}$ -in. (44 mm) penetration into horizontal wood framing members.

7.3.3.3 Common nails shall be bent over to engage not less than three strands of diamond mesh and flat rib expanded metal lath or not less than two strands of wire lath, or be bent over a rib when rib lath is installed.

7.3.3.4 Screws used to attach metal plaster base to horizontal and vertical wood framing members shall penetrate not less than $\frac{5}{8}$ in. (16 mm) into the member when the lath is installed. For expanded metal lath, the screw shall engage not less than three strands of lath. For wire laths, screws shall engage not less than two strands of diamond mesh and flat rib expanded metal lath or not less than two strands of wire lath. When installing expanded metal rib lath, the screw shall pass through, but not deform, the rib. When installing wire rib lath, the screw may deform the rib.

7.3.4 Attachments for Metal Plaster Bases to Metal Framing Members:

7.3.4.1 Except as described in 7.3.4.2, metal plaster bases shall be securely attached to metal framing members with 0.0475-in. 18 gauge (1.21 mm) wire ties, clips, or by other means of attachment which afford carrying strength and resistance to corrosion equal to or superior to that of the wire.

7.3.4.2 Rib metal lath shall be attached to open-web steel joists by single ties of wire, not less than 0.0475 in. 18 gauge (1.21 mm), with the ends of each tie twisted together $1\frac{1}{2}$ times.

7.3.4.3 Screws used to attach metal plaster base to metal framing members shall extend through the metal framing

member with a minimum of three (3) exposed threads when the lath is installed, and for expanded metal laths shall engage not less than three strands of lath. For wire laths, screws shall engage not less than two strands of diamond mesh and flat rib expanded metal lath or not less than two strands of wire lath. When installing expanded metal rib lath, the screw shall pass through, but not deform, the rib. When installing wire rib lath, the screw may deform the rib.

7.3.5 Attachments for Metal Plaster Bases to Solid Bases:

7.3.5.1 Rib metal lath shall be attached to concrete joists by loops of 0.0800-in. (2.03 mm) wire, with the ends of each loop twisted together.

7.3.5.2 Metal plaster bases shall be attached to masonry or concrete with power-actuated fasteners, or a combination of power-actuated fasteners and hardened concrete stub nails. One power-actuated fastener shall be located at each corner and one at the mid-point of the long dimension adjacent to the edge of the metal plaster base sheet. The balance of the sheet shall be fastened with power-actuated fasteners or hardened concrete stub nails. The fasteners shall be installed in rows not more than 16 in. (406 mm) on center and spaced vertically along each row not more than 7 in. (178 mm) on center. Power-actuated fasteners and concrete stub nails shall be not less than ¾ in. (19 mm) long, with heads not less than ⅜ in. (10 mm) wide. Where the head diameter of the power-actuated fastener or concrete stub nail is smaller than ⅜ in. (10 mm), fastener shall use a ⅞-in. (22 mm) diameter minimum corrosion-resistant metal washer, which shall be perforated when washer diameter exceeds 1 in. (25 mm).

7.4 Installation of Lathing Accessories:

7.4.1 Lathing Accessory General Requirements:

7.4.1.1 The type, location, ground dimension, and orientation of lathing accessories shall be indicated in the contract documents.

7.4.1.2 Install lathing accessories before cement plaster application to facilitate lathing installation, cement plaster application, and functionality of the completed stucco cladding assembly.

7.4.2 Lathing Accessory Attachment Requirements:

7.4.2.1 Attach lathing accessory attachment flanges to substrate to ensure proper alignment during application of cement plaster. Secure lathing accessory attachment flanges at 7 in. (178 mm) maximum intervals along framing members.

7.4.2.2 Install lathing accessories with key attachment flanges to completely embed the flanges in cement plaster.

7.4.2.3 Alternatively for solid plaster base substrates, adhere lathing accessory key attachment flanges directly to solid plaster bases with adhesive applied in nominal 1 in. (25 mm) dabs at intervals in accordance with **7.4.2.1** or in a semi-continuous bead between the solid plaster base and the solid portion of the key attachment flange.

7.4.3 Lathing Accessory Water Management Requirements:

7.4.3.1 Where a defined drainage space is provided over the water-resistive barrier under lath and cement plaster, the ground dimension of lathing accessories with solid attachment flanges installed behind the water-resistive barrier and defined drainage space to facilitate drainage, such as weep screeds, designated drainage screeds, expansion joints and drainage

flashings, shall accommodate the defined drainage space dimension and specified cement plaster thickness.

7.4.3.2 Install the water-resistive barrier and lathing to entirely cover the vertical solid attachment flange of lathing accessories with a drainage function and drainage flashings such as weep screeds, designated drainage screeds, expansion joints, and drainage flashings. Terminate lathing within ½ in. (13 mm) nominal above the lathing accessory drainage surface.

7.4.3.3 At intersections of lathing accessories exposed at the cement plaster cladding finished surface, install the vertical lathing accessory continuously through the intersection unless the horizontally intersecting lathing accessory performs an expansion or drainage function, or both. Where vertical lathing accessories terminate above a drainage screed lathing accessory or drainage flashing, the intersection shall be kept free of sealant or other materials that will impede drainage.

7.4.3.4 Lathing accessories installed over the water-resistive barrier shall not impede drainage.

7.4.4 Foundation Weep Screed—Install a weep screed lathing accessory at the bottom of steel or wood framed exterior walls. Locate the bottom edge of the weep screed lathing accessory not less than 1 in. (25 mm) below the joint formed by the foundation and framing. Locate the weep screed lathing accessory ground 4 in. (102 mm) minimum above raw earth or 2 in. (51 mm) above paved surfaces.

7.4.5 Designated Drainage Screed—Install a designated drainage screed lathing accessory at locations indicated in the contract documents and follow specified requirements in the contract documents.

7.4.5.1 Where vertical and downward facing horizontal exterior weather-exposed plaster surfaces meet, provide means to facilitate drainage.

7.4.6 Casing Bead—Install a casing bead lathing accessory or other suitable means, at locations to separate cement plaster from dissimilar materials, penetrating elements, load bearing members and to avoid transfer of structural loads.

7.4.7 Internal Corner Reinforcement—Install an internal corner reinforcement lathing accessory at internal cement plaster corner locations except where lathing is installed continuously through the internal corner, or where an expansion joint lathing accessory or control joint lathing accessory is installed at the internal corner location.

7.4.8 External Corner Reinforcement—Install an external corner reinforcement lathing accessory at external cement plaster corner locations. Alternatively, where no external corner reinforcement lathing accessory is used on framed, and framed and sheathed construction, lathing shall be furred away from the substrate and installed continuously around external corners for a minimum distance of one framing member beyond the corner.

7.4.9 Expansion Joint—Install an expansion joint lathing accessory at an expansion joint location in the building, the substrate, or its components.

7.4.10 Control Joints—Install control joint lathing accessories in conformance with **7.3.1.5**.

7.4.10.1 Form control joints by attaching a prefabricated control joint lathing accessory, or alternatively by attaching a pair of casing beads with key attachment flanges, back to back,

with a separation spacing not less than 1/8 in. (3 mm) or as required by the anticipated thermal exposure range and a flexible barrier membrane behind the casing beads. Wall or partition height door frames shall be considered as control joints.

7.4.10.2 Install control joint lathing accessories at locations to delineate cement plaster panel areas of 144 ft² (13 m²) maximum for walls and 100 ft² (9 m²) maximum for horizontal installations, that is, ceilings, curves, or angle type structures.

7.4.10.3 Install control joint lathing accessories at locations to delineate cement plaster panel areas of 18 ft (5 m) maximum dimension, in either direction, or a maximum length-to-width ratio of 2½ to 1.

7.4.10.4 Install a control joint lathing accessory at locations where the ceiling framing or furring changes direction.

8. Keywords

8.1 control joint; expansion joint; lath; plaster; screed; suspended ceiling; walls

ANNEX

(Mandatory Information)

A1. INSTALLATION OF METAL FURRING FOR SUSPENDED CEILINGS

A1.1 *General*—Installation of metal furring requirements for suspended ceilings are located together in this Annex for convenience of use.

A1.2 *Hangers and Inserts:*

A1.2.1 Hangers shall be of ample length and shall conform to the requirements of **Table A1.1**, both as to size and maximum cement plaster panel area to be supported, except as modified in this section.

A1.2.2 When strap hangers are used, 7/16-in. (11 mm) diameter holes shall be provided on the center line at the upper end of the strap hanger to permit the attachment of the strap hanger. The edge of the holes in the strap hangers shall be not less than 3/8 in. (10 mm) from the ends.

A1.2.3 In concrete, rod or strap hangers shall be attached to inserts embedded in the concrete, or to other attachment devices designed for this purpose, and able to develop full strength of the hanger.

A1.2.4 Strap hangers shall be bolted with machine bolts. (See **Fig. A1.1**.)

A1.2.5 The nuts of the machine bolts shall be drawn up tight.

NOTE A1.1—Hangers required to withstand upward wind pressures shall be of a type to resist compression. Struts of formed channels shall be permitted.

A1.3 *Installation of Hangers for Suspended Ceilings Under Wood Constructions*—Hangers shall be attached to framing members by any of the following methods:

A1.3.1 A hole shall be drilled through the wood framing member not less than 3 in. (76 mm) above the bottom, with the upper end of the wire hanger passed through the hole and twisted three times around itself. (See **Fig. A1.2**.)

A1.3.2 Three 12d nails shall be driven, on a downward slant, into the sides of the wood framing member with not less

than 1¼ in. (32 mm) penetration and not less than 5 in. (127 mm) from the bottom edges, and not more than 36 in. (914 mm) on the center with the upper end of the wire hanger wrapped around the nails and twisted three times around itself. (See **Fig. A1.3**.)

A1.3.3 A loop shall be formed in the upper end of the wire hanger and secured to the wood framing member by four 1½ in. (38 mm), not less than 9 gauge, 0.1483-in. (3.77 mm) diameter wire staples driven horizontally or on a downward slant into the sides of the wood framing members, three near the upper end of the loop and the fourth to fasten the loose end. (See **Fig. A1.4**.)

A1.3.4 Where framing members for flooring are thicker than 1½ in. (38 mm) and are spaced more than 4 ft (1.2 m) on center, eye screws (or equivalent), spaced not more than 3 ft (914 mm) on centers shall be screwed into the flooring framing members with the upper end of the wire hanger inserted through the eye screws and twisted three times around itself.

A1.3.5 Two holes shall be drilled in the upper end of the flat hangers and nailed to the sides of the wood framing members with 12d nails driven through the holes and clinched. Nails shall be not less than 3 in. (76 mm) above the bottom edge of the framing member. (See **Fig. A1.5**.)

A1.4 *Attachment of Hangers to Cold-rolled Channel Furring Main Runners:*

A1.4.1 Wire hangers shall be saddle-tied to cold-rolled channel furring main runners. (See **Fig. A1.6**.)

A1.4.2 Smooth or threaded rod hangers shall be fastened to cold-rolled channel furring main runners with special attachments appropriate to the design.

A1.4.3 The lower ends of strap hangers shall be bolted to cold-rolled channel furring main runners, or bent tightly around the cold-rolled channel furring main runners and

carried up and above the cold-rolled channel furring main runners and bolted to the main part of the hanger. (See Fig. A1.1)

A1.5 Installation of Cold-rolled Channel Furring Main Runners:

A1.5.1 Minimum sizes and maximum spans and spacings of cold-rolled channel furring main runners for the various spans between hangers or other framing members shall be in accordance with the requirements of **Table A1.1**.

A1.5.2 A clearance of not less than 1 in. (25 mm) shall be maintained between the ends of the cold-rolled channel furring main runners and the abutting masonry or the concrete walls, partitions, and columns. Where special conditions require that cold-rolled channel furring main runners let into abutting masonry or concrete construction, within such constructions maintain a clearance of not less than 1 in. (25 mm) from the ends and not less than ¼ in. (6 mm) from the tops and sides of the cold-rolled channel furring main runners.

A1.5.3 A cold-rolled channel furring main runner shall be located within 6 in. (152 mm) of the paralleling walls to support the ends of the cold-rolled channel cross-furring. The ends of cold-rolled channel furring main runners shall be supported by hangers located not more than 6 in. (152 mm) from the ends.

A1.5.4 Where cold-rolled channel furring main runners are spliced, the ends shall be overlapped not less than 12 in. (305 mm) with flanges of cold-rolled channel furring main runners interlocked and securely tied near each end of the splice, with double loops of 0.0625 in. (1.59 mm) or double loops of twin strands of 0.0475-in. 18 gauge (1.21 mm) wire. However, when the splice occurs at an expansion joint or control joint, the cold-rolled channel furring shall be nested and loosely tied to hold together but still allow movement.

A1.5.5 Hanger wires shall hang straight down. If an obstacle prevents this, a trapeze type device shall be used to allow hanger wires to hang straight.

A1.6 Installation of Cold-rolled Channel Cross-furring:

A1.6.1 Minimum size and maximum spans and spacings of various types of cold-rolled channel cross-furring for various spans between cold-rolled channel furring main runners and framing members shall conform to the requirements of **Table A1.2**.

A1.6.2 Cold-rolled channel cross-furring shall be saddled to cold-rolled channel furring main runners with 0.0625-in. 16 gauge (1.59 mm) wire, or a double strand of 0.0475-in. 18 gauge (1.21 mm) wire or with special galvanized clips, or equivalent attachments. (See Fig. A1.7.)

A1.6.3 Where cold-rolled channel cross-furring members are spliced, the ends shall be overlapped not less than 8 in. (203 mm), with flanges of cold-rolled channel cross-furring interlocked, and securely tied near each end of the splice with double loops of 0.0625-in. (1.59 mm) 16 gauge wire or twin strands of 0.0475-in. 18 gauge (1.21 mm) wire.

A1.6.4 Cold-rolled channel cross-furring shall not come into contact with abutting masonry or reinforced concrete walls or partitions, except, where special conditions require that cold-rolled channel cross-furring be let into abutting masonry or concrete construction, the applicable provisions of **A1.6.2** shall apply.

A1.6.5 Cold-rolled channel furring main runners and cold-rolled channel cross-furring shall be interrupted at expansion joints or control joints. However when the splice occurs at an expansion joint or control joint, the cold-rolled channel furring shall be nested and loosely tied to hold together but still allow movement.