EXTERIORS
STUCCO

ESTIMATING STUCCO

Three-coat stucco requires lath as well as cement-mortar stucco. Estimating Stucco Materials, below, provides some rough measures of the materials required for different construction elements and stucco thicknesses.

FIGURE: ESTIMATING STUCCO MATERIALS

MATERIALS FOR 100 SQ. YD. OF WALL

Type of Construction	Lath (sq. yd.)	Other Materials
Metal lath on wood studs	105	8 lbs. self-furring nails or 15 lbs. staples
Metal lath on steel studs	105	10 lbs. tie wire, 1,000 lin. ft. of 3/4-in. channel

STUCCO FOR 100 SQ. FT. OF WALL

		1:3 Mortar Materials	
Stucco Thickness (in.)	Stucco Amt. (cu. ft.)	Cement (cu. ft.)	Sand (cu. ft.)
1/4	2.08	0.68	2.06
3/8	3.13	1.03	3.10
1/2	4.17	1.37	4.12
5/8	5.21	1.71	5.15
3/4	6.25	2.06	6.18
1	8.33	2.74	8.24

STUCCO TYPES: WEEP SCREEDS AND CONTROL JOINTS

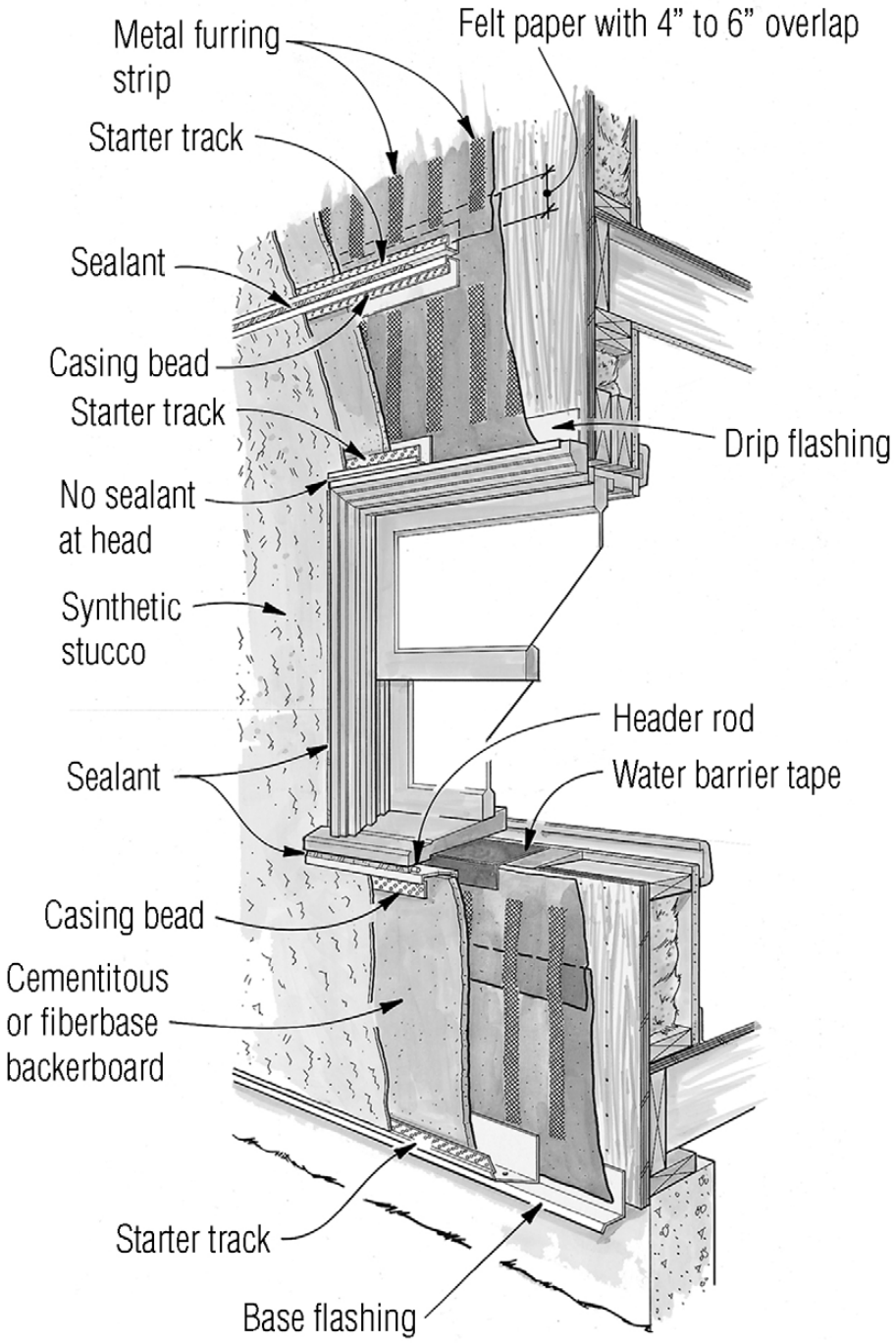
A perforated weep screed at the bottom of the wall and over openings serves two important purposes — it provides a screed that helps ensure a uniform coat thickness, and it provides a place for water that leaks into the wall to escape (Weep Screed, below).

Stucco Control Joints

Control joints allow for structural movements that would otherwise crack the stucco. On a house, control joints should be applied over the metal lath at a few critical locations:

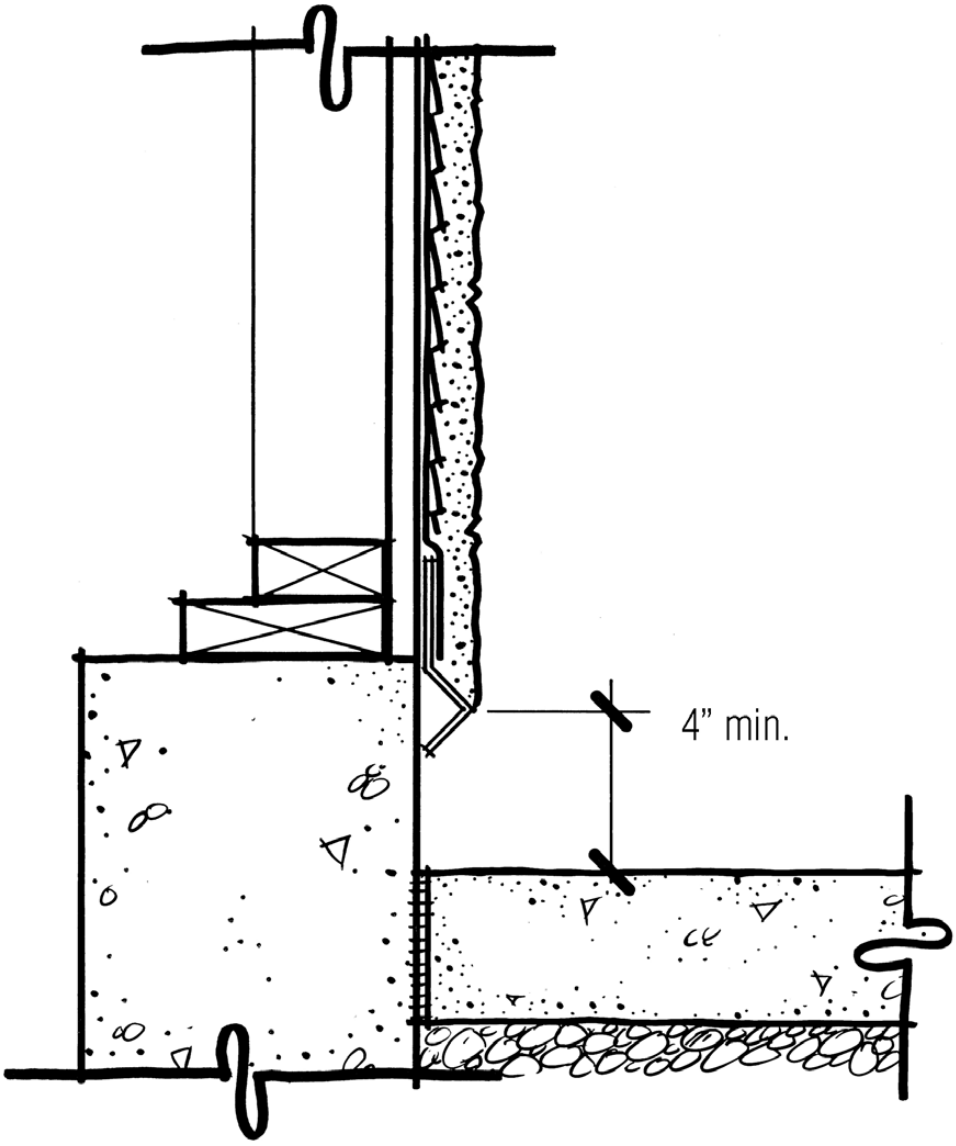
- Over the rim joist at the intersection between floors to accommodate shrinkage in the floor joists
- Over the intersection between different types of construction, such as the joint between wood framing and a block wall (Stucco Control Joints, below).
- On tall walls and long runs, applied vertically or horizontally to break up wall areas into smaller sections (less than 18 ft.)

FIGURE: DRAINAGE PLANE FOR SYNTHETIC STUCCO



Cementitious backerboard provides a more durable substrate for synthetic stucco than foam insulation board. The backerboard must be installed over mesh furring strips to provide a drainage gap so that any water that gets through the stucco is directed to weep areas at windows and wall skirts.

FIGURE: WEEP SCREED



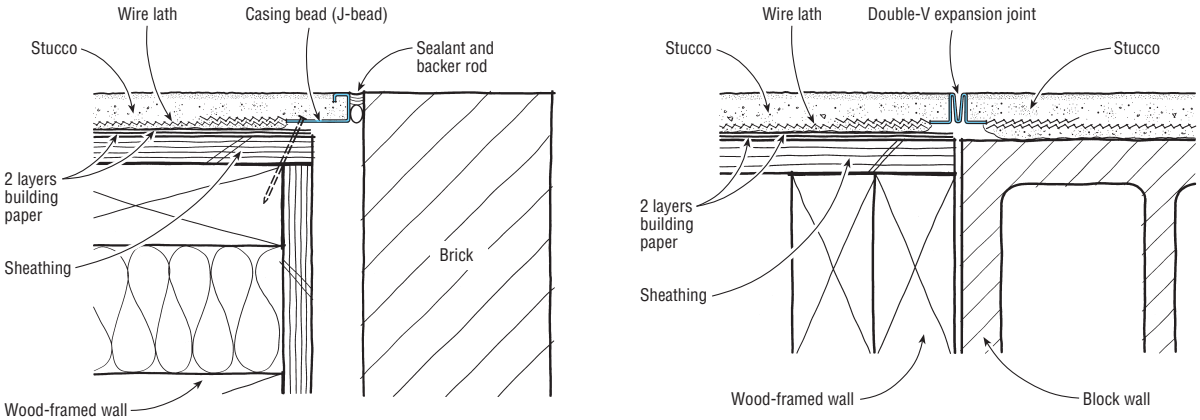
Install weep screeds to ensure a uniform stucco thickness and to provide a drainage outlet for water.

Similarly, casing bead and corner bead help to create expansion joints at critical intersections:

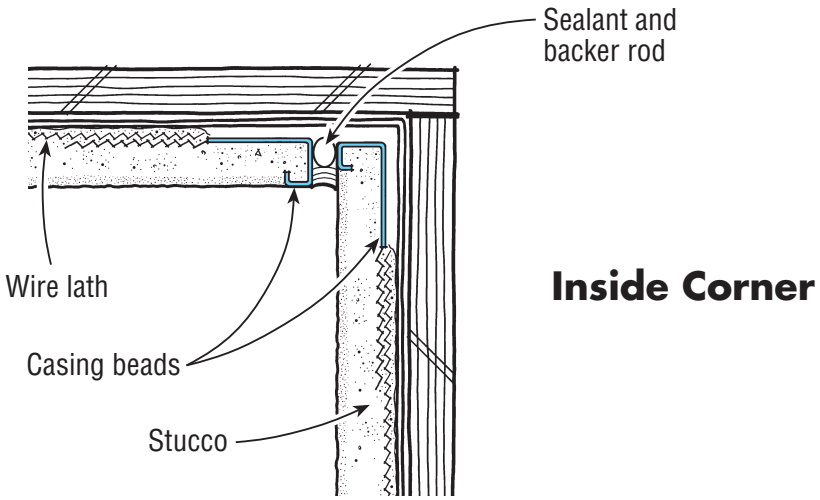
- Outside corners are best detailed with corner bead (Stucco Corner Treatments, below). Continuous stucco wrapped around corners is likely to crack.
- Inside corners should be flashed with two layers of sheathing wrap or flexible flashing, and then casing bead should be applied vertically to create an expansion joint (Stucco Corner Treatments, below). While the flashing serves as the most important water sealing protection, the joint between the two casing beads should be caulked with a high-quality urethane caulk, as a first-line defense.
- Apply casing bead (also called J bead) at the joint between any dissimilar materials — around window flanges (Drainage Plane for Synthetic Stucco, above), where stucco meets a brick chimney (Stucco Control Joints, below), or at the top of a wall where stucco meets a soffit or frieze board.

Stucco Types: Weep Screeds and Control Joints

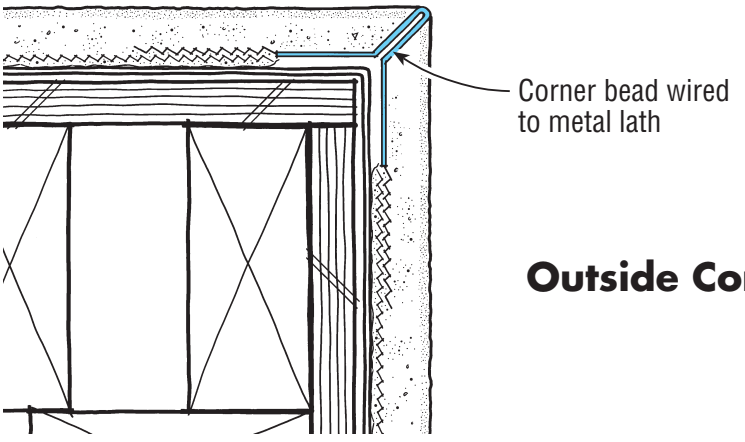
FIGURE: STUCCO CONTROL JOINTS



Control joints are needed at the juncture between dissimilar materials. Without an expansion joint, the stucco will crack.



Inside Corner



Outside Corner

STUCCO TYPES: METAL LATH

Traditional three-coat systems and one-coat systems both require lath — either expanded metal lath or wire lath (Metal Lath for Stucco, below). The primary purpose of metal lath is to provide a keyway to bond the stucco to the structure, and so it must stand off the wall slightly to allow stucco to get behind it and fully encase the metal. This is done by using a self-furring material or with furring nails. Metal lath also provides some tension reinforcement for the stucco, but it will not prevent cracking. Cracking must be controlled by using the right mix, controlling the temperature during application, and allowing the stucco to cure.

Expanded metal lath comes in several varieties. Diamond lath is available in plain, self-furring (allows plaster underneath the lath), and paper-backed. Stucco mesh is similar to diamond lath but has larger openings. It is available only plain, so it must be installed with furring nails over sheathing wrap. Flat ribbed lath typically requires furring nails; it is available in two weights — 2.75 and 3.4 lbs. per yd. The lighter material is made for interior plaster and is not suitable for exterior stucco. Three-eighths-inch rib lath is self-furring, but it's difficult to encase completely in stucco and so is not recommended for wet climates.

Wire lath is not the same as chicken wire. Woven wire is available in plain, self-furring, and paper-backed versions; plain wire lath should be installed with furring nails. Use heavier 16- and 17-gauge material for three-coat stucco; lighter 20-gauge wire can be used for one-coat systems.

Furring nails. When using plain lath, use furring fasteners — which have fiber spacers — to keep the lath about 1/4 in. away from the sheathing wrap. This allows the stucco to fully encase the lath.

Installing Metal Lath

- Run the long dimension of metal lath perpendicular to the framing.
- With plain (unbacked) lath, start at the top so lower courses lap over upper courses. Paper-backed sheets should be the opposite — "shingled" so upper courses lap over lower courses, like the sheathing wrap, allowing water to drain down and out.
- Expanded metal lath should be lapped 1/2 in. along the top and bottom sides and 1 in. at the ends. Wire lath should be lapped on all sides at least one full mesh
- (1- to 2-in.).
- Use galvanized fasteners. Do not use aluminum fasteners; these will react galvanically with the steel lath.

FIGURE: METAL LATH FOR STUCCO

	Type	Weight (lb. per sq. yd.)	Opening Size (in.)	Typical Unit Dimensions
Expanded Metal	Diamond mesh[1]	1.75, 2.5 and 3.4	5/16 X 3/8	27 in. X 96 in.
	1/8-in. flat rib mesh[1]	2.75 and 3.4	5/16 X 3/8	27 in. X 96 in.
	3/8-in. rib lath (high rib)	3.4 and 4.0	5/16 X 3/8	27 in. X 96 in.
Wire lath	Woven Wire[2]	1.7 (18 gauge)	1 (hexagonal)	3 ft. X 150 ft. (rolls)[2]
		1.4 (17 gauge)	1 1/2 (hexagonal)	3 ft. X 150 ft. (rolls)[2]
	Welded Wire[2]	1.4 (16 gauge)	2 X 2	3 ft. X 150 ft. (rolls)[2]
		1.4 (18 gauge)	1 X 1	3 ft. X 150 ft. (rolls)[2]
		1.9 (16 gauge)	1 1/2 X 2	3 ft. X 150 ft. (rolls)[2]

Notes: 1: Available in plain, self-furring, and paper-backed; **2:** Paper-backed and self-furring also available in sheets

THREE-COAT STUCCO

The first two coats of a three-coat system are made of a site-mixed cement plaster. Each batch contains measured amounts of Portland cement, hydrated lime, fine sand, and water. To help reduce the cracking that is common with stucco, the basic mix can be modified with liquid polymer additives, which increase strength and improve curing, and with chopped fiberglass for reinforcement.

Scratch Coat

The scratch coat is applied directly to a clean block wall or, on wood structures, over "D" paper (or better) and galvanized metal lath. A metal rake is used to create "scratch" lines in the still-wet surface. The furrows create a rough surface into which the brown coat can key for a good bond.

Scratch-coat thickness. The scratch coat should be approximately 3/8- to 1/2-in. thick — thick enough to just cover the wire.

Brown Coat

The brown coat (which is actually gray, like other cement stucco) is applied the next day as a smooth coat, usually "rodded" with straightedges and wooden floats (Brown Coat, below). In the western U.S., a steel trowel is used to produce an adobe look when the brown coat is the final coat.

Brown-coat thickness. The brown coat is composed of slightly more sand than the scratch coat mixture, and therefore it is more manageable but slightly weaker. It should be applied 1/4- to 3/8-in. thick. Apply the brown coat as evenly as possible. An uneven brown coat can lead to an inconsistent thickness in the finish coat, causing some areas of the finish coat to dry before others. The result is a splotchy or "mottled" color coat and excessive hairline cracking.

Once applied, the two coats should be allowed to cure for at least a week, preferably two weeks, before applying the finish coat (see Curing Stucco). This allows the scratch and brown coats to strengthen, settle down, and do all the shrinkage cracking they intend to do.

Finish Coat

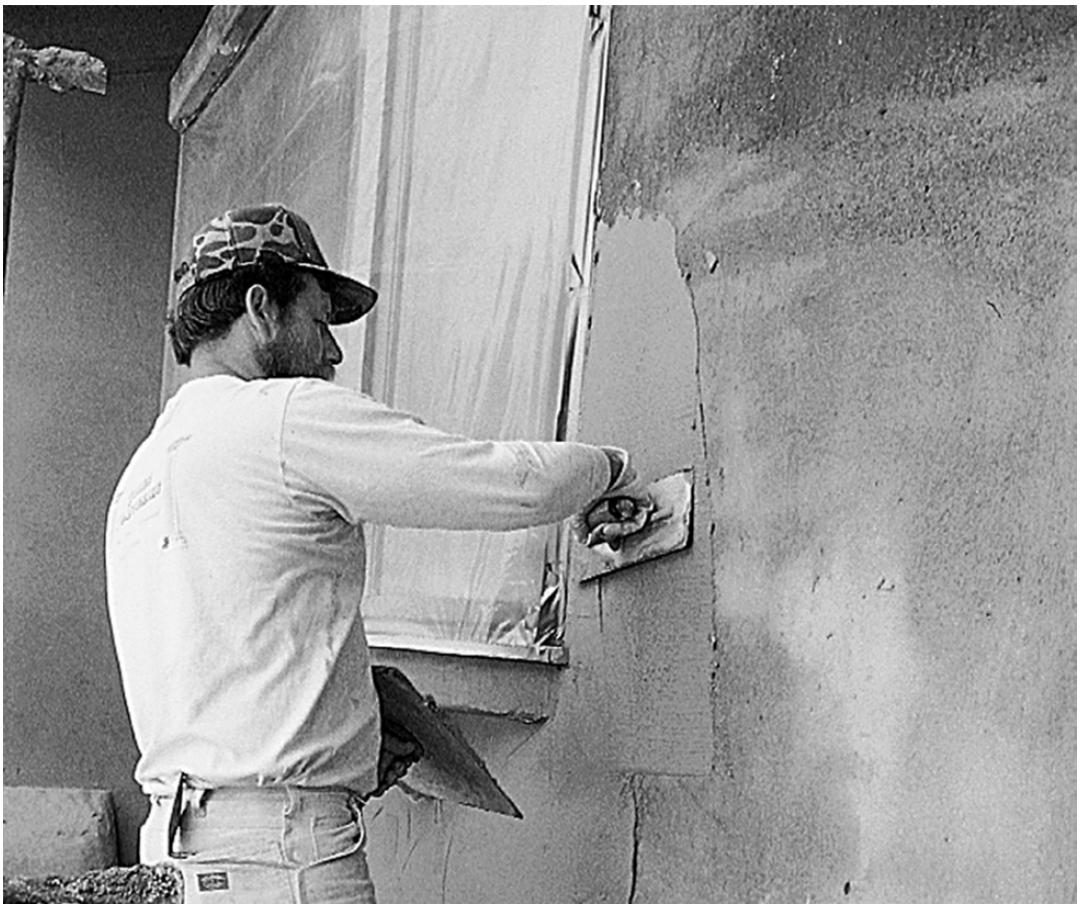
After the curing period, a finish coat can be applied (Finish Coat, below). Color is applied to the finish mix by adding iron oxide pigments to a mix made with white Portland cement. There are many types of pigments available at different prices. The cheaper pigments tend to fade and be inconsistent from batch to batch.

Finish-coat thickness. The finish coat is only about 1/8 in. thick. It should be applied as evenly as possible to ensure uniform drying.

FIGURE: BROWN COAT

A 1/4- to 3/8-in.-thick brown coat is applied over the scratch coat and "rodded" with a straightedge.

FIGURE: FINISH COAT



A 1/8-in.-thick finish coat is applied with a trowel.

MIXING STUCCO

Stucco (like concrete) derives its strength as a result of two factors: the relative strength of the mix and its drying time. A wet mixture will result in excessive shrinkage (often called checking), and a dry mixture — or stucco completed in very hot weather — will create a weak bond (see Weather Precautions, page 10).

STUCCO INGREDIENTS

Water

Use clean water that is suitable for drinking. Mineral and organic impurities in water may discolor or affect the set time, and may attack metal lath.

Sand

It is important to use bagged silica sand to ensure that there are no iron particles in the mix, which may cause staining. Do not use the less expensive "yard sand," which often has impurities.

Cement

Most stucco uses Portland cement (Types I and III, Figure: Cold-Weather Guidelines for Concrete Walls and Footings, Cold-Weather Concrete) or masonry cement (Types M, S, and N, Figure: Standard Mortar Mixes, Mortar). White Portland cement is used to produce a white or light colored finish coat. Plastic cement is a special cement made expressly for the plaster industry, and is commonly available in the Southwest and on the West coast. It is a blend of Portland cement and plasticizing materials, such as limestone or hydrated lime. When plastic cement is used, no lime or other plasticizer is required.

Plasticizer

The function of a plasticizer is to improve the workability of the brown and finish coats or the scratch coats applied over poured concrete walls. Type S hydrated lime is the most common plasticizer used in stucco.

MIX PROPORTIONS

Inconsistent mixing will result in obvious differences in color, texture, and strength between batches. Over time, mismixed batches can effloresce or fail. Make every effort to keep mix proportions consistent, following the guidelines shown in Stucco Mixes.

FIGURE: STUCCO MIXES

MIX PROPORTIONS (PARTS PER VOLUME)

Group	Portland Cement	Type II Masonry Cement	Plastic Cement	Lime	Sand
C (Cement)	1	—	—	0 to 1/4	3 to 4
C	1	1	—	—	6 to 7 1/2
C	1	—	—	1/4 to 1/2	4 to 6
L (Lime)	1	—	—	2 to 1 1/4	4 1/2 to 9
L	—	1	—	—	3 to 4
F (Finish)	1	—	—	1 1/4 to 2	5 to 10
P (Plastic)	1	—	1	—	6 to 10
P	—	—	1	—	3 to 4

RECOMMENDED STUCCO GROUP

Base Material	Scratch	Brown[1]	Finish
Low Absorption (poured concrete, dense brick)	C, P	C, L, P	L, F, P
High Absorption (concrete block, clay brick, structural tile)	L, P	L, P	L, F, P
Metal Reinforcement (over all types of construction)	C, P	C, L, P	L, F, P

Choose the stucco group for each coat, depending on the base material requirement shown in the bottom half of this table. When mixing each stucco group, keep proportions consistent between batches and follow mix proportions shown in the top half of the table.

Notes: 1: Use as base coat in two-coat work

MIXING PROCEDURE

Follow this procedure, using a paddle-type mortar mixer:

- Add majority of the mix water and start mixer. Keep in mind that the drier the mix, the stronger the stucco, so don't add too much water.
- Add approximately half of the sand.
- Add lime (if required), followed by cement and any admixtures required.
- Add remainder of sand.
- Add pigment (finish coats only). Allow the mixer to run until the color is dispersed throughout the entire load. Undermixing the finish will permit lumps of raw color to be left in the finish.
- Add water required to reach desired consistency (and no more). Continue mixing 3 to 5 minutes until batch is mixed uniformly.
- Keep batches to a size that can be applied within one hour after mixing.

WEATHER PRECAUTIONS

Cold Weather

Don't mix materials or apply stucco when the air temperature is below 35°F. Keep materials covered at night, and if working temperatures are low, warm the mix water and the sand with salamander heaters. Also keep freezing rain and snow away from freshly stuccoed walls. If possible, install gutters and tip up scaffold planks at the end of the day to reduce splashback.

A calcium-based accelerant can be added as an "anti-freeze." But this also increases the salinity of the mix and may cause efflorescence — the migration of salts to the surface.

Hot Weather

In hot, or warm windy weather (above 75°F), there is a danger of the stucco drying too fast, or flash curing. Keep materials out of the direct sun. Sand and water both hold heat, and if these can be kept cool, the stucco will dry more slowly. But don't moisten the sand to cool it off; this may throw off the mix ratio. If possible, start work early in the day and "chase the shadows" (working in the shade will slow drying times).

After applying brown coat, keep freshly stuccoed walls damp in hot weather, using a garden sprayer or a garden hose with a fogging head. Mist the walls every hour until the sun and wind are no longer a problem. Also, draping new work with wet burlap and keeping a soaker hose on the top of the wall to keep the burlap wet will retard evaporation as well.

Do not mist or dampen a color coat, however. This may result in splotchy walls. To be safe, the only choice is to wait for the right weather to apply the finish coat.

CURING STUCCO

The brown and scratch coats must cure for a minimum of seven days before the color coat can be applied (Curing Schedule for Cement Stucco, below). For best results, wait four weeks to allow the brown coat to achieve full strength.

Three-coat stucco requires moist curing — fogging with fine water spray at the beginning and the end of the work day under normal weather conditions. Fogging should be delayed until the scratch and brown coats are sufficiently set to prevent erosion, and at least 12 hours after applying the finish coat. For two-coat stucco applications, follow curing recommendations for brown and finish coats.

FIGURE: CURING SCHEDULE FOR CEMENT STUCCO

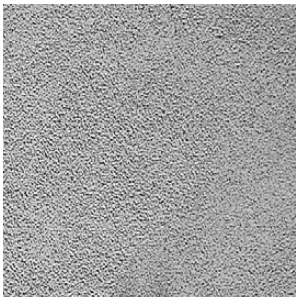
Stucco Coat	Moist Curing	Total Setting Time[1]
Scratch	12 to 24 hr.	At least 48 hr. (between coats)
Brown	12 to 24 hr.	At least 7 days (between coats)
Finish[2]	12 to 24 hr.	At least 48 hr. (before painting)

Notes: 1: Air temperature min. 50°F should be maintained during this time; **2:** Moisten base coat immediately before applying finish coat.

FINISH TEXTURES

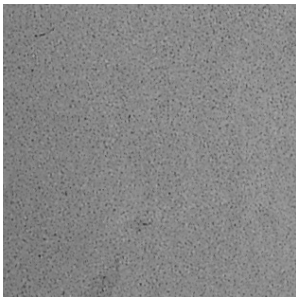
The color-coat finish is usually floated to a sand finish, but an experienced applicator can vary the texture and color with trowel techniques (Common Stucco Textures).

FIGURE: COMMON STUCCO TEXTURES



Sand Float
After troweling on stucco, use a sponge float in a swirling motion. Additional water may be sprinkled lightly on the area, as needed, to roll the sand, but don't over-rub; this may create a bald spot.

Fine Lace
Use a small brush and lightly dab wet stucco onto the colored stucco base. Wait a minute for the excess water to dry out, and then flatten the ridges by lightly running a clean trowel over the dabbed spots.



Smooth Finish
Trowel on the finish stucco, continually working and smoothing the material. To reduce small shrinkage cracks, it may be necessary to retrowel a second and third time, sprinkling water on the wall with a brush, as needed, to act as a lubricant for the trowel.