VOLUME 8

McGinnis Chen Associates Inc
ARCHITECTS I ENGINEERS

# Architechnics

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*Architechnics is the architectural journal of McGinnis Chen Associates, Inc.*

*Architechnics is published to inform our clients and colleagues of issues and problems addressed in our practice. By publication of technical articles and case studies, we hope to circulate information that will be helpful to practicing architects, building managers and others in the building trade and related professions.*

*Due to the unique nature of our practice, McGinnis Chen Associates is often the beneficiary of hindsight. That is, we are often asked to examine, analyze and repair failed building systems principally regarding the building envelope.*

*Having done this type of work for over forty years, our office has accumulated a wealth of insight into the causes of many different types of building failures and how they might be rectified or avoided. We routinely work on buildings ranging from residences to high-rises, commercial to governmental, and old to new.*

## A Letter from the Editor: Ron McGinnis, AIA, LEED AP

McGinnis Chen Associates, Inc. would like to welcome back Architechnics, our publication on architectural technology. With a new team of editors and writers, we're looking forward to reconnecting with the design, construction, and building ownership communities. Through the rebirth of Architechnics, we strive to contribute stories that provide insight into our practice, and also to educate our readers in the art and science of waterproofing. We want you to understand this aspect of the industry: from the satisfaction of finding and repairing a leak, to the preservation of character and aesthetic of a contemporary structure. That's where we leave you in this Spring 2007 issue. As summer approaches, there's only more to come.

## Every field has experts. Every expertise has a field.

by Jessica Walitt

Architecture firms offer varying areas of expertise, ranging from single-family homes to airport terminals to retail chains across the U.S. Some architects focus strictly on design, while others rely on their construction experience, and market their company as "design-build".

No architect can expect to understand the full range of building systems, which is why every major job has a list of consultants: civil, structural, mechanical, electrical, plumbing, acoustical, and landscaping. But there is one crucial system that is not covered by the traditional consultants, and often cast aside by the designer: waterproofing.

Traditional architecture schools teach that the true art and creation of a building is its design. But those trained in the technical arts say it's all in the details. Connections, penetrations, terminations: they are the true pieces that bring your building together. If detailed correctly, a building has the potential to stand up to whatever man or nature may throw its way for many years. But if details are ignored, aesthetic degradation will be the least problem. Greater concerns include discomfort of building occupants, structural failure, and our company favorite: leaks.

We call ourselves a technical firm that specializes in waterproofing consultation. The sign on the door says Architects/Engineers, and we take on many jobs as the primary architect. But we don't design per se; we design repairs. We evaluate the

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# THE EARL WARREN STATE BUILDING
## A Case Study

by Steve Weissberg, P.E.

Totaling approximately 200,000 sf. ft., the six-story Earl Warren State Building (EWSB), opposite the northern boundary of San Francisco's Civic Center Plaza, houses California's Supreme Court courtroom, along with office and support facilities for the Justices and their staff. Also located in the EWSB are offices for the Appellate Courts, the Governor, Attorney General and Legislators.

Designed by San Francisco architects Bliss & Faville, the original structure was built in 1921, and expanded in 1931. The structural system consists of a steel skeleton encased in masonry with masonry back-up walls, and an exterior façade clad in Sierra White California granite. The building is essentially E-shaped with a full basement.

In October 1989, the Loma Prieta earthquake heavily damaged the EWSB. It was vacant until 1998 when extensive seismic repairs were completed.

**The Problem**

In September 2005, several pieces of loose granite from the fourth floor balustrade fell to the ground, narrowly missing a pedestrian. California's Department of General Services (DGS) commissioned McGinnis Chen to investigate this hazardous condition. During our investigation other hazardous conditions were observed. *This article, however, focuses on the cause of granite failure, and the innovative repair solution utilized*.

The balustrade at the fourth floor extends along the entire south façade as well as the east and west facades. It consists of 184, thirty-inch high, six-inch diameter turned granite balusters carried by granite rails top and bottom that in turn tie into the adjacent pilasters.

Using an 80 ft. boom lift to closely observe all sections of the balustrade, McGinnis Chen's engineers were able to easily remove several loose pieces of granite from the tops and bases of the balusters at the west and south elevations. Many of these pieces were directly above the building's main entrance. At numerous locations, radial cracks were observed at the top and/or bottom of the balusters.

(E) Cracked base at baluster
Note rusting steel dowel

At one baluster, a one-pound piece was easily removed just below the rail. The removal revealed a one-half inch diameter steel rod embedded into the baluster. Extensive corrosion was observed. It was apparent that the balusters were cracking due to the corrosion and associated expansion of the steel rod anchors, a condition commonly referred to as *"rust jacking."*

Given the extent of the problem and the potential life safety issues, the decision was made to replace all of the existing granite balusters. Luckily, the quarry from which the original granite was extracted is still in operation in Knowles, California. The problem quickly became apparent. How do we install these new balusters?

**The Solution**

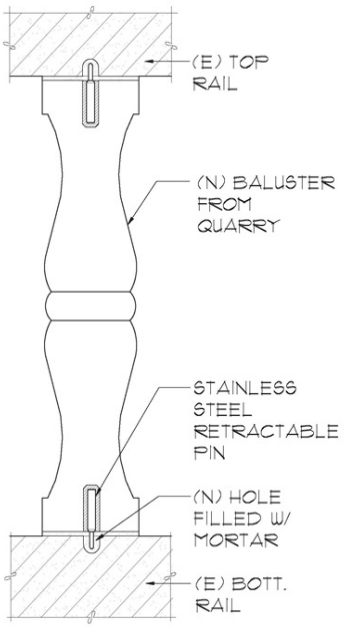
Removal of the existing balusters was easily accomplished by cutting them at mid-height, carefully chipping out the mortar joint at the base, and slicing through the anchor rod with a reciprocating saw. This process was then repeated at the top rail, and again at every other baluster to maintain adequate rail support.

Removal of the top rails would of course have made installation of the new balusters an easy operation. But that would have been difficult, risky, and very costly as the top rails were integrally connected to the adjacent pilasters. We "racked our brains" for a solution that didn't involve removing the top rails. Finally a possible solution emerged, elegant in its simplicity: Could spring-loaded, retractable steel pins work?

The idea was to embed the shaft of the pins into pre-drilled holes at each end of the new balusters, fixing them in place with epoxy. The protruding pins were designed to carry the lateral seismic force consistent with present-day Uniform Building Code requirements, and have a spring force low enough to accommodate installation and high enough to push through the stiff mortar in the receiving holes. The existing anchor rods in the top and bottom rail were removed by core drilling, providing the necessary receiving pocket. Because the underside of the top rail was level and the bottom rail was sloped for water drainage, installation began by inserting the baluster and pin into the top rail, and then depressing the opposite pin and sliding the baluster up the bottom rail until the pin engaged.

MCA designed the spring-loaded pins to work as described; but, because they would be custom fabricated, a prototype and mock up test was not possible before construction began. The idea seemed simple enough, but we talked with several stone and masonry contractors before the bids were let to confirm installation procedures. When the pins were delivered to the site, a replacement baluster was installed following these procedures.

All went as smoothly as anticipated - quick, easy, and without surprises.




(N) Baluster Detail

# CONTEMPORARY PRESERVATION

## A Case Study

by Jessica Walitt

Building preservation does not only occur on historic structures. When a building is built with a design intent in mind, we as designers and preservationists should make every attempt to maintain that intent and keep the building aesthetically intact. Colors, textures, ornamentation, even interior sensations of natural lighting or views are all considered during the design process, and are integral to the visual and psychological image of the building.

Unfortunately, the need for maintenance or repairs often makes preservation a difficult task. Although a new building may be designed with all the best intentions, the repairs needed to address the effects of aging, weathering, or failure of assemblies are seldom a part of the design.

When a remedial architectural company such as ours is faced with building repairs, there is often more than one option for solving the problem. However, not all of the options will maintain the original architect's design intent. Meanwhile the owner wants the least expensive repair with the smallest impact on the building's occupants that will have the longest life without too much maintenance. A daunting – though not impossible – goal.

On a recent project in our office, we achieved this very goal for a high-rise office building in downtown San Francisco. Standing 22 stories above street level, the building's exterior walls consist of precast concrete panels cast with white cement. In addition to a number of leaks seen throughout the building, large cracks and spalls were noticed on two elevations about a year prior to our involvement. At that time a local waterproofing contractor was called in to remove loose or damaged pieces of concrete in the interest of the life safety of pedestrians walking below. In removing the concrete, the rebar was left exposed, and subsequently covered with sealant for temporary protection against corrosion.

Following a partial investigation on two elevations on the building, we began devising repair alternatives. We came up with two effective and plausible solutions. In both alternatives, the cracks and spalls had to be repaired. However, in the first case, the repair mortar could be a standard gray cement that would ultimately be coated with an elastomeric coating. In the second alternative the patching cement would have to be white to match the building, which would then be coated with a clear water repellent sealer.

Of these two options, the first would be much easier to implement. Many manufacturers produce a cementitious patching mortar that could easily be purchased, and used to patch the building's spalls. The elastomeric coating would be white to match the existing color of the concrete, and would cover up cracks, patches, and any other inconsistencies on the surface of the building.

The second alternative for a color-match patching compound – and the one preferred by the owner – was much more difficult to achieve. Matching new concrete to existing and getting an exact color match is difficult, and even harder if you're looking for a white cement. After many discouraging phone calls with technical representatives across the country who told us it couldn't be done, we finally found our solution: an independent manufacturer who supplies masonry, concrete, and protection products. We sent them a sample of concrete from the building, and they sent us back a white patching cement.

With a little bit of practice, our contractor was able to form a patch having a color and texture that was extremely close to the existing concrete panels. There is some variability in texture on the building, but the contractor was able to reproduce a range of textures by implementing different finishing methods.

A clear penetrating water repellent sealer was applied over the entire building to create a protective barrier from moisture. Thus the concrete, both in its original and patched locations, is not only protected, but it is visually identical to the building that was designed and constructed in 1986.

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condition of the building envelope – roofing, windows, doors and thresholds, concrete, stucco, siding, masonry, below grade systems, plazas, and balcony decks – and we make recommendations for these systems. Whether it's a leaking roof that needs to be replaced, new sealant and gaskets on a leaking curtain wall system, or the owner is simply anticipating upcoming maintenance, we look at the system, and we design a repair to keep water out.

Five years ago, buildings were designed with only the slightest mention of waterproofing. But building owners are starting to recognize that it comes down to life-cycle cost - something that is talked about more and more in this era of sustainable building. Spend the money on top-notch window assemblies, a long-lasting waterproofing membrane, and a skilled waterproofing contractor, and you'll save money in repairs down the road. Skimp on these elements, and you face costly repairs that may include replacement sealant and gaskets at your windows, tearing up a finished plaza to replace the membrane underneath, or a lawsuit that drags on. This not only digs into your wallet; it affects the daily use of the building by its occupants.

In performing consulting or peer review services on new construction jobs, we work directly with the design firm as they prepare their Construction Documents. While keeping the design intent in mind, we address the components of the building envelope. This allows the architect to focus on the design, and gives the owner greater confidence in the finished product.

Meanwhile, buildings constructed forty years ago didn't have today's construction technologies. After all those years of weather exposure, systems have broken down. The owner wants to take advantage of new, improved systems that will last through their use of the building, and on to the next occupant.

We follow the traditional phases of the design industry for our remedial work, with an extra one up front: Investigation and Evaluation. That's when we look at the existing conditions, establish a scope of work for repairs, and recommend the next step. This includes selection of materials, integration with other assemblies, and evaluation of construction issues as they come up.

As construction continues to reach for the sky and old buildings are torn down to make way for the new, the end of architecture is nowhere in sight. Good designers are crucial to maximize the experience and comfort of the building inhabitants within their space. But in order to maximize that experience and make it a lasting one, the details cannot be ignored. You wouldn't dream of starting a project without a structural consultant or a mechanical consultant. So next time, put a waterproofing consultant on your list.

McGinnis Chen Associates is pleased to announce the opening of its Sacramento office to better serve your projects in the Central Valley and Foothills. Contact Jeff Martin, Regional Manager at jmartin@mcaia.com or (916) 979-1303.

Comments? Suggestions? Questions?
What would you like to see in future issues of this newsletter?
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McGinnis Chen Associates, Inc. has been providing specialized architectural and engineering consulting to private, institutional and public property owners since 1963. Over this period we have provided pre-construction, diagnostic and remedial design for many of the San Francisco Bay Area's most prestigious commercial and civic properties as well as hundreds of residential properties. Our clients have included the most experienced property owners, developers, builders, architects, and attorneys as well as single-family and multi-family residential property owners and homeowner associations.