



Water Management in Stucco Systems

It has long been determined that incidental moisture can find its way past the cement stucco membrane on framed walls and with proper design, detailing and installation, the assembly works. However, excessive water can infiltrate stucco walls through larger cracks, penetrations and separations at accessories and this can lead to problems. Water that enters through openings will generally be absorbed by the cement or run down on the face of the water resistant barrier and exit at the building base within the stucco foundation screed. Excessive water entering the stucco system typically can become a problem on walls that are over one-story in height. Water that infiltrates through cracks, trim accessories, building penetrations, and when not allowed to drain or “weep” can create a hydrostatic head, which can eventually leech the bitumens from the paper and thus compromise the integrity of the WRB and can lead to interior water infiltration.

Stucco systems that provide drainage points within the wall will redirect water to the outside before it can become trapped behind the stucco. **By Don Pilz**

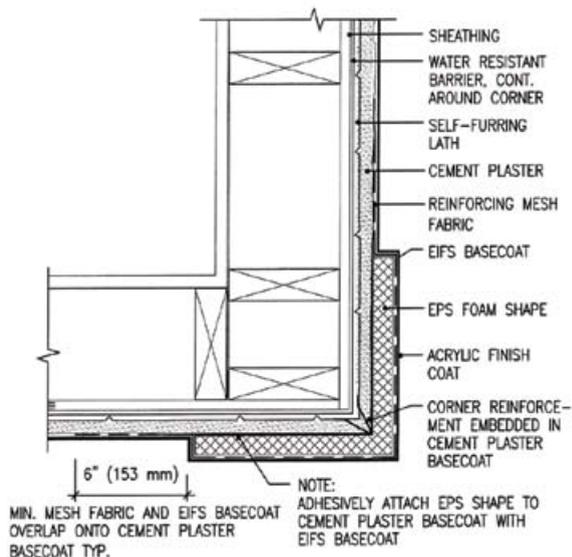
Continuing research and development of stucco accessories are occurring at this time. This research and development is leading to an enhanced management of water within the stucco wall assembly. Through a simple modification of current stucco accessories, and the implementation of some new improved ones, water can be diverted out of the stucco wall before it gets to the building base. This can alleviate many concerns and make cement stucco a true high-performance cladding.

INTRODUCTION

Twentieth-century stucco wall claddings did not face the type of performance expectations today's stucco walls face. To amplify the matter, today's building materials, which include fast growth Douglas

fir, paper-faced sheathing and fully insulated wall cavities create the ideal conditions for mold growth from minimal water infiltration. The transition to energy efficient buildings has also created building construction with less airflow through the structure, creating “tighter” buildings and less opportunity for infiltrating moisture to evaporate from the exterior claddings, further exacerbating the conditions for mold growth.

In a design driven construction industry, the traditional stucco systems have been forced to adapt. The introduction of new finish coatings, foam (EPS) plant-on shapes, aluminum reveals, and custom architectural designs have led to a greater consideration for water management within stucco wall systems. In today's designs, the challenges for



SP2 – EPS Corner Implants



Cement stucco pulling from aluminum leaving large enough gaps for bulk water to enter the stucco.



the construction industry to prevent water infiltration problems associated with utilizing the standard technologies for stucco systems requires good design, good planning and qualified contractors.

Despite industry advances in technology of building materials, buildings continue to leak. Most experts have learned that many water infiltration problems can be remedied by limiting entry and then providing drainage points for water built into the stucco accessory. Focusing on water management is important and how to detail stucco accessories to function as a flashing, as well as a termination point for stucco.

DESIGN FUNCTION CONSIDERATIONS FOR STUCCO SYSTEMS

The construction industry has adopted multiple variations and stucco-like assemblies and systems. The introduction of EIFS, finish coats and foam (EPS), and plant-on shapes over stucco systems, are examples of the continuing advancement to meet designers' needs and wants. The original EIFS is a system unto itself in which the water resistant barrier is on the outer layer, which is commonly called lamina, a fiberglass mesh embedded into a polymer enriched cement coating. This system is heavily dependent on perimeter and termination sealant joints, as well as a properly installed system according to the manufacturers

guidelines. Commonly called a “barrier” system, designers and installers must adhere to that principle.

In a stucco system, the water resistive barrier is behind the stucco, sometimes called a “concealed barrier system.” The cement coating provides strong water resistance and protection for the WRB. Since the cement stucco membrane is made from sand and cement it is accepted that the membrane will eventually crack. Large cracks have been proven to allow water (via rain) into the stucco cavity. Small amounts of water entry will be absorbed by the cement and diffuse, but water in volume that enters the assembly relies on draining out by force of gravity along the outer face of the WRB; most common of which is building paper.

The designer should consider this when merging EIFS finish coats with traditional stucco systems and the ramifications. Although they can work together successfully, the following designs and concepts should be considered.

Foam (EPS) plant-on shapes. Foam (EPS) plant-on shapes can reduce the ability for stucco to dry out behind the plant-on shape, if the water is allowed behind the shape with no place to weep out. (See drawing SP2.) Therefore, the cement stucco membrane can stay wet for longer periods of time, which can eventually put additional stress on the building paper. The building paper

is the final line of defense from water infiltration. Once the building paper begins to degrade by way of prolonged water saturation, the protection is compromised and water can enter the interior cavity of the wall.

■ Acrylic/Elastomeric Finish Coats.

Acrylic finish coats have water repellency and should be verified they are vapor permeable prior to use. Elastomeric finish coats have extreme water resistant properties, which can provide additional water intrusion protection, but have vapor drive and other issues. Stucco experts always anticipate cement stucco walls to develop a crack, most are hairline, but some will allow water entry. Once water enters through the crack, the assembly should allow the water to drain down the face of the water resistant barrier and ultimately out at a weep point.

Although both of these coatings can reduce rain absorption and capillarity, they also often retard the drying of the wall assembly to the exterior if it gets wet through other mechanisms such as interior moisture or failed exterior control joints [2]. (See photos on the top right.) This is more severe with the less vapor permeable coatings.

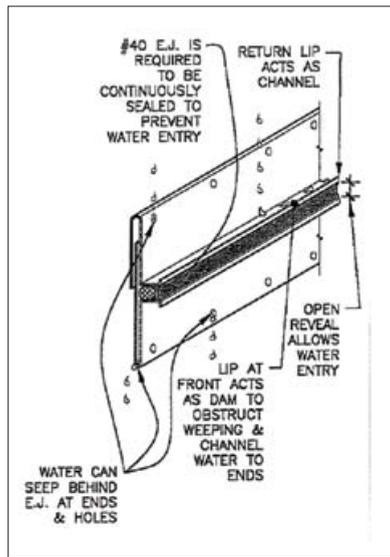
■ **Aluminum Reveals.** The installer should be careful to insure all fasteners go into solid backing, this will require extra backing for all intersections, which often times

Water Management in Stucco Systems

gets missed. Aluminum reveals should not be considered as a flexible control joint because there are very minimal movement capabilities in the rigid aluminum profile. Another consideration is the expansion and contraction of the aluminum as compared to cement. This can result in cement stucco pulling from aluminum leaving large enough gaps for bulk water to enter the stucco assembly (as shown on the top right of page 29).

- Pressure Differential.** When air pressures are lower inside a structure than on exterior areas, water can literally be sucked into a building. Interior spaces may develop a negative differential pressure with respect to outside ambient conditions, or they may develop positive differential pressures. The former condition may arise due to greater volume of air being exhausted from the space than is being supplied. Under certain conditions, a slightly negative room pressure can result in excessive air and dust infiltration, as well as direct water leakage through penetrations in the exterior wall assembly. Wood framing and other building materials within the wall cavity are storage mechanisms to hold this moisture.

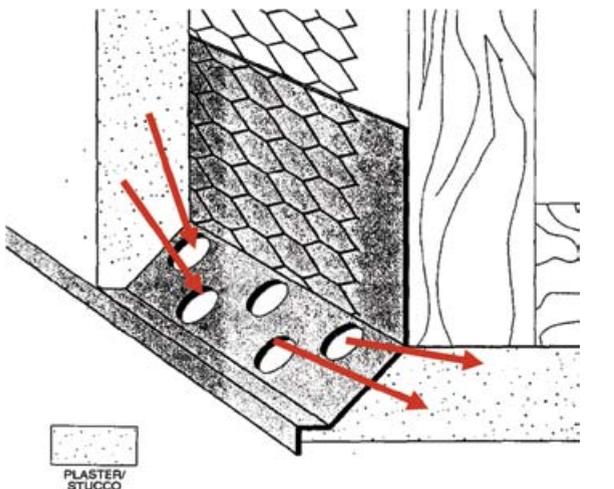
Model building codes, such as the International Building Code and the One and Two Family Residential Code, contain flashing requirements intended to prevent water entry. Building openings must be properly flashed and provided with a proper water resistant



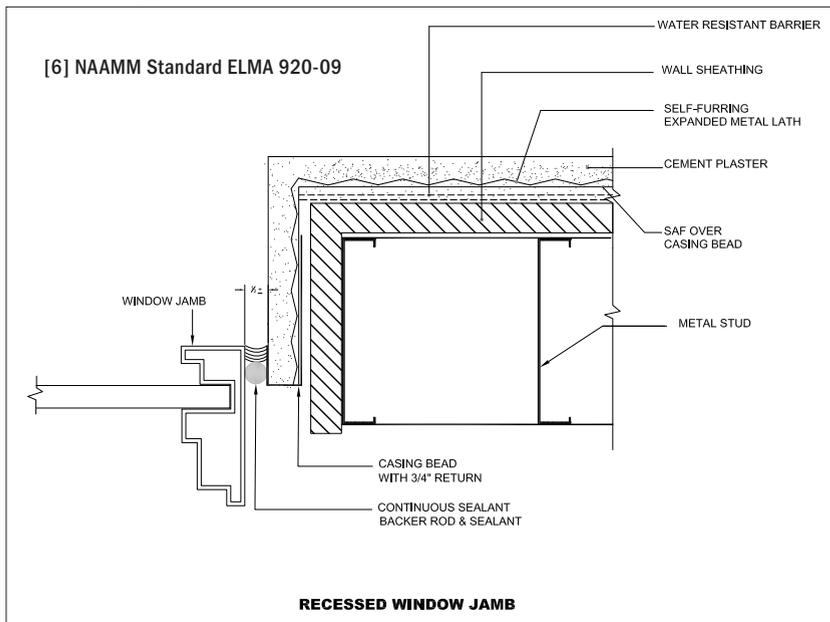
barrier, and the flashing must provide an acceptable means of moving moisture that has penetrated the building envelope to the exterior of the building [3]. Good water management details and techniques are critical to direct this water back to the exterior during differential pressure conditions at penetrations in the wall assembly.

- Stucco Accessories.** The type of stucco accessories offered by the construction industry has changed very little since they were first introduced. Until recently, the primary functions of stucco trim accessories were a termination point, thickness control, expansion, and weeping capabilities. Although some manufacturers have recently modified their trim accessories to divert water away from the water resistant barrier, many of the original accessories are still available and in use today. The following potential failures should be considered when installing trim accessories:

- Two-Piece Expansion Joint (known in the industry as #40):** The main design flaw in this assembly is the bottom male portion with drilled attachment holes. In dry areas of the country, this product presents very few problems; in wet areas, water can seep through the open reveal or through the provided nail holes and become a source of water intrusion. This led the Northwest Wall and Ceiling Bureau to revise the detail to include a water tight seal at the opening.
- Control Joints (also known as Trim Item #15):** This particular trim is installed for the purpose of controlling the location and amount of cracking that might occur due to stucco shrinkage. The installer must be aware that these trims have the potential of allowing water into the stucco assembly via separation cracks and unsealed butt joints within the accessory (see photo in the upper right corner of page 29). Once the water gets in, it becomes dependent on gravity and the nearest weep screed to exit the stucco cavity. In a structure that is several stories high, the foundation weep screed may be at a great distance. A better design for areas with significant rainfall is to allow for a weep point at various height locations. The intent is to avoid trapped moisture that will eventually deteriorate the WRB.
- Soffit Drip Edge (also known as #5 Soffit Drip):** This particular trim



Water can enter through the perforated nail holes on the casing bead.



was originally designed to allow the stucco to key into the holes to minimize separation between the stucco and the accessory.

The designer/installer should be aware that the water travel-

ing down the face of the WRB can enter through these holes and travel along the stucco of the returned soffit. If this stucco system is coated with an elastomeric coating, moisture will

become trapped in the soffit, which can damage the soffit framing over time. (See photo in the lower left corner of page 30.)

- Standard Casing Bead (also known as #66): This accessory is used for a termination point for stucco systems.

The manufacturers of this accessory provide perforated nailing holes along the leg that attaches to the substrate. (See photo on page 30 lower right corner.) The installer must be aware that the open holes can provide access for water infiltration to the interior. This accessory also provides a very limited area for topical sealant joints with its 1/8 inch return edge when installed on edge. The result has been sealant applied over stucco, which does not provide a reliable sealant joint.

CONSIDERATION FOR STUCCO SCREED FLASHING INTEGRATION

Despite following industry guidelines

**HE NEEDED WATERPROOFING SUPPLIES.
TO FIND THEM, HE TURNED TO
WWW.WCONLINE.COM/BLUEBOOK**

**WALLS & CEILINGS
2010 BLUE BOOK**

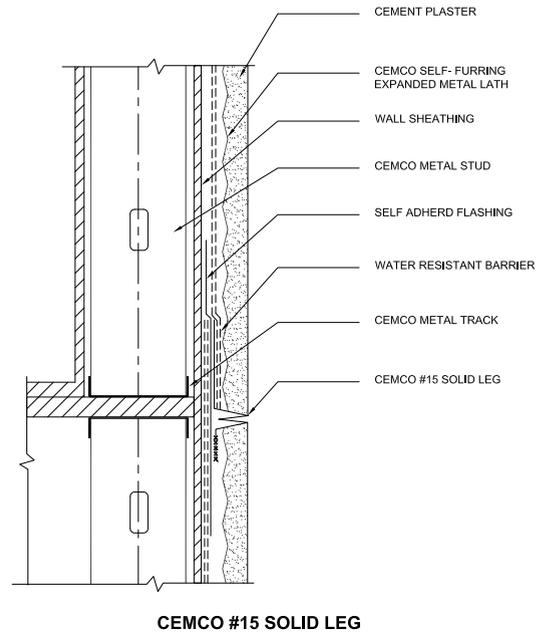
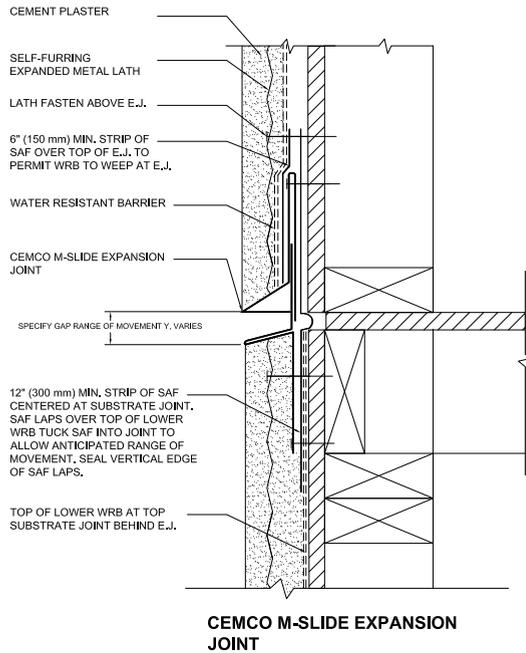
Search for the products, manufacturers, industry associations, trade names and dealers/distributors You need!

- Search by Product Category or Company Name
- Downloadable Product Spec Sheets
- Alpha Company Listings
- Live Web & Email Links
- Product Photos

Start your search today!

www.wconline.com/bluebook

**WATCH FOR
EXPANDED LISTINGS!**



and recommendations for stucco wall assemblies, designers can elect to provide additional water management capabilities within the stucco system. Currently, design consultants are working with manufacturers to provide plaster trim accessories that will also work as flashings. The designer/installer should be aware that any stucco system can ultimately have an elastomeric coating placed over the stucco. Water behind the stucco with an elastomeric coating will have a reduced ability to evaporate because of reduced vapor presence on the wall assembly. With this in mind, it is generally recommended a cement stucco assembly in wet areas should have a horizontal drainage point spaced no further than every other floor. In wind-driven areas with rain, it may be advisable to have drainage points at every floor. Discuss the design and options with your local plaster bureau and/or contractor.

EXPANSION/CONTROL JOINTS: DRAINAGE POINTS

In multi-floor construction, where the designer/builder needs a two-piece expansion joint, rather than using the traditional two-piece #40 that requires sealant, consider the following graphic M-Slide Expansion Joint (shown above):

This two-piece expansion joint allows water to exit the top piece

similar to a standard weep screed, while the bottom is sloped to divert moisture. Providing a bond breaker to the sloped edge of the accessory such as WD-40, will greatly improve drainage within the system. In the past acrylic finish coats that bond to the stucco accessory have restricted drainage and cause moisture to become trapped behind the stucco. ([5]see CEMCO M-Slide detail)

In low-rise construction where a one-piece control joint will be used, the installer should consider the noted detail: [5] CEMCO #15 Solid Leg



Pillar Construction installed drainage points within an 18 story building at Legacy Memorial.

By incorporating a solid 3-inch flange to the upper portion of the accessory, water can exit the top slope of the control joint the same way it would with a standard weep screed. The bottom portion will still have the expanded metal lath incorporated into the one-piece accessory. This portion will be wire-tied to the lath installed on the wall, which will allow movement for stucco shrinkage.

SEALANT JOINTS

Sealant joints that are installed directly over stucco do not provide continuity from the WRB to the sealant joint. Due to the fact that bonding to cement plaster is precarious and water can bypass the typically applied sealant altogether it is preferred the sealant be installed to a non-absorptive material.

The designer/installer should have an understanding of the location of the sealant joint and make an attempt to see if it can be installed to solid metal of the stucco accessory. The extended flange casing bead is an example of new products that easily solve the age old problems (detail on upper left corner of page 32).

CLOSING REMARKS

Interior moisture penetration issues related to cement stucco assemblies can be minimized with good communication and proper detailing before

Flex-C Trac - Fast, Easy, Effective - Flex-C Trac

FLEX-C ANGLE
FLEX-C TRAC



Please note the latest additions to our product line:

4" 18 Gauge Flex-C Trac
8" 18 Gauge Flex-C Trac
10" 18 Gauge Flex-C Trac
16 Gauge Flex-C Angle

All With
Hammer-Lock®
Feature



WE HAVE THE PRODUCT YOU NEED FOR YOUR NEXT CURVED FRAMING APPLICATION.



Flex-C Trac • Flex-C Angle • Flex-C Arch • Flex-C Header • Flex Lite • Deflection Products

Please see our website for a complete listing of our family of products.

www.flexabilityconcepts.com • Tel: 866-443-3539

FLEX-ABILITY
CONCEPTS

Please Circle #129 On Reader Action Card

Water Management in Stucco Systems

the job gets started. Mock-ups for the purpose of understanding sequencing are vital for the installer and designer for all construction parties to have an appreciation for the installer's ability and the designer's intent.

The construction industry is constantly reviewing new design elements as well as new building materials. Some of these changes are good, some are not so good, but understanding water management is key to distinguishing between the two.

One way to better understand a cement stucco assembly over framed walls is to think of when, not if, water gets to the water resistant barrier. Where will it go? Does it have drainage points in place? If an elastomeric coating is placed over the top of the stucco, will water still be able to escape the assembly? Is there proper integration between the stucco and all penetrations i.e. windows, vents, doors, pipes, electrical, etc.?

It is hoped that the concepts and the new products discussed in this article provide better management of water and the beginning of good dialogue between designers, installers and manufacturers. **W&C**

After 23 years in the construction industry as a foreman and building envelope consultant, Don Pilz is now the R&D Manager for CEMCO assisting consultants and contractors with stucco detailing needs. Don Pilz can be reached at (626) 506-3881 or dpilz@cemcosteel.com

REFERENCES:

- [1] Details from "Portland Cement Plaster" Stucco Resource Guide, published by Northwest Wall and Ceiling Bureau, Seattle.
- [2] "Moisture Control Handbook, Principles and Practices for Residential and Small Commercial Buildings," Lstiburek, Joseph, Carmody, John, copyright 1994.
- [3] "Technical Manual No. 15 Evaluation of Three-Coat Portland-Cement Plaster (Stucco)," The Association of the Wall and Ceiling Industries International.
- [4] "Stucco as a Weather Protection System," Westcon Annual Seminar, November 2, 2006.
- [5] CEMCO Water Management www.cemcosteel.com.
- [6] NAAMM Standard ELMA 920-09

If you read this article, please circle number 167.

STICK WITH US

WELD-CRETE CONCRETE BONDING AGENT AND
PLASTER-WELD PLASTER BONDING AGENT.

Contractors want it, because it works. And it works because we've put a half a century of experience and industry knowledge into our bonding agents. Start bonding with quality Larsen products today.

Plus, Weld-Crete and Plaster-Weld's low VOC content significantly reduces airborne pollutants that affect health and the environment.

LARSEN
PRODUCTS CORP.

Originators of leading chemical bonding agents... worldwide since 1952

800.633.6668
www.larsenproducts.com



Please Circle #205 On Reader Action Card