

# STUCCO



## Architects Design Guide

Published by the Stucco Manufacturers Association

## DESIGNERS GUIDE

**Overview:** There are number of stucco and stucco-like claddings available for designers to select from and no assembly or system is perfect for every building, substrate or location. The designer should select a stucco considering factors such as Type of Construction (I-V), impact on fire ratings, moisture management principles, durability, availability of skilled labor, availability of materials and regional preferences. Once a system or assembly is selected, details and specifications should follow complimenting the criteria. Moisture management is one of the more confusing issues with cement plaster (stucco) as there are various methodologies in handling moisture. Moisture management for stucco can fit into one of three categories: *Barrier, Concealed Barrier, or Rain Screen*. Selecting a moisture management and adhering to that principle is recommended, particularly with consistency of details at penetrations, transitions, and terminations of the chosen assembly. Options available with stucco, such as adding Continuous Insulation or Decorative Shapes can make these principles more confusing. Contractors who fail to understand these principles or untrained crews tend to exacerbate problems, especially with unclear or confusing directives and details.

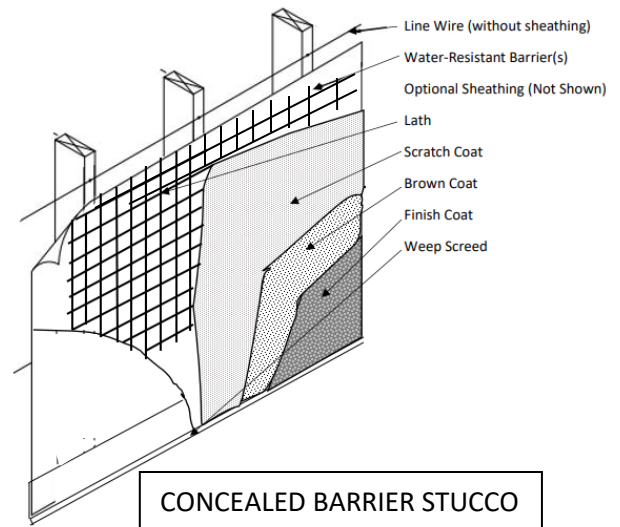
The Stucco Manufacturers Association (SMA) produced this brochure as a guide to assist designers in selecting a system suited for their ideals and project. SMA guide details are available upon request. SMA details are guides and not intended for any specific project or to limit options. Specific manufacturers recommendations override SMA recommendations.

**CODE:** Building Codes, as of 2108, simply require exterior walls to provide a weather-resistant wall envelope that includes flashing as described in Section 1404.4. The envelope shall be designed and constructed in such a manner as to prevent the accumulation of water by providing a water-resistive barrier behind the veneer, a means of draining and protection against condensation. Exceptions are concrete or masonry walls and assemblies passing ASTM E 331 testing with a few additional conditions. Flashing shall be done in a manner to prevent moisture from entering the wall or to redirect that moisture to the exterior. The code intentionally allows for a variety of material and design options to meet the intent of the codes "Performance Requirements" (Section 1402).

**(100 series) BARRIER MOISTURE MANAGEMNT:** The "barrier" methodology relies on the cement plaster material to keep bulk water out and in some cases, vapor as well. Cement plaster is highly water-resistant and can be a barrier. The barrier method relies heavily on sealing penetrations and terminations to prevent water entry beyond the face or barrier. This method is common and been used for centuries in Europe with cement plaster over masonry or concrete substrates, and a preferred method of construction in some regions. A lath must be added for plaster over 5/8 inch thick. **CAVEAT:** For framed walls, the barrier approach is considered a "code alternate".

**(200 series) CONCEALED BARRIER MOISTURE MANAGEMENT:** This moisture management principle acknowledges cement plaster as the primary defense. However, we anticipate incidental water will find its way behind the cement cladding, typically at penetrations, terminations or larger cracks. A concealed water-resistive barrier is installed to prevent incidental moisture from entering the wall cavity or damaging the framing substrate (code compliance). The concealed barrier may be a sheet, or a fluid applied product that must integrate with flashings. The concealed barrier is the most common method

used with for cement plaster over framed walls. This method is 2021 code compliant for Climate Zone B. Climate Zones A & C may require and benefit with a rainscreen approach. Incidental water intrusion is absorbed by the cement membrane and typically exits as vapor before it travels down to the weep screed. The US Dept of Energy and Oak Ridge National Laboratory report properly mixed and applied, cement plaster is highly water-resistant, vapor permeable and 2 layers water-resistant membrane (WRB) provide excellent drainage. **CAVEATS:** Two layers of WRB are required over wood-based sheathings. These layers must integrate with flashings in a “shingle-fashion”. Refer to 400 or 500 for adding Continuous Insulation and 300 for adding a rain screen option.



**(300 series) RAIN SCREEN:** This is a moisture management principle that allows for greater water intrusion beyond incidental water. Rain screen creates a measured path to allow water to flow freely to the base of the framed wall to exit at a weep screed. Approved for all Climate Zones. Drainage mats with a liner facing outwards is the preferred method to create additional drainage. **CAVEATS:** Costs can increase with special trims and accessories for rainscreen. Fire ratings should be investigated when rain screen is employed. Some rigid insulation (CI) assemblies may also qualify as a rain screen.

**(400 series) CONTINUOUS INSULATION:** The implementation of Continuous Insulation with stucco has been done for decades. Typically, the WRB is placed behind the rigid insulation, as the cement plaster bonds tenaciously to most foams and mineral wool. However, a lath is still required for CI stucco.

**CAVEATS:** The rigid insulation should be of a type that allows a bond with the cement plaster. CI rain screen options include a drain mat or drainage grooves between the insulation and the sheathing. Fire ratings should be tested per NFPA requirements. Rigid mineral wool may also be used. SAM recommends that insulation not exceed 2 inches thickness without manufacturers approval. Refer to 500 for situations with the WRB placed over the foam.

**(500 series) DENSE INSULATION:** Should the designer prefer or be required to put the WRB over the insulation, the insulation should be similar in strength and density to conventional sheathings, such as gypsum or wood-based sheathings. A dense sheathing allows items to be attached and for flashings to stay in a vertical line, facilitating ease of drainage. **CAVEATS:** The insulation should be approved for use by the manufacturer. The SMA recommends not exceeding two-inch of CI thickness. Attachment of lath shall comply to Building Code tables covering cladding on foam sheathings in Chapter 26 for a cladding weighing 11 per square foot. This weight is considered three-coat cement plaster .

## PROPRIETARY vs GENERIC

PROPRIETARY- A “proprietary” system is by a specific manufacturer and must follow their recommendations and/or Evaluation Report. This includes design options, material selection and installation. Common Proprietary systems are One-Coat Stucco, Cement Board Stucco, EIFS. Contact

the manufacturer to ensure compliance. The following illustrated of proprietary systems will familiarize yourself with terminology. Many are high performance systems, have warranties or preferred in various regions. You should also consider finish coat, texture, colors, decorative shapes and crack resistance membranes and availability. Proprietary systems should have an ESR (Evaluation Services Report).

GENERIC: These are prescriptive assemblies per the building code. They should follow established standards such as ASTM, ACI or SMA for guidance. The SMA details are based on generic stucco installations but may be used with “system” if allowed by that manufacturer. The SMA provides on-line training on generic assemblies to the lath and plaster industry with Modules of learning. SMA Contractor Certification verifies education and reference checks on installing generic cement plaster assemblies.

Two coat cement plaster (Brown and Finish Coat) on masonry walls is also a generic assembly. A lath is required when the plaster exceeds 5/8 inch thickness. A concealed barrier (WRB) is not required and typically not recommended for two-coat plaster on masonry.

## Three-Coat Stucco

Cement plaster (stucco) in America is more common on framed walls as opposed to the rest of the world with stucco on masonry walls. This necessitated the need for a first coat to provide a rigid base for the second/leveling coat. This was because “Open-Stud” construction was predominate in early America . Today most framing is sheathed. All stucco and stucco like systems are meant to have a final decorative coating over the cured nominal 3/4 inch base or leveling coat. The three coats are a Scratch, Brown (basecoat) and a Finish coat. Installation of a three-coat stucco is generic, prescriptive and per the Building Code, ASTM or industry established standards. Three coat stucco can have a cement or an acrylic finish coat.

PROS:	CONS:
<p>Historic, traditional, and proven in all regions. Listed in the code as noncombustible with a one-hour fire-rating at 7/8 inch thick cement. Durable and suitable for all Types (I-V) of construction. Allows for mixing and matching of products. Most durable of stucco systems. Offers widest range of texture possibilities. Materials typically can be locally sourced. Two-coat is for masonry walls.</p>	<p>Mixing and matching of products can open a door to problems. Portland cement plaster needs 7 days to cure prior to applying finish coat. Stucco is subject to an occasional hairline crack when under stress. Requires trained and skilled workers in lath and plastering to be installed properly.</p>



**THREE COAT PORTLAND CEMENT PLASTER ON WOOD-BASED SHEATHING**

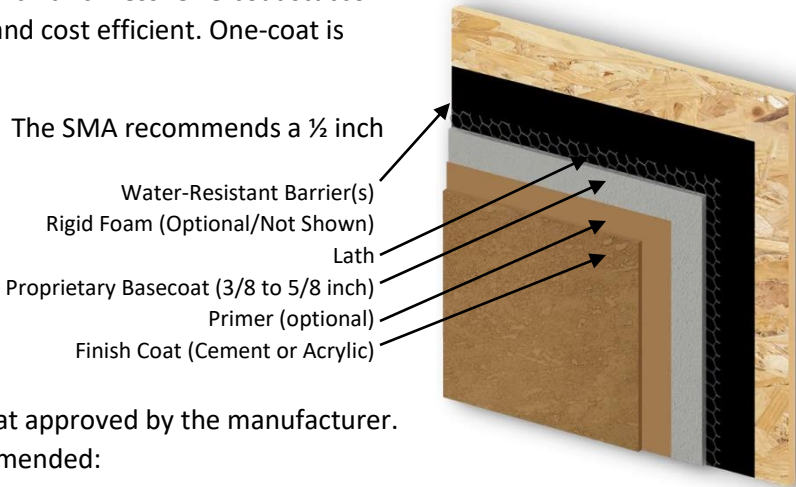
# One-Coat Stucco

One-coat stucco is a basecoat and finish coat plaster. The basecoat is a proprietary blended cement with approval to be applied to less than the code ¾ inch thickness. One-coat stucco systems applied over a rigid foam base are popular and cost efficient. One-coat is classified as a hard coat stucco.

One-coat stucco does not need a scratch (first) coat. The SMA recommends a ½ inch basecoat for enhanced performance.

One-coat stucco is a proprietary system from a specific manufacturer requiring a code compliant Evaluation Report.

Follow the report and the manufacturer’s instructions. One-coat stucco is suitable for a cement or an acrylic finish coat approved by the manufacturer. For one-coat over rigid foam, the following is recommended:

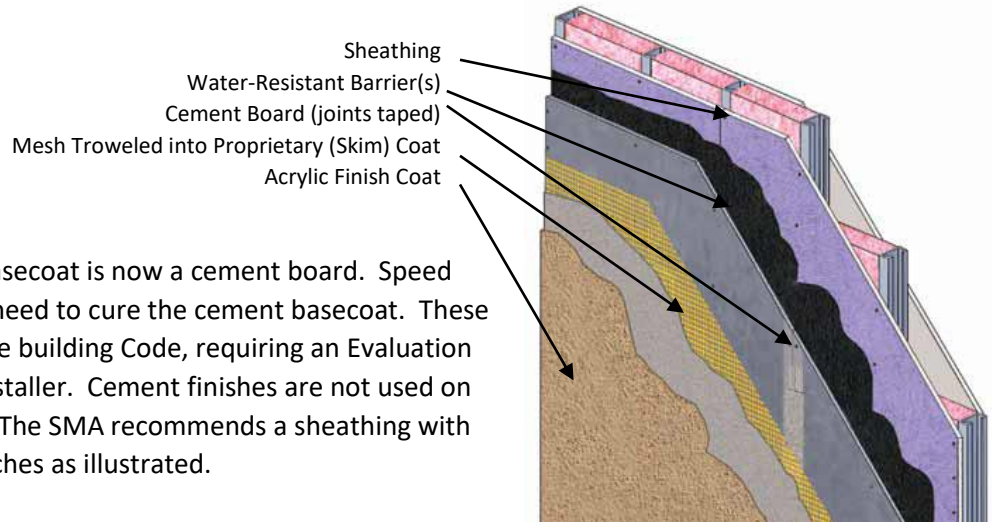


- Foam approved by manufacturer
- Use a water-resistive barrier rated 60 minute or higher
- Install the water-resistive barrier under the foam
- Use tongue and groove horizontal edges and vertical drainage channels in wet climates

PROS:	CONS:
<p>System manufacturer verifies the products are compatible. One-coat with a drainable rigid foam is an economical and tested Continuous Insulated Rainscreen cladding suitable for all Climate Zones. Classified as a hard coat stucco.</p> <p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>• Faster cure times</li> <li>• Less Labor</li> <li>• Best for accelerated schedules</li> </ul>	<p>Mixing or switching of products is not allowed unless approved by manufacturer. Typically limited to Type V construction or structures less than 40 feet in height ( consult manufacturer) Limited ability to straighten framing errors.</p>

## Cement Board Stucco

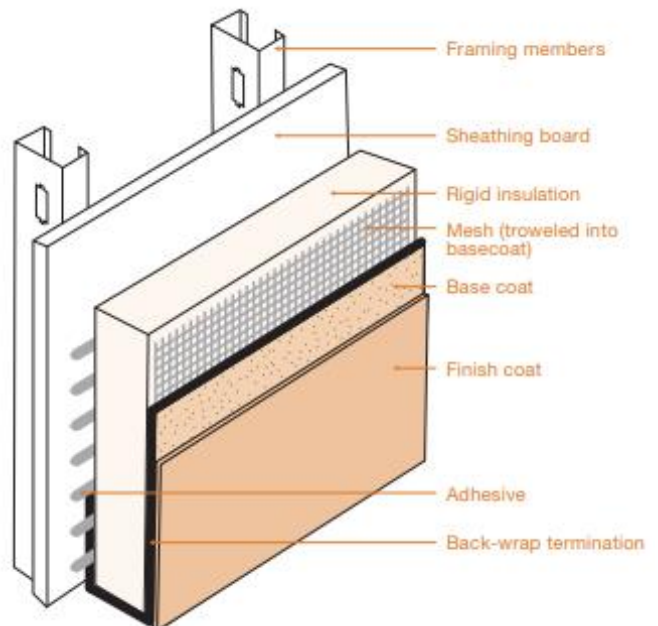
This is the newest of the stucco-like systems. Materials will increase the cost when compared to three or one-coat stucco. Material cost may be offset by a reduced need for skilled plasterers as the plaster basecoat is now a cement board. Speed may also be increased due to no need to cure the cement basecoat. These are proprietary systems, not in the building Code, requiring an Evaluation Report and must signed by the installer. Cement finishes are not used on Cement Board systems. **CAVEAT;** The SMA recommends a sheathing with joints offset by no less than 16 inches as illustrated.



PROS:	CONS:
Best for regions lacking plasterers as the basecoat is installed by traditional carpenters. Good crack resistance when following best practices per manufacturer.	Limitation to certain types of construction per systems Evaluation Report. Must be installed per the report to maintain a warranty. Skill requires plasterers for lamina and finish coat.

## EIFS

Exterior Insulation and Finish Systems (EIFS) are proprietary systems designed for Continuous Insulation. Most incorporate drainage provisions using a variety of products including fluid applied, house wraps or drain mats. The rigid insulation can be adhesively or mechanically attached. The mesh/basecoat is similar to the lamina used in the cement board system. The finish coat is an acrylic finish. The SMA preferred system for CI on masonry or concrete walls.



<b>PROS:</b> The ultimate cladding in continuous insulation requirements. Good design flexibility	<b>CONS:</b> Cost can be prohibitive when compared to cement plaster. Low abuse resistance
---	--

## SYSTEM ADDITIONS

The advent of various products developed by SMA manufacturers can enhance drainage, provide Continuous Insulation (CI) , reduce cracking, create new textures, add decoration or add abuse resistance. The following is a guide to some of the innovations available to designers and contractors.

**CONTINUOUS INSULATION:** Rigid foam or mineral wool can be added to most stucco or stucco/like systems to provide a continuous insulation (CI) when required by the Energy Code. Cement basecoat adheres well to many insulation products, and it is generally preferred to place the building paper/house wrap under a water-resistant insulation. Lath is placed over this insulation and then attached to framing members.

**DRAIN MAT:** This is a fibrous mat that provides a measurable gap between the stucco and the concealed water-resistive barrier. It is generally recommended to use a mat designed especially for cement stucco. This is classified as a rainscreen management system to enhance water drainage and potentially allow air circulation to ventilate the cladding.

**FURRING NAILS:** These are large headed nails with washers that hold (furr) the lath off of the water-resistive barrier to ensure the cement keys into and around the lath. Not required with self-furred lath.

**RIGID FOAM:** Foam can be added to three and one-coat stucco to make the system a Continuous Insulation Energy Code compliant cladding. It is generally recommended to use foam that has drainage channels in moist or marine environments.

**FOAM SHAPES:** The use of decorative foam shapes as cornice, quoins or window surrounds is popular and an economical method to dress up stucco or stucco-like systems. These decorative shapes can be pre-fabricated and coated or cut on site. These shapes should be adhesively adhered to the basecoat and coated with approved materials. Ask your stucco contractor for details.

**LAMINA:** (Base/Mesh) Similar to the lamina used on Cement Board Stucco and EIFS. The polymer enriched skim coat and fiber mesh are applied over the basecoat providing a strong, flexible and breathable lamina to prevent unsightly cracking in the plaster. A lamina is strongly recommended for three-coat stucco assemblies with a smooth trowel finish. See SMA Module 5 under training.

**MINERAL WOOL:** This insulation has recently been tested for fire and water intrusion with impressive results. Approved mineral wool is recommended to have the water-resistant barrier under insulation.

**TRIMS:** Trims for stucco come in a wide variety of shapes, styles and materials. Standard trims are acceptable, but some manufacturers have developed exciting new trims to improve stucco. Expanded or deep flanges can offer superior embedment of cement. Others have recessed edges to hide the otherwise exposed metal edge. Unique or special designs can allow for greater movement or even enhanced drainage. Most these trims are called specialty products and are proprietary in nature, they can be found on manufacturers websites through a link on the SMA website.

# MOISTURE MANAGEMENT

**Overview:** There is no one method best for all projects or regions of the country. The decision of which moisture management method to follow should be discussed, agreed and adhered to by all parties for best results. The following are key points to discuss.

Barrier	Concealed Barrier	Rainscreen
<ul style="list-style-type: none"> <li>The outer surface of the cladding provides all the bulk water protection</li> <li><b>PROS:</b> Typically, lowest in cost. Inspections are made easier as all are on the surface.</li> <li><b>CONS:</b> Maintenance is required to keep intact. All penetrations must be well sealed.</li> <li><b>USES:</b> Most common and practical for masonry and concrete substrates.</li> </ul>	<ul style="list-style-type: none"> <li>The outer surface of the cladding provides most the bulk protection and only incidental water is anticipated to penetrate past the cement cladding.</li> <li><b>PROS:</b> Low cost, works well with nail-flange style windows.</li> <li><b>CONS:</b> Inspection after plaster installation is more challenging</li> <li><b>USES:</b> Most common on framed walls</li> </ul>	<ul style="list-style-type: none"> <li>The cladding is assumed to be challenged by rain and enhanced drainage with possible ventilation is provide behind the cladding.</li> <li><b>PROS:</b> allows for faster water drainage.</li> <li><b>CONS:</b> Increases cost</li> <li><b>USES:</b> Provides added assurance and a comfort factor in wet/humid regions.</li> </ul>

**Flashing** is more critical for stucco than other claddings due to the fact cement plaster is classified by the code as an “air barrier”. Meaning cement stucco properly applied is very water and air-tight. While this makes cement stucco a superior cladding when installed incorrectly, it can potentially be more problematic. The importance of proper installation cannot be overstated. Rainscreen is the most forgiving of installation errors of the three methods for framed walls, but still requires proper installation.



Mid-rise in Seattle, no overhangs, stucco installed and flashed properly with 2 layers building paper. Stucco was removed over decade later.

## MYTHS ABOUT STUCCO

- **“Hairline cracks result in leaks”**. An occasional hairline crack is not a water intrusion issue. Consider concrete pipes develop cracks. The phenomena known as Autogenous Healing is well documented and provides the ability of concrete to heal itself.
- **“Building paper disintegrates fast”**. Because stucco installed incorrectly can allow water to invade and make wood wet, the paper will then disintegrate, but installed properly, the paper will and has proven to last several decades. The Department of Energy and NIST BEES report state *“properly applied stucco should have a useful life of 100 years.”*



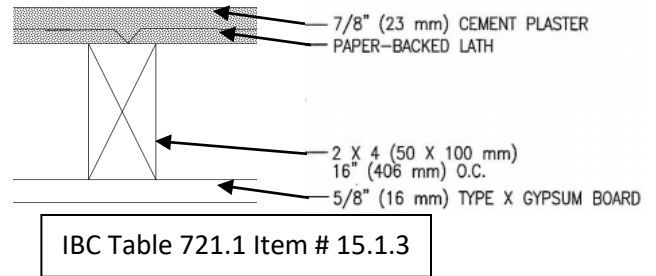
# SIMPLIFIED CHECKLIST

**FIRE:** Each manufacturer can provide the test data approved by UL, Intertek or equivalent agency verifying compliance for a fire rating. Generic cement plaster (three-coat) is per the building code in Table 721.1 item 15.1.3 (2018) and stucco (7/8 inch) of cement plaster over lath is part of fire-rated framed wall assembly, adding wood or gypsum-based sheathing under stucco is acceptable.

**NOTE:** Adding plastic drain mat or foam sheathing (CI) may require additional NFPA testing.

**CHECKLIST:** This abbreviated list can help to clarify the system and guide the owner/contractor. Options would include

- Rainscreen enhances drainage provisions.
- Rigid Insulation provides a thermal break
- Foam Shapes add decoration to stucco.
- Control/Expansion Joints strategically allow for stress relief.
- Base/Mesh Lamina over the basecoat to significantly reduce cracking of cement.
- Acrylic Finish offers more color options and consistency.



Proprietary systems (One-coat, Cement Board System and EIFS) should have a manufacturer listed. Request an approval sheet including related Evaluation Reports (ESR) to verify the system is per that manufacturer. Three-coat stucco is per the building code and per SMA recommendations.

### Pre-Installation Topics

<b>SYSTEM/ASSEMBLY</b>	System approved and explained; including the Moisture Management Method employed
<b>FLASHING</b>	Windows, Doors ( meet FGIA/AAMA Performance Class ratings) Follow approved flashing procedures. Discuss other penetrations
<b>WEEP SCREED</b>	Installed at base of wall (framing)
<b>WATER-RESISTANT BARRIER</b>	Sheet goods installed shingle-fashion and properly integrated with flashings, no reverse laps. Fluid applied as per manufacturer literature
<b>LATH/CEMENT BOARD</b>	Securely attached to framing
<b>CONTROL JOINTS</b>	Needed? where and how to be installed
<b>PLASTER BASECOAT</b>	Hard float to densify the base coat
<b>CURE</b>	Is water curing needed?
<b>FINISH COAT</b>	Material/color and texture approved?
<b>CRACKS/COLOR</b>	Expectations discussed, options considered

## About Your Contractor

The best system/products are not as effective without a qualified and educated lather/plasterer to install them. They must know the products, codes, industry standards and have the experience to problem solve on site. This has been true since stucco first entered the American market over 200 years ago. A qualified contractor also knows how these systems work, the options available and can be helpful in guiding the owner on selection of various options. The SMA developed a certification program to help owners in selecting a contractor to install their stucco, explain options and assist in making the stucco or stucco like cladding a success.

The SMA developed an on-line training program that is free to view, available in English or Spanish. The Certification process is the next step in providing building owners some assurance the stucco contractor is knowledgeable and has had references checked. The SMA does this for you.

Qualifications start with classes, then 150 questions the qualified person must pass to enter the contractor certification process. Projects are then submitted for review, references checked, and a contract signed with the SMA that the contractor will abide by SMA decisions to maintain SMA certification standing.



[www.stuccomfgassoc.com](http://www.stuccomfgassoc.com)

