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Making Buildings Perform Better

BY ALLANA BUICK & BERS, INC.

CATEGORY: Building Envelope / External Walls / Plaster / Stucco

PREVENT CRACKING PLASTER

Hardcoat stucco", also known in some areas as "two or three-coat stucco", though porous, is a waterproof, cementitious composite when mixed, applied, cured properly over a sound substrate. However, when improperly applied over an unsound substrate, it can cause cracks to occur making the system subjective to leaks. This is also true when assembling a one-coat stucco system, a system generally consisting of a thinner plaster finish (approximately 3/8" rather than 7/8" thick) applied over a substrate such as polystyrene.

The History of Plaster

Around 500 B.C. "plaster", an ancient Greek term meaning "to Daub on", was used to describe interior plaster finishes. Years later, when it first became popular to apply on exterior surfaces, it was called "Stucco work" meaning exterior plaster; plaster is the structural and leveling coat and stucco the thin finish coat.

Early plaster did not perform well on the exterior of buildings due to the elements. It wasn't until a bricklayer living in Leeds, England, Joseph Aspdin, invented Portland cement in 1824, that the use of exterior plaster became a reliable exterior finish system. When first used, it was applied as a finish material over concrete block or brick substrates which were stiff structures that did not deflect under wind loads.

Beginning in the 19th century, applying plaster over wood-framed structures introduced a new phenomena, deflection, though not as serious a problem that it is today. Early wood structures were usually constructed using "old-growth" lumber, whereas today we build with "second growth" or "juvenile" lumber which has lower structural characteristics than old-growth lumber.

Dimensionally, studs in the past where full 2" x 4" members, rather than the 1.5" x 3.5" dimensions manufactured today. The older members provided more stiffness against lateral loads such as wind pressure. Prior to modern metal and vinyl lath products, plaster scratch coats were held in place by securing thin, narrow strips of straight-grained wood lath (lath generally cut from hardwoods such as, chestnut or oak) spaced to provide a key (the plaster extruding past or behind lath which, when hard, serves to hold the plaster in place)

Modes of Failure

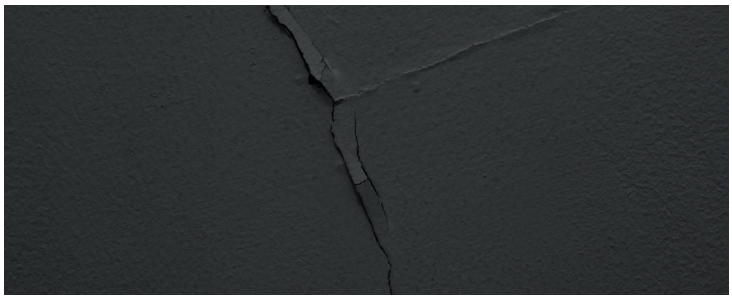
Most experts agree plaster systems will crack at some location on almost every structure. Some feel this might be a cop-out statement, and to a large degree it is. The truth is, there are many methods that can effectively prevent cracking to include: design, material mixes, proper workmanship by other trades and the plaster application itself. Cracks are much easier to see when the stucco finish is smooth, where coarse lace texture finishes mask cracks.

According to the Stucco Manufacturers Association, if a crack is visible from more than 10 feet away or is a source of leaking, it should be repaired. There are two primary reasons for plaster to crack: shrinkage and structural issues. Shrinkage cracks are synonyms to crazing, mapping and spider web cracking, which may develop as excess water evaporates during the cements' drying process. Shrinkage cracks typically occur very early and often cannot be seen until after the finish color coat (stucco) is applied. In the finish coat, hairline or eggshell cracking or checking can also be the result of rapid drying which most commonly occurs on hot and windy days. This often demonstrates that the applicator failed to properly hydrate the system during application.

Stress cracks are synonyms to corner, lateral, vertical and reentrant cracks; also larger more pronounced mapping or spider web cracking. They occur when stress is transferred to the plaster system from various internal and external sources. Understand that plaster is a brittle material so it can't handle tensile forces well however, it does perform well in compression. Stresses are due to many factors including: ground movement due to poor soil conditions, compaction practices or seismic event, foundation problems such as slab or footing creep, sag or curling, framing or structural anomalies (such as offset framing loads), large or long spans, point loads, green lumber, warped or twisted lumber, improper notching of lumber, cantilevers, absence of vibration control in design to deal with mechanical equipment, improper spacing of wood wall sheathing members (failure to provide gaps along the ends and edges), failure to install corner reinforcement at reentrant corners (corner openings of doors, windows, etc.), improper attachment of plaster netting or accessories, and failure to properly engineer and construct a stiff building system that meets L/360 to withstand lateral forces such as wind loads. The latter being one of the biggest causes of plaster failure.

Preventing Premature Plaster Failure

The first step in making sure a plaster system will perform with minimal cracking starts with an experience owner who is properly apprised by his design professional. Proper project planning, design, engineer and clear detailing sets-out the bases for a proper bidding phase. An experienced general contractor, who supervises highly knowledgeable subcontractors, creates yet another line of defense to minimize cracking. Lastly, qualified third-party inspectors should be retained by the owner to critic the design and work performed by the contractors for conformance with the approved plans and specifications in accordance with proper trade and industry practices, complying with all applicable codes, and meets the manufactures' application requirements.



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Allana Buick & Bers, Inc. is an architectural engineering and forensic consulting firm. We have over 33 years of experience making building enclosure, roofing, and waterproofing systems perform better. We have 16 office locations nation-wide ready to deliver a locally managed streamlined response for new construction, renovation, and repair projects.

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CONTACT ABBAE

bd@abbae.com
800.378.3405

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