TRC Worldwide Engineering – Restoration & Inspection, LLC

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August 3, 2021

Mr. Donald Davis, Manager 4400 Gulf Shore Boulevard North Naples, Florida 34103

RE: Ardissone Condominium Association, Inc. Pile Cap Forensics Report Buildings 1 through 6

Dear Mr. Davis:

On July 29th and July 30th of 2021, representatives from this office conducted limited visual observations and mechanical sounding of the pile caps on buildings 1 through 6 on the 3-story high rise structures. The purpose of our field work was to gather information that would enable us to render an opinion concerning concrete deterioration of the pile cap surfaces in order to make remedial recommendations. Neither our observations nor this report is intended to cover hidden defects, hazardous materials, mechanical, electrical, or architectural features. The concrete surfaces were visually observed and sounded using a hammer to strike the surface of the concrete. Unsound concrete was detected by a contrasting hollow echo and lack of positive rebound that are indicative of concrete spalling.

TRC performed a conditional survey at (70) pile cap locations within the 6 building structures, below is a summary of our findings. Refer to the attached field inspections plates to determine our findings at each of the buildings observed.

- 1. Damaged concrete areas were detected on the vertical surfaces of the pile caps, the sea wall caps and CMU surfaces below the sea wall at the base of the building. Hollow sounding concrete and apparent spalls on the sea wall and CMU surfaces were denoted on the plans by a "S/#" with the "#" representing the approximate surface area of the visible spall or surface area requiring excavation and repair. Please note that this does not represent the total cubic feet of repair volume that is presented in the probable opinion of construction cost sheet attached. TRC must estimate the repair depth in order to quantify the volume of concrete repairs which is then used by the contractors to bid the work. Additional field measured areas on the pile caps are also represented on the attached templates based on field measurements and past repair depths from excavations performed in 2019. (See Photos 1- 7)
- 2. The majority of the pile caps investigated and sounded were either previously repaired in 2019 or epoxy injections were carried out prior on the miscellaneous cracks on the vertical face of the piles. Very few of the pile cap structures exhibiting hollow sounding areas. Spalling of the concrete surface can be indicated where the concrete surface has heaved, cracked, or where a deep hollow echo is produced.
- 3. Additional horizontal cracks on the pile caps were visually observed on the bottom vertical face of the caps. Each of the pile caps located on the building were sounded and lacked the hollow echo of a typical spall and the majority of the deteriorated concrete areas were based on visually observations. (See Photos 8-14)

- 4. Several areas of spalling deteriorated concrete were also visually observed on the sea wall caps and CMU surfaces below the base of the building structure. These areas were noted primarily on buildings No. 2 and No. 3. Large cracks, heaved sections of the concrete surface and visually exposed reinforcement bars were observed at these locations. A hollow reverberance was also detected when sounded during our observations, refer to the attached templates for locations. (Refer to Photos 15-18)
- 5. All the pile cap surfaces were previously coated with a cementitious waterproofing membrane and painted to match the existing finishes on the building. The existing cementitious coatings were also inclusive in the past concrete restoration repairs to the caps and conducted at all excavated repair locations and areas where delamination or failures occurred. One minor area of delaminated cementitious waterproof coatings was observed throughout all of the buildings. A minor location of coating failure was identified on the vertical face of pile cap No. 30 located on building 3. (See Photos 19-20)
- 6. Similar to the pile caps the sea wall caps appear to coated with cementitious waterproof coating. However due to the concealed location of the sea walls, the surfaces were left bare and lacked coatings to match the finish of the structure. No apparent delamination's or failed coatings were observed on the sea wall surfaces.
- 7. Several hairline cracks were also observed on the vertical face of the pile caps during observations at previously repaired locations. The cracks identified at these locations were straight and uniform, following the linear outline of the saw cuts performed during the excavational process on the caps, indicative to a cold joint. A cold joint is typically formed from an interruption or delay in concrete operations. This occurs when concrete begins to set before the following batch is placed or at repair locations where the new concrete repair mortar joins the existing. (See Photos 21-24)
- 8. During the pile cap evaluations, the existing piling wraps were visually observed below the caps. All of the pilings were protected with what appears to be a standard HDPE material wrapped around the pilings and secured with galvanized metal straps on the upper portion of the pilings just below the cap. All of the existing HDPE wrap materials appear to be intact. One piling wrap on building No. 6 under pile cap No. 63 was visually damaged. (See Photo 25)
- 9. A handful of the straps observed on the upper surfaces of the pilings were also damaged, loose or not secured at the upper portion of the pilings. This was noted at seven locations under the follow pile cap locations: No. 24, No. 37, No. 48, No. 67, No. 68, No. 63 and No. 62. (See Photos 26-28)

CONCLUSIONS

The condition survey performed at the (70) pile caps located on the (6) buildings as described herein consisted of visual observations and manual sounding of concrete surfaces noting areas lacking positive rebound and/or yielding a hollow echo that are indicative of concrete spalling, delaminating stucco, or surface spalling.

Spalled surface areas were identified visually as cracked sections below the textured cementitious coatings on the pile cap surfaces. As mentioned earlier and in past evaluations,



the hollow sounding areas indicative to concrete spalling were not detected during the mechanical sounding process. Previous remedial repairs along the pile caps were performed with the use of an injectable epoxy resin, mended the loose hollow sections of concrete that were not detectable during the mechanical sounding process. The injections performed on the cracked concrete sections seal and fill the existing cracks, temporarily mending the concrete sections and aiding in controlling further water mitigation. However, injectable epoxy resins will not repair or control the corrosion process on the underlying reinforcing steel. The corrosion continues along the affected reinforcing steel causing expansion of the metal and surrounding concrete surfaces forming additional cracks in the surfaces adjacent to the reinforcing steel or re-cracking the areas previously injected. The cracks transitioning through the applied cementitious coatings on the surface of the caps are then visually evident and detected.

Several additional areas of concrete deteriorated were also identified on the sea wall and CMU block directly below the sea wall caps through mechanical sounding, visually observed cracks or heaved concrete sections with exposed reinforcement.

These items noted above should be addressed as they are allowing for moisture infiltration within the substrate. This intrusion promotes further activity of corrosion on the reinforcing steel and will lead to an increased amount of concrete demolition in order to achieve proper treatment of the steel to reduce the risk of further areas of deteriorated concrete along the identified repair locations.

RECOMMENDATIONS

Based on our findings made during observations and past experience with the pile cap surfaces on the structure there are several cracked and raised areas that are indicative of deteriorated concrete and corrosion to the underlying reinforcing.

We recommend that the deteriorated concrete sections should be excavated by power tools back to sound material to allow abrasive blast cleaning of the steel reinforcing bars free of rust and coated with an epoxy-cement bonding agent prior to forming and placing of new low permeability micro-concrete mix with integral corrosion inhibiting admixture. Based on the condition of the reinforcing steel in the concrete at the spalled areas previously repaired in the last restoration project and the unseen conditions that cannot be anticipated until excavation, it is our professional opinion that corrosion mitigation anodes continue to be used to ensure the mitigation of the corrosion to the reinforcing steel and provide sound repairs. It is also recommended that corrosion mitigation anodes be utilized at the concrete repair locations due to the age of the structure and the chlorides in the atmosphere from the surrounding environment that have permeated the concrete over time.

Given the acceleration of the current steel corrosion and exposure to the surrounding environmental conditions, performing the concrete repairs as soon as the 2022 calendar year at the pile caps would reduce the future scope of work as less concrete excavation will be required to clean existing reinforcing steel and reduce further delamination.

Following the concrete repairs on the pile cap surfaces the existing cementitious waterproofing membrane coatings shall be re-applied to the repair areas for future protection of the concrete surfaces of the pile caps from moisture. We feel that proceeding with waterproof coating as such would consolidate mobilization costs, promote future protection of the concrete, and ensure a uniform finish with the existing finishes. In conjunction with the cementitious



waterproof coating replenishments at the new repair areas, the existing repairs with cold joint delineations on the vertical face of the caps be routed out, sealant applied and recoated with the specified cementitious coatings.

We have prepared a preliminary opinion of probable construction costs for a repair scope based on our observations and recommendations in this report. The opinion of probable cost includes budget quantities of concrete repair and related work items corresponding to the repairs observed and documented on the pile cap and sea wall surfaces. In providing these opinions of probable construction costs, it should be understood that we have no control over costs or the price of labor, equipment or materials, or other methods of pricing used by Contractors, and that the opinion of probable construction cost provided herein was made on the basis of our qualifications and experience. We make no warranty, expressed or implied as to the accuracy of such opinion as compared to bid or actual costs.

LIMITATIONS

This correspondence is intended to communicate a summary of findings at the completion of the first phase of work in anticipation that TRC will continue to provide structural engineering services in relation to the restoration of the pile cap structures. As a result, this report is not a final engineering document and should be considered as preliminary in the fact that additional structural analysis and design may be required to provide any final construction documents nor is this intended to serve as testimony to any perceived deficiencies. Due to the limited scope of our investigation, we cannot attest to the structure's compliance with obsolete building codes or previously accepted construction techniques. This report does not cover hidden defects, mechanical, electrical or architectural features.

Our opinions are based upon judgement to an extent normal for a review of this type. Our review was walkthrough in nature and we did not use any special tools or instruments, nor did we perform any testing, remove any enclosures, finishes, etc. A review of that type would require considerably more time and cost and would be destructive in nature, likely disrupting normal occupancy.

We shall await further instruction before proceeding further with our work. If so directed, our next course of action would be to prepare remedial specifications for the purpose of soliciting bids from contractors and obtaining the required permits from the building department.

Due to the limited scope of this investigation, we cannot attest to the structure's compliance with building codes or accepted construction techniques. This report is prepared for the sole benefit of The Ardissone Condominium Association, Inc. Unauthorized use without our permission shall result in no liability or legal exposure to TRC Worldwide Engineering Restoration & Inspection, LLC.

Very truly yours, TRC Worldwide Engineering Restoration & Inspection, LLC.

Paul S. Moerschel, P.E. President, Florida Group Florida Registration No. 60487 Matthew Maltezos Senior Project Manager



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The Ardissone Condominium, Inc. (TRC Job No. 21FTM644) OPINION OF PROBABLE CONSTRUCTION COST

PILE CAP RESTORATION WORK

PROBABLE COST	\$	154,875.00
Construction Contingency @ Approximately 10%	\$	14,000.00
Contractor Mobilization, Staging, and General Conditions	\$	30,000.00
Surface Preparation and Painting of the Pile Cap Repairs SUBTOTAL	\$ \$ ^	12,000.00 110,875.00
Application of Cementitious Waterproof Coatings	\$	9,000.00
Corrosion Mitigation Anodes (175 Locations @ \$85.00/ Each)	\$	14,875.00
Spalled Concrete Repairs (75 Cubic Feet @ \$1000/Cu. Ft.)	\$	75,000.00

ESTIMATED UNIT QUANTITIES PER BUILDING

Building 1 Concrete Cap Repairs:	9.51 Cubic Feet
Building 1 Mitigation Anodes:	21 Total
Building 2 Concrete Cap Repairs:	7.37 Cubic Feet
Building 2 Mitigation Anodes:	24 Total
Building 2 Concrete Sea Wall Repairs	8 Cubic Feet
Building 3 Concrete Cap Repairs:	6.88 Cubic Feet
Building 3 Mitigation Anodes:	25 Total
Building 3 Concrete Sea Wall Repairs	1 Cubic Foot
Building 4 Concrete Cap Repairs:	11.18 Cubic Feet
Building 4 Mitigation Anodes:	33 Total
Building 5 Concrete Cap Repairs:	11.42 Cubic Feet
Building 5 Mitigation Anodes:	29 Total
Building 6 Concrete Cap Repairs:	10.77 Cubic Feet
Building 6 Mitigation Anodes:	31 Total



Pile Cap Photo Exhibit – The Ardissone Condominium Association



Photo #01



























Photo #10





















Photo #16





































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