CASE STUDY: LEONARDO ARMS BUILDING I – BUILDING RESTORATION

Adapted from the Original as Published in the Florida Community Association Journal

A Cause for Concern

Located toward the southern end of Fort Myers Beach, Leonardo Arms is a grouping of three mid-rise condominiums, each managed by their own association. Building One was the first to be built, constructed 40 years ago using mixed construction types. The six-story structure is built of masonry and stucco with pre-cast slab floors under the living units and open-web steel joists with metal pans under the walkways and balconies. The manicured grounds, beachfront views, and surrounding properties have attracted buyers to these units for years and still do. If you casually drove by Leonardo Arms, you would never have suspected the hidden damage concealed within.

Several months ago, when an association board member and the board president crawled under the first floor walkway of Building One in an effort to resolve an unrelated concern, they were shocked when they looked up and observed extensive damage to the steel joists supporting the walkway. Even as lay persons, they knew enough to be seriously concerned.

After some discussion with the board and their property management firm, Acheron and Associates, they decided to contact Consult Engineering for a full condition survey of the structure.

To begin with, the entire underside of the building was visually inspected, all walkways were surveyed, and the structure was thoroughly inspected. However, no destructive testing was utilized nor was

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any portion of the building dismantled during the survey. The walkway ceilings had been covered in a stucco finish, and discovering further damage within the dropped ceilings was discussed as a possibility. The total scope of recommended repairs included the entire replacement of the first floor walkways and balconies, repairing all concrete damage, re-waterproofing all the walkways, painting the building, and installing new guardrails on the walkways to meet current life safety codes.

Upon completion of the condition survey, the engineer presented the findings to the association with cost estimates on repairing the damage. This was looking to be a monumental project for the association, and was met with some understandable confusion as the building had just been restored in the mid-to-late 90's.

Sins of the Past

The condition survey presented several questions the engineer had for the association. Evidence of previous attempts to repair the building was observed. Large galvanized steel beams were placed under several of the walkway spans during the previous restoration in an attempt to add support to walkways whose joists were severely damaged. Not only was this not a long-term solution to the problem, but half of the beams were not even installed correctly. In several locations, a one-fourth inch gap could be measured between the steel beams and floors, demonstrating that the beams weren't supporting anything. This same scenario was repeated under the first floor balconies.

The tile on the walkways had almost completely debonded from the slab. As you walked along the walkways, the crunch of old grout and loose tiles could be heard beneath your feet. This is usually caused by the improper installation of tile onto waterproofing membranes, but can also be caused by the failure of the membrane itself. Both conditions presented themselves so it's impossible to say if one caused the other.

These were the types of historical issues the association was facing and everyone involved expected to eventually discover more problems as the project would get underway.

Bidding the Process, Not the Scope

This is a phrase I often use to explain to a client the intent of the bidding process. Every project should be bid based on a professionally developed bid specification. A properly prepared bid specification should include at a minimum a detailed scope of work, general specifications (the body of the contract), and technical specifications (details on the actual work to be performed). All contractors bidding the project should be bidding on the specification documents. The term often used is "bidding apples to apples." The only thing that sets the bidders apart are their prices and the processes they propose to use.

During many bid openings several contractors will be priced high, middle, and low. Often, one or more low bidders will be close enough that the price difference is negligible. At this point, the association should perform bid interviews between the association and the low bidders, moderated by the engineer. Sometimes, these decisions are extremely difficult, and it often comes down to non-cost related issues such as project phasing, unit owner access during

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construction, and promised manpower. In the case of Leonardo Arms Building One, that is just what happened. The two low bidders were brought in to discuss how they proposed to perform the scope of work and after several hours of serious consideration the association decided to choose Elias Brothers Contracting Group as the general contractor.

Unexpected Discoveries and Associated Costs

The contractor began the project by removing the first floor balconies and the tile on the second through sixth floor walkways. Once the tile was removed, the old waterproofing membrane was scraped and ground off of the slab. At this point, two new issues were discovered.

The first concern was a diagonal crack on the grade beam between the corner of the building and the piling cap on the first floor below the now-removed balcony at the southwest corner. The crack appeared to be a shear stress crack usually caused by overloading the end of the reinforced concrete beam. This exact construction configuration was repeated in two other locations beneath other corner balconies, both containing the same shear crack as the first beam. After some analysis, it was determined that the beams were overstressed and required repair and additional strengthening to be retrofitted onto the beams. The overload was caused by either a design defect or construction defect, but in either case was inherent to the original construction of the building.

The first problem could only be resolved by adding shear strength to the affected beams containing shear cracks. But before they can be strengthened, they have to be repaired. Stress cracks are most effectively repaired by injecting them with a low viscosity high strength epoxy. The process is aptly called "epoxy pressure injection" and will ensure that loads, which were previously circumventing the cracks, will once again pass through the cracked areas as originally intended. The cracks are sealed except for occasional ports that allow the epoxy to be injected under pressure into the cracks. The epoxy will fill the voids created by the cracks and should be visible in the adjacent ports as it fills.

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The chosen method used to strengthen the beams was a carbon fiber wrap system fully bonded to the beams and bridged over the shear cracks. The completed wraps will add the necessary strength to ensure the beams can handle the loads they were originally intended to carry.

The second concern dealt with the walkway slabs. Typically, an open-web steel joist slab supports a corrugated metal pan that is then topped with concrete. The concrete is typically finished to meet the desired profile for water runoff and to provide an appropriate height difference between the unit slab and walkway slab. On Leonardo Arms Building One the walkway slab was not finished to the desired height during its initial pour and instead was topped with another cementitious layer approximately three-fourths inch thick. This cementitious layer appears to have debonded from the base in many areas a long time ago and was replaced during the repairs conducted in the 90s. Of those repaired areas, most were debonding again, leading to a repeated and systematic failure of the walkway toppings. This failure of the toppings (debonding and cracking) compromises waterproofing membranes and allows the penetration of salt-laden water into the slab ceiling assemblies below, leading to corrosion damage of the steel

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joists, anchors, and stucco lath. Large amounts of topping needed removal, and an appropriate product needed to be chosen to prevent this sort of problem in the future.

The walkways had to be sounded using audible detection techniques to determine which areas were debonded. Areas that were debonded and cracked were marked by the engineer for removal.

Two products were presented and tested by the contractor, and one was chosen for its workability, finish, bonding strength, and resistance to shrinkage cracking.

These unexpected discoveries also come with unexpected costs associated with them. The last word any association likes to hear during a project is the word “overage”. Dealing with unexpected project expenses can be done in one of three ways: contingency, reserves, or assessment. The three methods were listed in order of preference with an additional assessment being the least desired. Depending on the scope and nature of the project, an experienced engineer can recommend an appropriate contingency amount to help deal with unknown expenses. This typically ranges between 10 percent and 30 percent of the initial construction contract value and should not include engineering fees. If an association has to assess the unit owners in order to pay for the project, this will help prevent an additional assessment later. Any money remaining can always be refunded to the unit owners or rolled over to future reserve expenses, depending on the rules and regulations governing your association.

Should your association not have contingency funds set aside or run out of contingency funds by a small amount, oftentimes reserve funds can be used to pay for overages. Again, this depends on the rules governing the use of your reserves. If your project includes painting, for example, and you already had money set aside in reserves for painting, those funds can be applied to your project. Often, a reserve fund will not have any money specifically allotted to any project related expense and the question arises, “Can we use our reserves to pay for these overages?”, and more importantly, “How do we determine our new reserve contribution rates after utilizing those funds for project related expenses?”

This is where a Reserve Impact Statement (RIS) can be of value. An RIS takes your current Reserve fund criteria, applies the overages the association wants to pay out of reserves, redistributes the remaining funds appropriately, and determines the new reserve contribution rate in order to maintain a healthy reserve fund. This essentially avoids the impact of a second assessment, spreads it out over a longer period of time, and rolls it into the reserve contribution rate. RIS’s can also be used to recalculate reserve contributions when reserve expenses exceed the amount in reserves for that line item or when reserve expenses occur earlier than planned for. RIS’s are invaluable tools that cost significantly less than a whole new Reserve Study. However, they utilize the current reserve plan without re-evaluating it for correctness and it is only recommended for Associations that have had a professionally prepared or updated Reserve Study within the last three years.

If no contingency was planned for and no reserve funds are available to utilize, the final option for funding overages is to have the Association perform a second assessment. The cost of

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overages should be evaluated by the Association's Engineer to determine if they are in-line with industry standard rates.

Corrective Measures

The Leonardo Arms Building One Association planned ahead and prepared a contingency amount of funds for such overages. The scope and cost of the overages was agreed upon and the project never missed a beat. The suspended stucco ceiling above the walkways was previously repaired incorrectly. Almost all areas that were repaired during the previous restoration project needed replaced and were removed. The metal framing supporting the stucco lath (metal mesh which the stucco is placed onto) was installed per industry standard details. Many details and specifications that are "standard" in new construction have flaws that are exposed only after a building has significantly aged. This was the case with the stucco ceilings. When exposed to only a small amount of moisture the framing would rust and break apart. In many locations, hundreds of pounds of stucco were suspended above the walkways and residents' heads by caulking and paint alone.

The Engineer and Contractor met to discuss a new framing method and develop a system that went beyond the "industry standard". The final design changed the original system and included rust resistant materials and redundant fastening so that if the damage ever occurred again it would reveal itself and not fall.

The first floor walkways and balconies were completely demolished and a new cast-in-place design was provided by the Engineer. The reconstruction of the slabs and beams went smoothly and little to no complications presented themselves.

The next challenge was installing the new guardrails. The original guardrails were core drilled and grout set into the slab. When the contractor started removing some of the rail posts he discovered several issues. First, the slab was barely 3" thick at the edge and there was no metal pan for the last several inches. This meant, if new holes were to be cored into the slab the contractor would likely punch through the slab and there would be no way to pack the grout in around the new posts since it would all just fall into the ceiling below. The second problem

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was that the original construction of the building exhibited this very problem. In many locations, cardboard, roofing felt, and other miscellaneous materials were found in otherwise hollow cores.

It appears that the original contractor wedged whatever he could find into the post pockets in order to temporarily hold them still, then poured his ¾" concrete topping against the rail, locking it into place and hiding the mistake. The association was fortunate over the years that the limitations of the old rail system did not result in the harm of any persons.

A surface mount method was decided upon as the only viable way to safely attach the new rails to the slab without significantly rebuilding all the walkways.

The final major step in the project was to apply the waterproofing membrane to the walkways and the first floor balconies. The system used was a three-step process utilizing a popular polyurethane based system. The first coat is the actual waterproofing coat applied directly to the prepared concrete. The second coat is a topping material which has sand broadcast into it. Whatever sand sticks to the second coat remains, and the rest is brushed off the surface. A third and final coat was applied over the sand impregnated layer giving the surface a non-slip texture and protecting the waterproofing base from ultraviolet (UV) light damage. These types of systems typically need recoated every five years to correct scratches and blemishes and to restore the UV protection.

The reconstruction of the first floor walkways and balconies were phased so that residents on floors two through six always had access to at least one elevator. The contractor met with first floor residents who had special needs and provided other means of access to their units during this phase. Temporary stairs were built to several first floor balconies allowing unit owners to come and go as they pleased throughout the project. This increases resident satisfaction and reduced project downtime for the Contractor.

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The Final Touch

Bold moves were made to improve the appearance of the building. The association knew that the new rails on the walkways were going to be a significant improvement to the aesthetics of the property and so they decided to make some other changes as well. The existing paint scheme at Leonardo Arms was a simple white with beige trim. The scheme had never been changed since the buildings were built. Several new paint color schemes were presented to the association by the paint manufacturer using software which shows the paint on an actual photo of the building before it's ever painted. A scheme was decided upon and the contractor was able to incorporate the new colors into the project timeline.

Old wooden walls built alongside the main walkway ramps were also torn down in favor of extending the new guardrail and adding additional awning material. The overall change took the building from a drab 1970's appearance to a vibrant and warm place to call "home". To say the residents at Leonardo Arms Building One were happy about the final results would be an understatement.

Construction projects are never enjoyable for the residents and are often referred to as a "necessary evil". But a well-developed plan and competent professionals can make it as painless as possible.

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