



Standard Specification for Application of Portland Cement-Based Plaster¹

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1. Scope

1.1 This specification covers the requirements for the application of full thickness portland cement-based plaster for exterior (stucco) and interior work.

1.2 This specification sets forth tables for proportioning of various plaster mixes and plaster thickness.

NOTE 1—General information will be found in Annex A1. Design considerations will be found in Annex A2.

1.3 The values stated in inch-pound units are to be regarded as the standard. The SI (metric) values given in parentheses are approximate and are provided for information purposes only.

1.4 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.

1.5 Details of construction for a specific assembly to achieve the required fire resistance shall be obtained from reports of fire-resistance tests, engineering evaluations, or listings from recognized fire testing laboratories.

2. Referenced Documents

2.1 ASTM Standards:

- C 11 Terminology Relating to Gypsum and Related Building Materials and Systems²
- C 25 Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime²
- C 35 Specification for Inorganic Aggregates for Use in Gypsum Plaster²
- C 91 Specification for Masonry Cement²
- C 150 Specification for Portland Cement²
- C 206 Specification for Finishing Hydrated Lime²
- C 207 Specification for Hydrated Lime for Masonry Purposes²
- C 219 Terminology Relating to Hydraulic Cement²
- C 260 Specification for Air-Entraining Admixtures for Concrete³
- C 595M Specification for Blended Hydraulic Cements^{2,3}

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² *Annual Book of ASTM Standards*, Vol 04.01.

³ *Annual Book of ASTM Standards*, Vol 04.02.

C 631 Specification for Bonding Compounds for Interior Plastering²

C 897 Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters²

C 932 Specification for Surface-Applied Bonding Agent for Exterior Plastering²

C 1063 Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster²

C 1116 Specification for Fiber-Reinforced Concrete and Shotcrete³

C 1328 Specification for Plastic (Stucco) Cement²

E 90 Test Method for Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions⁴

E 119 Test Methods for Fire Tests of Building Construction and Materials⁵

E 492 Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine⁴

2.2 ANSI Standard:

A108.1 Specification for Installation of Ceramic Tile⁶

3. Terminology

3.1 Terms shall be defined as in Terminologies C 11 and C 219, except as modified herein.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *accelerator*—an admixture that will shorten the setting time of plaster.

3.2.2 *admixture*—a material other than water, aggregate, or basic cementitious material added to the batch before or during job mixing.

3.2.3 *acid etching*—the cleansing and controlled erosion of a solid surface, using an acid wash.

3.2.4 *air entrainment*—the use of an air-entraining admixture or air-entraining cementitious material in a plaster mix to yield a controlled quantity of minute (typically between 10 and 1000 μm in diameter) disconnected air bubbles in the plaster (see *entrapped air*).

3.2.5 *backplaster*—plaster applied to the face of metal lath opposite a previously applied plaster.

3.2.6 *bond*—the state of adhesion between plaster coats or

⁴ *Annual Book of ASTM Standards*, Vol 04.06.

⁵ *Annual Book of ASTM Standards*, Vol 04.07.

⁶ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

between plaster and plaster base.

3.2.7 *bonding compound or agent*—compounds surface applied or integrally mixed with plaster to improve the quality of bond between plaster and plaster base or between plaster coats.

3.2.8 *cementitious material*—a material that, when mixed with water and with or without aggregate, provides the plasticity and the cohesive and adhesive properties necessary for placement and the formation of a rigid mass.

3.2.9 *coat*—a thickness of plaster applied in a single operation.

3.2.9.1 *basecoat*—all plaster applied before the application of the finish coat.

3.2.9.2 *bedding coat*—a plaster coat that receives aggregate or other decorative material impinged into its surface before it sets.

3.2.9.3 *brown coat*—in three-coat work, the second coat, applied over the scratch coat. In two-coat work, brown coat refers to the double-up basecoat. In either use, the brown coat is the coat directly beneath the finish coat.

3.2.9.4 *dash-bond coat*—a thick wet mixture of portland cement and water, with or without aggregate, dashed onto the surface of a plaster base such as smooth monolithic concrete or concrete block surfaces to improve the mechanical key for subsequent plaster coats.

3.2.9.5 *double-up coat*—the brown-coat plaster applied to the scratch coat plaster before the scratch-coat plaster has set.

3.2.9.6 *finish coat*—the final layer of plaster applied over basecoat plaster.

3.2.9.7 *fog coat*—a light coat of cement and water, with or without aggregate or color pigment, applied by machine spray to improve color consistency.

3.2.9.8 *scratch coat*—the first coat of plaster applied to a plaster base.

3.2.9.9 *skim coat*—a thin finish coat applied to an existing plaster surface or other substrate to improve appearance.

3.2.9.10 *three-coat work*—application of plaster in three successive coats with time between coats for setting or drying, or both.

3.2.10 *cold joint* (“*joining*” or “*jointing*”)—the juncture of fresh plaster application adjacent to set plaster, in the same plane.

3.2.11 *curing*—the act or processes of producing a moisture environment favorable to cement hydration, resulting in the setting or hardening of the plaster.

3.2.12 *entrapped air*—unintentional air voids in the plaster generally larger than 1 mm.

3.2.13 *factory prepared* (“*mill-mixed*” or “*ready mixed*”)—pertaining to material combinations that have been formulated and dry-blended by the manufacturer, requiring only the addition of and mixing with water to produce plaster.

3.2.14 *fiber, natural or synthetic*—an elongated fiber or strand admixture added to plaster mix to improve cohesiveness or pumpability, or both.

3.2.15 *floating*—act of compacting and leveling brown-coat plaster to a reasonably true surface plane using a float tool or the act of bringing the aggregate to the surface of finish-coat plaster.

3.2.16 *key* (also *mechanical key*)—plaster that physically

surrounds, penetrates, or deforms to lock onto the perforations or irregularities of the plaster base or previous coat of plaster.

3.2.17 *metal plaster base*—expanded metal lath, or welded or woven wire lath.

3.2.18 *plaster*—portland cement-based cementitious mixture (see *stucco*).

3.2.19 *required*—pertaining to a mandatory obligation imposed by a force outside of this specification, such as a building code, project specification, contract, or purchase order.

3.2.20 *rustication* (also “*break*”)—an interruption or change in plane of a plastered surface.

3.2.21 *scoring* (also known as “*scratching*”)—the grooving of the surface of an unset plaster coat to provide a key for a subsequent coat.

3.2.22 *set*—the chemical and physical change in plaster as it goes from a plastic, workable state to a rigid state.

3.2.23 *stucco*—portland cement-based plaster used on exterior locations.

3.2.24 *stucco finish*—a factory-prepared, dry blend of materials for finish coat applications.

3.2.25 *temper, v*—to mix or restore unset plaster with water to a workable consistency.

3.2.26 *texture*—any surface appearance as contrasted to a smooth surface.

4. Materials

4.1 Materials shall conform to the requirements of the referenced specifications and standards and to the requirements specified herein.

4.2 Cement:

4.2.1 *Portland Cement*—Specification C 150, Type I, II, and III, as specified. White where specified.

4.2.2 *Air-Entraining Portland Cement*—Specification C 150, type as specified. White where specified.

4.2.3 *Masonry Cement*—Specification C 91, Types N, S, and M. White where specified.

4.2.4 *Blended Hydraulic Cement*—Specification C 595, Type IP, I(PM), IS, and I(SM) as specified.

4.2.5 *Air-Entraining Blended Hydraulic Cement*—Specification C 595, Type IP-A, I(PM)-A, IS-A, and I(SM)-A as specified.

4.2.6 *Plastic Cement*—Plastic Cement shall meet the requirements of Specification C 1328, Standard Specification for Plastic (Stucco) Cement.

NOTE 2—Plastic cements are not available nationally.

4.3 *Type “S” Hydrated Lime*—A hydrated lime that contains not more than 8 % unhydrated oxides when tested in accordance with Test Methods C 25. See Specifications C 206 and C 207 for a complete description of a Type “S” hydrated lime.

4.4 Aggregates:

4.4.1 *Sand for Base Coats*—Specification C 897. Aggregate failing to meet gradation limits in Specification C 897 shall be permitted to be used, provided the plaster made with this sand has an acceptable demonstrated performance record in similar construction and climate conditions.

4.4.2 *Perlite*—Specification C 35.

4.4.3 *Sand for Job-Mixed Finish Coats*—Specification C 897.

4.5 *Water*—Water used in mixing, application, and finishing of plaster shall be clean, fresh, suitable for domestic water consumption, and free of such amounts of mineral or organic substances as would affect the set, the plaster, or any metal in the system.

4.6 *Admixtures*—See 3.2.2 and .

4.7 *Fibers*—Specification C 1116 on alkali-resistant fibers, glass fibers, nylon, polypropylene or carbon fibers.

5. Requirements for Bases to Receive Portland Cement-Based Plaster

5.1 Metal bases and accessories used to receive plaster shall be installed in conformance with Specification C 1063, except as otherwise specified.

NOTE 3—All metal, or PVC, or CPVC plastic members should be free of deleterious amounts of rust, oil, or other foreign matter, which could cause bond failure or unsightly discoloration.

5.2 Surfaces of solid bases to receive plaster, such as masonry, stone, cast-in-place or precast concrete shall be straight and true within 1/4 in. in 10 ft (2.1 mm/m) and shall be free of form oil or other elements, which would interfere with bonding. Form ties or other obstructions shall be removed or trimmed back even with the surface of the solid base.

5.2.1 Solid surfaces shall have the suction (ability to absorb water) or surface roughness, or both, to provide the bond required for the plaster.

5.2.2 Smooth or nonabsorbent solid surfaces, such as cast-in-place or precast concrete, shall be prepared to receive portland cement plaster by one of the following methods:

5.2.2.1 Sandblasting, wire brushing, acid etching, or chipping or a combination thereof,

5.2.2.2 Application of a dash-bond coat applied forcefully against the surface, left untroweled, undisturbed, and moist cured for at least 24 h, or

5.2.2.3 Application of a bonding compound suitable for exterior or interior exposure solid surfaces in accordance with the manufacturer’s written directions.

5.2.3 Where bond cannot be obtained over the entire surface to receive plaster by one or more of the methods in 5.2.2, or

where total plaster thickness will exceed the total thickness specified in Table 1 for types of solid bases, furred or self-furring metal plaster base shall be installed in accordance with Specification C 1063.

6. Plaster Proportions and Mixing

6.1 *Proportions:*

6.1.1 All portland cement plasters shall be mixed and proportioned in accordance with the following tables and accompanying requirements, using measuring devices of known volume with successive batches proportioned alike.

6.1.2 Plaster mix used shall be as designated and referenced to Table 2.

6.1.3 Base-coat proportions shall be as shown in Table 3 for the mix specified from Table 2.

6.1.3.1 *Measurement of Materials*—The method of measuring materials for the plaster shall be such that the specified proportions are controlled and accurately maintained. The weights per cubic foot of the materials are considered to be as follows:

Material	Weight, lb/ft ³ (kg/m ³)
Portland cement	94 (1505)
Blended cement	Weight printed on bag
Masonry or plastic cement	Weight printed on bag
Hydrated Lime	40 (640)
Lime Putty	80 (1280)
Sand, Damp and Loose (6.1.3.2)	80 (1280) of dry sand

6.1.3.2 For purposes of this specification, a weight of 80 lb (1280 kg) of oven-dried sand shall be used. This is, in most cases, equivalent to one cubic foot of loose, damp sand.

6.1.4 Finish-coat proportions for job-mixed finish coats shall be as specified in Table 4.

6.1.5 *Factory-Prepared Finish Coats*—See 3.2.14.

6.1.6 Dash-bond coat proportions shall be 1 volume part portland cement and not more than 2 volume parts of aggregate mixed to a consistency that will permit application as specified in 7.1.5.

6.1.7 Admixtures shall be proportioned, mixed, and applied in accordance with the printed directions of the manufacturer. (See A2.5.)

6.2 *Mixing:*

TABLE 1 Nominal Plaster Thickness^A for Three- and Two-Coat Work, in. (mm)

BASE	Vertical				Horizontal			
	1st Coat	2nd Coat	3rd Coat ^B	Total	1st Coat	2nd Coat	3rd Coat ^B	Total
Interior/Exterior								
Three-coat work: ^C								
Metal plaster base	3/8 (9.5)	3/8 (9.5)	1/8 (3)	7/8 (22)	1/4 (6)	1/4 (6)	1/8 (3)	5/8 (16)
Solid plaster base:								
Unit masonry	1/4 (4)	1/4 (6)	1/8 (3)	5/8 (16)	Use two-coat work			
Cast-in-place or precast concrete	1/4 (6)	1/4 (6)	1/8 (3)	5/8 (16)				3/8 (9.5), max
Metal plaster base over solid base	1/2 (12.5)	1/4 (6)	1/8 (3)	7/8 (22)	1/2 (12.5)	1/4 (6)	1/8 (3)	7/8 (22)
Two-coat work:								
Solid plaster base:								
Unit masonry	3/8 (9.5)	1/8 (3)		1/2 (12.5)				3/8 (9.5)
Cast-in-place or pre-cast concrete	1/4 (6)	1/8 (3)		3/8 (9.5)				3/8 (9.5)

^A Exclusive of texture.

^B For solid plaster partitions, additional coats shall be applied to meet the finished thickness specified.

^C For exposed aggregate finishes, the second (brown) coat shall become the “bedding” coat and shall be of sufficient thickness to receive and hold the aggregate.

TABLE 2 Plaster Bases—Permissible Mixes

NOTE—See Table 3 for plaster mix symbols.

Property of Base	Mixes for Plaster Coats	
	First (Scratch)	Second (Brown)
Low absorption, such as dense, smooth clay tile, brick, or concrete	C	C, CL, M, or CM
	CM or MS P	CM, MS, or M P
High Absorption, such as concrete masonry, absorptive brick, or tile	CL	CL
	M CM or MS P	M CM, MS, or M P
Metal plaster base	C	C, CL, M, CM, or MS
	CL	CL
	CM or MS	CM, MS, or M
	M	M
	CP P	CP or P P

6.2.1 All plaster shall be prepared in a mechanical mixer, using sufficient water to produce a workable consistency and uniform color. (See X1.1.)

6.2.2 Base-coat plasters that have stiffened because of evaporation of water shall be permitted to be tempered one time only to restore the required consistency. Plaster not used within 1½ h from start of initial mixing shall be discarded.

NOTE 4—Severe hot, dry climate conditions accelerate the stiffening of plaster and require reduction of this limit. The use of cold waters will slow the stiffening process.

6.2.3 Finish-coat plaster shall not be tempered.

7. Application

7.1 General:

7.1.1 Portland cement plaster shall be applied by hand or machine to the nominal thickness specified in Table 1.

7.1.2 Plaster nominal thickness shall be measured from the back plane of the metal plaster base, exclusive of ribs or dimples, or from the face of the solid backing with or without metal plaster base, to the outer surface exclusive of texture variations.

7.1.3 Portland cement-based plaster shall be applied on furred metal plaster base when the surface of solid backing consists of gypsum board, gypsum plaster, wood, or rigid foam board-type products.

NOTE 5—On horizontal ceiling supports or roof soffits protected by a drip edge, gypsum board products shall be permitted to be used as backing for metal base to receive portland cement plaster.

7.1.4 Separation shall be provided where plaster abuts dissimilar construction materials or openings. (See A2.1.4.)

7.1.5 Each plaster coat shall be applied to an entire wall or ceiling panel without interruption to avoid cold joints and abrupt changes in the uniform appearance of succeeding coats. Wet plaster shall abut set plaster at naturally occurring interruptions in the plane of the plaster, such as corner angles, rustications, openings, and control joints where this is possible. Joinings, where necessary, shall be cut square and straight and not less than 6 in. (152 mm) away from a joining in the preceding coat.

7.1.6 Metal plaster base shall be covered with three-coat work with or without solid backing. The combined total nominal thickness shall be as shown in Table 1. A dash-bond coat shall not replace one of the specified number of coats.

7.1.7 Two-coat work shall be used only over solid bases meeting the requirements of 5.2. The combined total nominal thickness shall be as shown in Table 1. A dash-bond coat shall not replace one of the specified number of coats.

7.1.8 Backplaster where required, shall be applied only after the coat on the opposite side has set sufficiently to resist breaking or cracking the plaster keys.

7.1.9 Each coat shall be permitted to set before the next coat is applied. (See X1.4.2.)

7.1.10 Plaster coats that have become dry shall be evenly dampened with water prior to applying subsequent coats to obtain uniform suction. There shall be no visible water on the surface when plaster is applied.

7.2 Plaster Application on Metal Plaster Bases:

7.2.1 The first (scratch) coat shall be applied with sufficient material and pressure to form full keys through, and to embed the metal base, and with sufficient thickness of material over the metal to allow for scoring the surface.

7.2.1.1 As soon as the first (scratch) coat becomes firm, the entire surface shall be scored in one direction only. The vertical surfaces shall be scored horizontally.

7.2.1.2 The first (scratch) coat shall become sufficiently rigid to support the application of the second (brown) coat without damage to the monolithic continuity of the first (scratch) coat or its key.

7.2.2 The second (brown) coat shall be applied with sufficient material and pressure to ensure tight contact with the first (scratch) coat and to bring the combined thickness of the base coat to the nominal thickness shown in Table 4.

7.2.2.1 The surface of the second (brown) coat shall be brought to a true, even plane with a rod or straightedge, filling surface defects in plane with plaster. Dry rodding the surface of the brown coat shall be permitted.

7.2.2.2 The surface shall be floated uniformly to promote densification of the coat and to provide a surface receptive to bonding of the finish coat.

7.2.3 The third (finish) coat shall be applied with sufficient material and pressure to ensure tight contact with, and complete coverage of the base coat and to the nominal thickness shown in Table 1 and 7.3.1.1.

7.3 Plaster Application on Solid Plaster Bases:

7.3.1 High-suction bases shall be evenly dampened with clean water prior to the application of plaster. Do not dampen low-suction solid bases, such as dense concrete or smooth brick.

7.3.1.1 Where masonry or concrete surfaces vary in plane, plaster thickness required to produce level surfaces shall not be required to be uniform.

7.3.2 Three-Coat Application on Solid Bases:

7.3.2.1 The first (scratch) coat shall be applied with sufficient material and pressure to ensure tight contact and complete coverage of the solid base, to the nominal thickness shown in Table 1. As soon as the first (scratch) coat becomes firm, the entire surface shall be scored in one direction only. The vertical

TABLE 3 Base-Coat Proportions,^A Parts by Volume^B

Plaster Mix Symbols	Cementitious Materials					Volume of Aggregate per Sum of Separate Volumes of Cementitious Materials	
	Portland Cement or Blended Cement	Plastic Cement	Masonry Cement		Lime	1st Coat	2nd ^C Coat
			N	M or S			
C	1	...	...	...	0– $\frac{3}{4}$	2 $\frac{1}{2}$ –4	3–5
CL	1	...	...	...	$\frac{3}{4}$ –1 $\frac{1}{2}$	2 $\frac{1}{2}$ –4	3–5
M	...	...	1	...	...	2 $\frac{1}{2}$ –4	3–5
CM	1	...	1	...	...	2 $\frac{1}{2}$ –4	3–5
MS	...	...	...	1	...	2 $\frac{1}{2}$ –4	3–5
P	...	1	...	...	...	2 $\frac{1}{2}$ –4	3–5
CP	1	1	...	...	...	2 $\frac{1}{2}$ –4	3–5

^A The mix proportions for plaster scratch and brown coats to receive ceramic tile shall be in accordance with the applicable requirements of ANSI A108.1 series applicable to specified method of setting time.

^B Variations in lime, sand, and perlite contents are allowed due to variation in local sands and insulation and weight requirements. A higher lime content will generally support a higher aggregate content without loss of workability. The workability of the plaster mix will govern the amounts of lime, sand, or perlite.

^C The same or greater sand proportion shall be used in the second coat than is used in the first coat.

TABLE 4 Job-Mixed Finish Coat Proportion Parts by Volume

Plaster Mix Symbols ^A	Cementitious Materials					Volume of Aggregate per Sum of Separate Volumes of Cementitious Materials ^B
	Portland Cement or Blended Cement	Plastic Cement	Masonry Cement ^A		Lime	
			N	M or S		
F	1	...	...	...	$\frac{3}{4}$ –1 $\frac{1}{2}$	1 $\frac{1}{2}$ –3
FL	1	...	...	...	1 $\frac{1}{2}$ –2	1 $\frac{1}{2}$ –3
FM	...	...	1	...	...	1 $\frac{1}{2}$ –3
FCM	1	...	1	...	...	1 $\frac{1}{2}$ –3
FMS	...	...	...	1	...	1 $\frac{1}{2}$ –3
FP	...	1	...	...	...	1 $\frac{1}{2}$ –3

^A Additional portland cement is not required when Type S or M masonry cement is used.

^B In areas not subject to impact, perlite aggregate shall be permitted to be used over base-coat plaster containing perlite aggregate.

surfaces shall be scored horizontally.

7.3.2.2 The second (brown) coat shall be applied using the same procedures specified in 7.2.2 and 7.2.2.1, bringing the surface to a true, even plane with a rod or straightedge, filling any defects in plane with plaster and darbying. The surface shall be floated uniformly to provide a surface receptive to the application of the third (finish) coat.

7.3.2.3 The third (finish) coat shall be applied as specified in 7.2.3.

7.3.3 *Two-Coat Application on Solid Plaster Bases:*

7.3.3.1 The first (scratch) coat shall be applied as specified in 7.3.2.1.

7.3.3.2 The second (finish) coat shall be applied as specified in 7.2.3.

7.4 *Finish-Coat Application:*

7.4.1 Job-mixed or factory-prepared finish coats shall be applied, by machine or by hand, as specified in 7.2.3.

7.4.2 The use of excessive water during the application and finishing of finish-coat plaster shall be avoided.

7.5 *Fog-Coat Application*—Job-mixed or factory-prepared fog coats shall be applied in accordance with the directions of the manufacturer.

8. Curing and Time Between Coats

8.1 Provide sufficient moisture in the plaster mix or by moist or fog curing to permit continuous hydration of the cementitious materials. The most effective procedure for curing and time between coats will depend on climatic and job conditions. (See X1.4.2.)

8.2 Sufficient time between coats shall be allowed to permit each coat to cure or develop enough rigidity to resist cracking

or other physical damage when the next coat is applied. (See X1.4.2.)

9. Product Marking

9.1 Packaged materials shall be clearly marked or labeled to indicate product, brand name, the manufacturer, and the weight of the material contained therein. Similar information shall be provided in the shipping advices accompanying the shipment of bulk materials.

10. Delivery of Materials

10.1 Packaged materials shall be delivered in factory-sealed, unopened, and unbroken packages, containers, or bundles.

10.2 Bulk materials shall be delivered in clean transport vessels, free of contaminates.

11. Protection of Materials

11.1 Weather-sensitive materials shall be kept in a dry condition until ready for use. (See A2.4.)

11.2 Bulk materials shall be stored to prevent subsequent contamination and segregation.

12. Environmental Conditions

12.1 Portland cement-based plaster shall not be applied to frozen base or to a base containing frost. Plaster mixes shall not contain frozen ingredients. Plaster coats shall be protected from freezing for a period of not less than 24 h after set has occurred.

12.2 Portland cement plaster shall be protected from uneven and excessive evaporation during dry weather and from strong blasts of dry air.

12.3 *Plaster Application*—When artificial heat is required, heaters shall be located to prevent a concentration of heat on uncured plaster. Heaters shall be vented to the outside to prevent toxic fumes and other products of combustion from adhering to or penetrating plaster bases and plaster. Adequate ventilation shall be maintained in all areas, particularly in interior areas with little or no natural air movement.

12.3.1 Interior environment shall be maintained at a temperature above 40°F not less than 48 h prior to and during

application of portland cement-based plaster. Interior temperature shall be maintained above 40°F until normal occupancy.

12.3.2 For exteriors, plaster shall be applied when the ambient temperature is higher than 40°F (4.4°C), unless the work area is enclosed and heat is provided as described in 12.3.

13. Keywords

13.1 brown coat; cementitious; exterior plaster; fog coat—bond; portland cement; scratch coat; stucco

ANNEXES

(Mandatory Information)

A1. GENERAL INFORMATION

A1.1 The work shall include all labor, materials, services, equipment, and scaffolding required to complete the plastering of the project in accordance with the drawings and specifications, except heat, electric power, and potable water.

A1.2 Where a specific degree of fire resistance is required for plastered assemblies and constructions, details of construction shall be in accordance with official reports of fire tests conducted by recognized testing laboratories, in accordance with Test Methods E 119.

A1.3 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 by recognized testing laboratories, in accordance with applicable sound tests of Test Methods E 90 or E 492.

A1.4 Scaffolding shall be constructed and maintained in strict conformity with applicable laws and ordinances.

A1.5 Work schedules shall provide for completion of work affecting supports, framework or lath of a suspended ceiling (such as loading) before plastering work is accomplished.

A1.6 Surfaces and accessories to receive plaster shall be examined before plastering is applied thereto. The proper

authorities shall be notified and unsatisfactory conditions shall be corrected prior to the application of plaster. Unsatisfactory conditions shall be corrected by the party responsible for such conditions.

A1.6.1 Metal plaster bases, backing, attachment, and accessories to receive plaster shall be examined to determine if the applicable requirements of Specification C 1063 have been met unless otherwise required by the contract specifications.

A1.6.2 The construction specifier shall describe, in the proper section of the contract specifications, the physical characteristics of solid surface bases to receive plaster. The plane tolerance shall be not more than ¼ in. in 10 ft (3.1 mm/m). The mortar joints shall be flush and not struck. Dissimilar materials such as ties, reinforcing steel, and so forth, shall be cut back ⅛ in. (3 mm) below the surface and treated with a corrosion-resistant coating. Masonry shall be solid at corners and where masonry changes thickness in a continuous construction. Form release compounds shall be compatible with plaster or be completely removed from surfaces to receive plaster. The plastering contractor shall use this portion of the construction specifications for acceptance or rejection of such surfaces.

A2. DESIGN CONSIDERATIONS

A2.1 Exterior plaster (stucco) is applied to outside surfaces of all types of structures to provide a durable, fire-resistant covering. Interior plaster is applied to inside surfaces that will be subjected to various exposures, such as abrasion, vibration, or to continuous or frequent moisture and wetting, or to freezing or thawing.

A2.1.1 Sufficient slope on faces of plastered surfaces shall be provided to prevent water, snow, or ice from accumulating or standing. Air-entrained portland cement plaster provides improved resistance to freeze/thaw deterioration. Resistance to rain penetration is improved where plaster has been adequately densified during application and properly cured. Plaster shall

not, however, be considered to be “waterproof.”

A2.1.2 The construction specifier shall describe, in the appropriate section of the contract specifications, the requirements for furnishing and application of flashing. Flashing shall be specified at openings, perimeters, and terminations to prevent water from getting behind plaster. Flashing shall be corrosion-resistant material. Aluminum flashing shall not be used. Flashing supplemented with sealant shall be permitted.

A2.1.3 Sealing or caulking of V-grooves, exposed ends, and edges of plaster panels exterior work to prevent entry of water shall be provided.

A2.1.4 To reduce spalling where interior plaster abuts

openings, such as wood or metal door or window frames, or fascia boards, the edge of three-coat plaster shall be tooled through the second and finish coats to produce a continuous small V-joint of uniform depth and width. On two-coat work, the V-joint shall be tooled through the finish coat only.

A2.1.5 Provide in the appropriate project specification section that solid bases to receive plaster shall not be treated with bond breakers, parting compounds, form oil, or other material that will prevent or inhibit the bond of the plaster to the base.

A2.1.6 Maximum allowable deflection for vertical or horizontal framing for plaster, not including cladding, shall be $L/360$.

A2.2 *Provisions for Drainage Behind Exterior Plaster:*

A2.2.1 In multistory construction where lath and portland cement plaster exterior walls are continuous past a floor slab, tracks or plates and studs shall be offset to provide a space not less than $\frac{3}{8}$ in. (9.5 mm) between the inner face of the exterior plaster and the edge of the floor slab.

A2.2.2 At the bottom of exterior walls where the wall is supported by a floor or foundation, a drip screed and through-wall flashing or weep holes or other effective means to drain away any water that may get behind the plaster shall be provided.

A2.2.3 Where vertical and horizontal exterior plaster surfaces meet, both surfaces shall be terminated with casing beads with the vertical surface extending at least $\frac{1}{4}$ in. (6 mm) below the intersecting horizontal plastered surface, thus providing a drip edge. The casing bead for the horizontal surface shall be terminated not less than $\frac{1}{4}$ in. from the back of the vertical surface to provide drainage.

A2.3 *Relief from Stresses:*

A2.3.1 For information on control joints and perimeter relief see the Installation Section of Specification C 1063.

A2.3.1.1 Control joints shall be cleaned and clear of plaster within the control area after plaster application and before final plaster set.

A2.3.1.2 Prefabricated control joint members shall be installed prior to the application of plaster; therefore, the decision to use them, the type selected, their location, and method of installation shall be determined and specified in project specification sections other than the section on plastering.

A2.3.1.3 The creation of a groove or cut in plaster only, shall be specified in the plastering section. Such groove shall not be considered a control or expansion joint.

A2.3.2 Where plaster and metal plaster base continues across the face of a concrete column, or other structural member, water-resistive building paper or felt shall be placed between the metal plaster base and the structural member (paper or plastic-backed metal plaster base shall be permitted). Where the width of the structural member exceeds the approved span capability of the metal plaster base, self-furring metal plaster base shall be used and sparingly scatter nailed to bring paper and metal base to general plane.

A2.3.3 Where dissimilar base materials abut and are to receive a continuous coat of plaster: (1) a two-piece expansion joint, casing beads back-to-back, or premanufactured control-expansion joint member shall be installed; or (2) the juncture shall be covered with a 6-in. (152-mm) wide strip of galvanized, self-furring metal plaster base extending 3 in. (76 mm) on either side of the juncture; or (3) where one of the bases is metal plaster base, self-furring metal plaster base shall be extended 4 in. (102 mm) onto the abutting base.

A2.4 *Weather-Sensitive Materials*—Water-sensitive materials shall be stored off the ground or floor and under cover, avoiding contact with damp floor or wall surfaces. Temperature-sensitive materials shall be protected from freezing. Bulk materials shall be stored in the area of intended use and caution shall be exercised to prevent contamination and segregation of bulk materials prior to use.

A2.5 *Admixtures*—Admixtures shall be proportioned and mixed in accordance with the published directions of the admixture manufacturer.

A2.5.1 The quantity of admixtures required to impart the desired performance is generally very small in relation to the quantities of the other mix ingredients. Batch-to-batch quantities shall be measured accurately.

A2.5.2 Air-entraining agents cause air to be incorporated in the plaster in the form of minute bubbles, usually to improve frost or freeze-thaw resistance, or workability of the plaster during application. Air-entraining agents for portland cement-based plaster shall meet the requirements of Specification C 260.

APPENDIX

(Nonmandatory Information)

X1. GENERAL INFORMATION

X1.1 *Additions*—Bonding compounds or agents may be pre-applied to a surface to receive plaster. In this usage it is not considered an admixture. Bonding compounds that are integrally mixed with plaster prior to its application are considered admixtures. Where exterior exposure and cyclic wetting are anticipated, the re-emulsification capability of the bonding material must be considered. Bonding agents are only as good as the material surface to which they are applied; therefore, form release materials must be removed from concrete or be compatible with the bonding material used. Bonding agents in plaster mixes may increase the cohesive properties of the plaster. Bonding agents should meet the requirements of Specifications C 631 or C 932.

X1.1.1 By the use of a suitable admixture or additive, it is possible to improve plaster's resistance to moisture movement. However, the use of the terms damproofing or water proofing is misleading, and their use shall be discouraged.

X1.1.2 Natural or synthetic fibers, ½ to 2 in. (13 to 51 mm) in length and free of contaminants may be specified to improve resistance to cracking or to impart improved pumpability characteristics. The quantities per batch shall be in accordance with the published directions of the fiber manufacturer. No more than 2 lb (0.90 kg) of fiber should be used per cubic foot of cementitious material. Asbestos fibers should not be used. Alkaline-resistant glass fibers are recommended where glass fiber is used.

X1.1.3 Plasticizers containing hydrated lime putty, air-entraining agents, or approved fatteners to increase the workability of a portland cement plaster may be used. Plaster consistency and workability are affected by plasticizers that are beneficial in proper quantities from an economic standpoint, but in excess can be detrimental to the long-term performance of the plaster in place.

X1.1.4 Color material for integral mixing with plaster should not significantly alter the setting, strength development, or durability characteristics of the plaster. Natural or mineral pigments that are produced by physical processing of materials mined directly from the earth appear to offer the best long-term performance with respect to resistance to fading. Plaster color is determined by the natural color of the cementitious materials, aggregate, and any color pigment, and their proportions to each other. The use of white cement with the desired mineral oxide pigment color material may result in truer color.

X1.1.4.1 The uniformity of color cannot be guaranteed by the materials manufacturer of the component materials or by the applying contractor. Color uniformity is affected by the uniformity of proportioning, thoroughness of mixing, cleanliness of equipment, application technique, and curing conditions and procedure, which are generally under the control of the applicator. Color uniformity is affected to an even greater degree by variations in thickness and differences in the suction of the base coat from one area or location to another, the type

of finish selected, the migration of color pigments with moisture, and with job site climatic and environmental conditions. These factors are rarely under the control of the applicator.

X1.2 *Finish Coat Categories* (applicable to both natural and colored finishes):

X1.2.1 Texture, as a description of surface appearance, is identified generally with the method and tools used to achieve the finish. Texture can be varied by the size and shape of the aggregate used, the equipment or tools employed, the consistency of the finish coat mix, the condition of the base to which it is applied, and by subsequent decorative or protective treatment.

X1.2.2 There are many factors that affect the ultimate appearance of textured and integrally colored plaster. A suitably sized sample panel should be submitted for approval by the architect and the owner. Once approved, the sample should be maintained on site for reference and comparison.

X1.2.3 With the almost limitless variations possible for finish appearance or texture, the same term may not have the same meaning to the specifier, the contractor, and the actual applicator. The specifier is cautioned to use an approved range of sample panels. To provide some guidance, the following categories are generally understood and recognized to imply a particular method of application technique or resulting finished appearance:

X1.2.4 *Smooth Trowel*—Hand- or machine-applied plaster floated as smooth as possible and then steel-troweled. Steel troweling should be delayed as long as possible and used only to eliminate uneven points and to force aggregate particles into the plaster surface. Excessive troweling should be avoided.

X1.2.5 *Float*—A plaster devoid of coarse aggregate applied in a thin coat completely covering the base coat, followed by a second coat that is floated to a true plane surface yielding a relatively smooth to fine-textured finish, depending on the size of aggregate and technique used. It is also known as sand finish.

X1.2.6 *Trowel-Textured (such as Spanish Fan, Trowel Sweep, English Cottage)*—A freshly applied plaster coat is given various textures, designs, or stippled effects by hand troweling. The effects achieved may be individualized and may be difficult to duplicate by different applicators.

X1.2.7 *Rough-Textured (such as Rough Cast, Wet Dash, Scottish Harl)*—Coarse aggregate is mixed intimately with the plaster and is then propelled against the base coat by trowel or by hand tool. The aggregate is largely unexposed and deep textured.

X1.2.8 *Exposed Aggregate (also known as Marblecrete)*—Varying sizes of natural or manufactured stone, gravel, shell, or ceramic aggregates are embedded by hand or machine propulsion into a freshly applied finish “bedding” coat. The size of the aggregate determines the thickness of the “bedding” coat. It is

generally thicker than a conventional finish coat.

X1.2.9 *Spray-Textured*—A machine-applied plaster coat directed over a previously applied thin smooth coat of the same mix. The texture achieved depends on the consistency of the sprayed mixture, moisture content of the base to which it is applied, the angle and distance of the nozzle to the surface, and the pressure of the machine.

X1.2.10 *Brush-Finish*—A method of surfacing or resurfacing new or existing plaster. The plaster is applied with a brush to a thickness of not less than $\frac{1}{16}$ in. (1.6 mm). For an existing plaster surface the bond capability must be determined by test application or a bonding compound must be applied prior to the brush application.

X1.2.11 *Miscellaneous Types*—This finish coat category is somewhat similar to trowel-textured finishes, except that the freshly applied plaster is textured with a variety of instruments other than the trowel, such as swept with a broom or brush, corrugated by raking or combing, punched with pointed or blunt instrument, scored by aid of a straightedge into designs of simulated brick, block, stone, and so forth. A variation of texturing a finish coat involves waiting until it has partially set and then flattening by light troweling of the unevenly applied plaster or by simulating architectural terracotta.

X1.2.12 *Scruffitto*—A method of applying two or more successive coats of different colored plaster and then removing parts of the overlaid coats to reveal the underlying coats, usually following a design or pattern. This is not generally considered a finish coat operation because of the number of thickness of coats.

X1.3 When specified as alternate for final coat, trowel- or plaster machine-applied textured acrylic finishes containing aggregate may be substituted for portland cement finish coats, provided brown coat is properly prepared and finish is applied according to the manufacturer's directions.

X1.3.1 *Staining of Plaster*—Staining and discoloration of plaster, caused by free water draining from one plane of plaster to another or from a dissimilar material onto a plaster surface, can be minimized by providing sufficient depth and angle for drip caps and the use of water-resistive surface coatings.

X1.3.2 Staining of plaster due to entrapment of moisture behind the plaster, can be avoided or minimized by providing an air space for ventilation between the back of the plaster and adjacent material. This type of staining may occur where insulation with or without vapor barrier, or other material containing asphaltic or coal tar derivatives, fireproofing salts, and so forth, can migrate with moisture movement to the finished plaster surface.

X1.3.3 Integrally colored plaster can be discolored or altered in shade if subjected to moisture, either from uncured base coats or external sources, such as rain, too soon after applications.

X1.4 *Installation Instructions:*

X1.4.1 Hand mixing should not be permitted, except as approved by the contract specifier.

X1.4.1.1 After all ingredients are in the mixer, mix the plaster for 3 to 5 min.

X1.4.1.2 The amount of water used in the plaster mix should be determined by the plasterer. Factors such as the suction of the base, or of the previous coat, water content of the aggregate, drying conditions, and finishing operations should be considered in determining water usage. Use of excessive water may result in dropouts, fall or slide off, excessive shrinkage, high porosity, and lower strength.

X1.4.2 *Time Between Coats and Curing for Portland Cement-Based Plaster:*

X1.4.2.1 The timing between coats will vary with climatic conditions and types of plaster base. Temperature and relative humidity extend or reduce the time between consecutive operations. Cold or wet weather lengthens and hot or dry weather shortens the time period. Moderate changes in temperature and relative humidity can be overcome by providing additional heating materials during cold weather and by reducing the absorption of the base by pre-wetting during hot or dry weather.

X1.4.2.2 In order to provide more intimate contact and bond between coats and to reduce rapid water loss, the second coat should be applied as soon as the first coat is sufficiently rigid to resist cracking, the pressures of the second coat application, and the leveling process.

X1.4.2.3 The amount of water and the timing for curing portland cement plaster will vary with the climatic conditions, the type of base, and use or nonuse of water-retentive admixtures.

X1.4.2.4 Some moisture must be retained in or added back to freshly applied portland cement-based plaster. If the relative humidity is relatively high (above 75 %), the frequency for rewetting a surface may be reduced. If it is hot, dry, and windy, the frequency of rewetting must be increased.

X1.4.2.5 Consider the physical characteristics of the structure as well as the previously mentioned conditions when selecting the method of curing. The method can be one or a combination of the following:

(1) Moist curing is accomplished by applying a fine fog spray of water as frequently as required, generally twice daily in the morning and evening. Care must be exercised to avoid erosion damage to portland cement-based plaster surfaces. Except for severe drying conditions, the wetting of finish coat should be avoided, that is, the base coat prior to application of the finish coat.

(2) Plastic film, when taped or weighted down around the perimeter of the plastered area, can provide a vapor barrier to retain the moisture between the membrane and plaster. Care must be exercised in placing the film: if too soon, the film may damage surface texture; if too late, the moisture may have already escaped.

(3) Canvas, cloth, or sheet material barriers can be erected to deflect sunlight and wind, both of which will reduce the rate of evaporation. If the humidity is very low, this option alone may not provide adequate protection.

 **C 926**

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