

Existing Structures

Engineering, Inc.



Prepared for:

River Club Condominium

1525 Minutemen CWSY

Cocoa Beach, FL 32931

Rev 1- included seawall and pool deck

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Executive Summary

Existing Structures Engineering conducted a condition survey of River Club Condominium located at 1525 Minutemen Cswy Cocoa Beach, Florida. The condition survey was designed to support follow-on production of a Project Manual for the implementation of recommended restoration work.

Based on the results of the condition survey, the following work is recommended:

- **Stairways & Railing:** The stair treads themselves all appear to be in good condition. It is recommended that the current coating be removed, and a new hybrid coating system with a knock down texture be installed.
- **Walkway Railing:** The walkway railings are of aluminum construction and are not compliant with current building code.
- **Walkway Coating:** The elevated walkways should be stripped and upgraded with knock down hybrid coating system. The ground floor will require just a knock down acrylic system.
- **Balconies:** The elevated walkways are constructed of hollow core planks. There are cracks from between the planks telegraphing through the old coating system. These cracks should be repaired prior to installation of a new coating system.
- **Building Envelope:** No action is required at this time.

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Overview

Existing Structures Engineering, (ESE) has been commissioned to conduct a Condition Survey in support of a planned Restoration Project at River Club Condominium in Cocoa Beach, Florida. This report documents the defects found and summarizes the recommended maintenance actions required. Once reviewed and approved by the Association, these actions will be incorporated into the Project Manual during the design and bid phase (Phase 2).

The complex consists of one- two -story building, with balconies on the North side and walkways on the South. The complex contains 16 units, all with balconies or patios. The building is constructed of CMU walls with hollow core plank walkways and concrete cast in place stairs.

Specific items of interest to the Client include:

- Quantification of concrete repair scope
- Recommendations on corrosion control technologies
- Service life and cost of repair

Technical Approach

Visual and Hands-on Inspection

The majority of the inspection work was conducted by visual and hands-on inspection by trained professionals. The tools used to supplement this effort were rods and chains, sounding hammers, hand tools, and tape measures. The inspection was intended to be non-destructive. By its nature, a visual non-destructive inspection is limited to that which can be seen or heard. Although it is limited, it is quite effective for preliminary inspection and for allocating inspection and repair resources.

The hands-on aspect included acoustic soundings and examination of items within the scope of inspection including:

- Walkways
- Guardrails and guardrail attachment points
- Deck coatings

Visual inspection and soundings are acceptable preliminary inspection methods in accordance with the International Concrete Repair Institute (ICRI), the American Concrete Institute (ACI), and the American Society of Civil Engineers (ASCE) guidelines. The concrete evaluation is in general accordance with:

- ACI 201.1R-92, Guide for Making a Condition Survey of Concrete in Service
- ACI 224.1R-93, Causes, Evaluation and Repair of Cracks in Concrete Structures
- ACI 364.1R-94, Guide for the Evaluation of Structures Prior to Rehabilitation
- ACI 546R-96, Concrete Repair Guide
- ASCE 11-98, Guideline for Structural Condition Assessment of Existing Buildings

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Corrosion Control

The primary reason for concrete corrosion damage is water and chloride intrusion. When chlorides permeate through concrete and come into contact with reinforcing steel, the normally protective passive layer is disrupted, and the reinforcing steel begins to corrode. As corrosion progresses, the more voluminous corrosion products impose tensile stresses within the concrete, eventually leading to concrete cracking and spalling. Because this creates an additional water intrusion point, the concrete damage increases exponentially. Waterproofing, together with the proper selection of repair mortars and corrosion inhibitors, is the best course of action to provide effective corrosion control.

Defect Identification

General concrete defects typically start with corroding reinforcing bar (rebar) which causes cracking, spalling and delamination, as shown below.

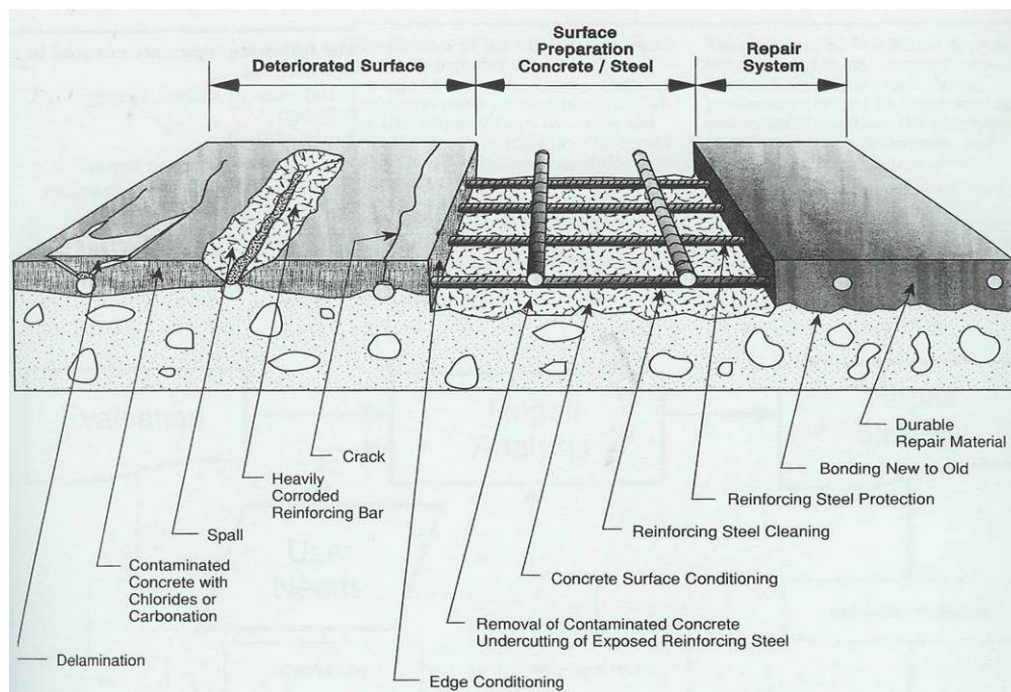


Figure 1: Deteriorated concrete proceeding to repair system

Concrete defects are further broken down into the following categories because although most exhibit the same symptoms (i.e. spalling and delamination), repair methods differ. Please note that all the listed items may not be present in every instance.

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Deck damage, also referred to as slab damage, consists of damaged or spalled concrete found on an elevated floor surface which does not telegraph through the entire thickness of concrete. Deck damage essentially requires rectilinear excavation using hand tools and, in most cases, does not involve replacing reinforcement. Estimates of deck damage assume excavation of 3 inches deep of concrete and do not require the installation of formwork. Deck damage is quantified by cubic foot (CF).

Through (thru) damage consists of spalled concrete which does penetrate through the entire thickness of concrete. Depending on the size and severity of the spall, replacing reinforcement is sometimes necessary. Repairing thru damage requires installation of formwork. Through damage is quantified by cubic foot (CF).

Any damage which is found within 12 inches of the deck edge is referred to as edge damage. Edge damage assumes excavation of the entire thickness of concrete and sometimes will require replacing reinforcement. Edge repairs also require formwork. Edge damage is quantified by cubic foot (CF).

Overhead damage (OVHD) is the same as deck damage except it is located on the overhead (or underside) of the elevated concrete surface. Overhead repair estimates also assume excavation of 3 inches of concrete as well as sometimes installing formwork. Overhead damage is quantified by cubic foot (CF).

Column damage can refer to any damage found on columns, beams, or stairs. This type of damage sometimes will require replacing reinforcement. Formwork installation is required, normally on two surfaces. Column damage is quantified by cubic foot (CF).

Another deficiency sometimes found is spot corrosion, which are rust spots created by the support members used in laying reinforcing steel. Spot corruptions are quantified by each (EA).

Other deficiencies and coatings may be quantified by the square foot (SF).

Findings and Discussion

Within this section we will discuss the findings of our inspection. We will end each discussion with a recommended repair. The priority of repair shall be based on:

Life Safety — These items may present a hazard to persons. This hazard may be in the form of structure stability, falling debris, loss of fire system, electrical shock hazard, etc. These are the highest priority of action.

Asset Preservation — These items need action to preserve an asset. This action may be corrosion control to stop spalling, crack repair to limit water egress, etc. These are the second highest priority of action.

Aesthetics — These items need action primarily for aesthetics or beautification. These actions may be crack repair that does not preserve assets, painting for architectural purposes, landscaping, etc. These are the lowest priority items.

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Stairways & Railings

The stair treads themselves all appear to be in fair condition. It is recommended that the current coating be removed, and a new hybrid coating system with a knock down texture be installed. This is an asset preservation item as well as an aesthetic one.

The stairway railings are of aluminum construction and are not compliant with current building code due to excessive rail spacing ($>4"$) and not of minimum required height.



Photograph 1: East stairway



Photograph 2: Typical stairway railing



Photograph 3: Embedded post pocket



Photograph 4: Elevator

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Walkway Guardrails

The walkway railings are of aluminum construction and are not compliant with current building code due to excessive rail spacing ($>4"$) and not of minimum required height. The railings are in fair condition but are starting to show signs of corrosion. This is an asset preservation item as well as an aesthetic one.



Photograph 5: Aluminum guardrail **Not** to current building code



Photograph 6: Typical walkway guardrail



Photograph 7: Excessive rail spacing **Not** to current building code



Photograph 8: Embedded rail post

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Walkway Coating

The walkways have a textured acrylic coating system throughout. The texture on the elevated walkway has been worn down or was never there to begin with. This could result in a slip hazard and injury. The coating is in fair condition but beginning to fail in a few areas. Besides the aesthetic reasons and a potentially slick surface, a failed coating provides no corrosion protective qualities. It is recommended that the current coating be removed, and a new hybrid coating with a knock down texture be installed on the elevated walkway.



Photograph 9: Chipped textured acrylic coating



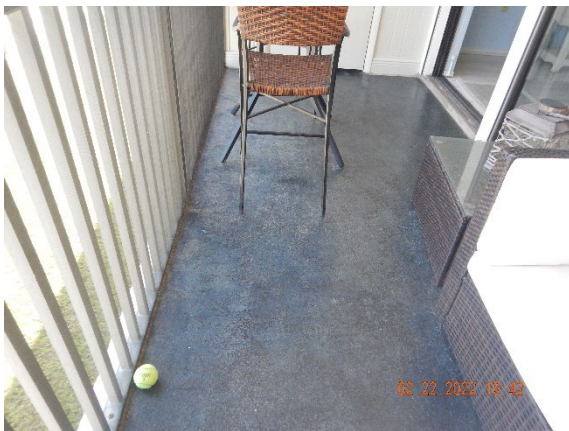
Photograph 10: Coating with very little texture

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Balconies

The elevated balconies are constructed of hollow core planks with CMU partition walls and wood frame storage sheds. The cracks that are telegraphing through the coating are likely to be where two planks come together. Temperature changes can cause these planks to move independently of each other causing the cracks. ESE recommends stripping the deck to bare concrete/overlay and installing a hybrid coating system with a urethane base coat and an acrylic topcoat. This system gives the most protection while also having some elastic characteristics to help bridge the panels and prevent some of the cracking. It also allows the ease of maintaining an acrylic topcoat system. This system should eliminate the issue with water leaking into the units below. This is an asset preservation item as well as an aesthetic one. Steel furniture, rugs and other floor coverings are NOT recommended on elevated concrete decks. Steel furniture rusts and damages the coating. Rugs retain moisture and hold water against the concrete and the rubber backings can also damage coatings.

The guardrails on the elevated balconies are a combination of guardrail and screen enclosure. The enclosures themselves are in fair condition but the fasteners at the bottom are corroded tap-cons with very little holding power. The tap-cons should be abandoned in place and new “T” bolts/expanding anchors should be install a few inches away from each tap-con.



Photograph 11: Some kind of stain & sealer



Photograph 12: 4 Carpet on the deck

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Photograph 13: Linoleum sheet with plants



Photograph 14: Tile

Building Envelope

The building envelope is in good shape and only minor action is required at this time. There is delaminated stucco at the ends of the balcony beams where the planks meet. The water is coming through the seam and disbonding the stucco from the beam. The community should plan on a waterproofing/paint in the next five years. This is an asset preservation item as well as an aesthetic one.



Photograph 15: Building Envelope



Photograph 16: Building Envelope

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Seawall

The reinforced concrete seawall cap and panels were reported installed during building construction in ~1977. The seawall is 287' long with expansion joints on 45' centers. The RC seawall cap is 9" d x 12" and resides on precast concrete panels. It is reasonable to expect a 30 year service life out of a traditional concrete seawall and this seawall is showing signs of aging and corrosion damage. The seawall exhibits several corrosion cracks from rebar spalling and soon these cracks will join at corner rebars and result in exposed rebar spalling. The seawall is still serviceable but we would expect corrosion spalling to cause unrepairable damage in less than five years. The CoA should plan on replacing the seawall in ~5 years. Discussion was entertained about replacing just the seawall cap but leaving 45 year old seawall panels under a new cap is not advisable.



Photograph 15: Seawall panel and cap



Photograph 16: Typical crack

It was also noted that the sod next to the seawall exhibited “washout” or hidden erosion. This is normal and should be address by bringing in more earthen fill.



Photograph 15: Straight edge showing washout



Photograph 16: Different location washout

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Pool deck and walkway

The pool deck walkway is a concrete 65' x 6' sidewalk between the pool and seawall and is unremarkable. The pool deck is ~45' x ~65' concrete with a textured acrylic coating. The pool deck exhibited some minor cracking which had undergone an attempted repair. Cracked concrete always “telegraphs” through “cool deck” and we are not aware of an adequate repair. We suggest maintaining the present coating and monitoring the cracking.



Photograph 15: Pool deck walkway



Photograph 16: Pool deck and crack

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Scheduled Maintenance Program

The suggested maintenance program is to conduct concrete condition surveys at four and a half years after a repair cycle. The restoration contractors provide a five-year warranty to repairs and ten years on replacements. We recommend that an inspection is done in year four to ensure warranty coverage of any items which need so.

Project Cost, Phasing, and Prolongment

According to NACE International “It is common during concrete repairs for the delaminated area excavated to be far more extensive than delamination surveys indicate.... An underestimate of 40% or more is not unusual and should be borne in mind when budgeting for repairs¹.”

If the project is to be delayed or completed in phases, the costs outlined in this “snapshot” report can be expected to dramatically increase. The actual percentage increase cannot be accurately predicted but, for example, concrete damage has been reported (Concrete International, Monitoring Parking Structure Repairs, Bickley and Liscio) to double and a 100 percent increase could be anticipated for prolonging the project a year.

It is always recommended that contingency funds be retained for any unforeseen conditions.

¹ NACE International Stand Practice Publication SP0308-2008 Item No. 21128

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Appendix A – Survey Results & Recommended Remediation Work

The attached summary worksheet(s) provides a cost estimate for the recommended repair work. This cost estimate is based on knowledge of current and past concrete restoration projects. Actual project bids will vary by contractor and will also depend on which options the Association chooses. **Please do NOT distribute engineering estimates to any contractors.**

Balcony	CF	CF	CF	CF	EA	EA	SF	SF	SF	SF	TYPE	
Unit	DECK	EDGE	OVHD	COL/BEAM	SPOT	POST POCKET	STUCCO	SURF PREP	HYBRID	ACRYLIC	COATING	Notes
101	-	-	-	0.45	-	-	-	180.00		180.00	Tile	
102	-	-	-	-	-	-	-	180.00		180.00	Tile	
103	-	-	-	-	-	-	-	180.00		180.00	Tile	
104	-	-	-	-	1.00	-	-	180.00		180.00	Chatt	
105	-	-	-	-	-	-	-	162.00		162.00	Tile	
106	-	-	-	-	-	-	-	180.00		180.00	Carpet	
107	-	-	-	-	-	-	-	180.00		180.00	Chatt	
108	-	-	-	-	-	-	-	180.00		180.00	Tile	
				-								
201	-	-	-	-	-	-	-	180.00	180.00		Tile	
202	-	-	-	-	-	-	-	180.00	180.00		Carpet	
203	-	-	-	-	-	-	-	180.00	180.00		Stain & Sealer	
204	-	-	-	-	-	-	-	180.00	180.00		vinyl	
205	-	-	-	-	-	-	-	162.00	162.00		Tile	
206	-	-	-	-	-	-	-	180.00	180.00		Tile	
207	-	-	-	-	-	-	-	180.00	180.00		Tile	
208	-	-	-	-	-	-	-	180.00	180.00		Tile	
Allowance	-	-	-	-	-	-	50.00					
TOTAL	-	-	-	0.45	1.00	-	50.00	2,844.00	1,422.00	1,422.00		

WALK	CF	CF	CF	CF	EA	EA	SF	SF	SF	SF	TYPE	
FLOOR	DECK	EDGE	OVHD	COL/BEAM	SPOT	POST POCKET	STUCCO	SURF PREP	HYBRID	ACRYLIC	COATING	Notes
1st	-	-	-	-	-	-	-	1,215.00		1,215.00	Acrylic	
2nd	-	-	-	-	-	-	-	1,215.00	1,215.00		Acrylic	255
West Stairs	-	-	-	-	-	-	-				Acrylic	15
Center Stairs	-	-	-	-	-	-	-				Acrylic	16
East Stairs	-	-	-	-	-	-	-				Acrylic	15
Allowance	-	-	-	-	-	-	50.00					
TOTAL	-	-	-	-	-	-	50.00	2,430.00	1,215.00	1,215.00		

* The quantities contain a predetermined percent increase (10 to 30%) because it is common during concrete repairs for the delaminated area excavated to be more extensive than delamination surveys indicate and it may also take 10-30% more concrete removal to get to clean rebar.

Repair Item	Quantities		Unit	Extended Cost
A. Mobilization & Permit	1.00	LOT	15%	13,600.00
B. Concrete Repairs - Balconies				
1. Deck repair	-	CF	450.00	-
2. Edge repair	-	CF	425.00	-
3. Overhead repair	-	CF	425.00	-
4. Column repair	0.45	CF	500.00	225.00
5. Spot repair	1.00	EA	60.00	60.00
6. Stucco repair	50.00	SF	25.00	1,250.00
C. Deck Coatings - Balconies				
1. Surface prep to bare concrete	378.00	SF	2.50	945.00
2. Surface prep tile/vinyl/chatt	2,466.00	SF	3.50	8,631.00
3. Knock down hybrid coating system	1,422.00	SF	10.00	14,220.00
4. Knock down acrylic coating	1,422.00	SF	6.00	8,532.00
D. Concrete Repairs - Walkways				
1. Deck repair	-	CF	450.00	-
2. Edge repair	-	CF	425.00	-
3. Overhead repair	-	CF	425.00	-
4. Column repair	-	CF	500.00	-
5. Spot repair	-	EA	60.00	-
6. Post pocket repair	64.00	LF	35.00	2,240.00
7. Stucco repair	50.00	SF	25.00	1,250.00
E. Deck Coatings - Walkways				
1. Surface prep to bare concrete	2,430.00	SF	2.50	6,075.00
2. Knock down hybrid coating system	1,215.00	SF	10.00	12,150.00
3. Knock down acrylic coating	1,215.00	SF	6.00	7,290.00
F. Guardrails - Walkways				
1. New 3-line guardrail	255.00	LF	90.00	22,950.00
2. New angled guardrail for stairs	46.00	LF	100.00	4,600.00
Total Estimate			\$	104,018.00

Additional Project Contingency	Quantity	Unit	Extended Cost
We recommend assessing for an addtl 20% contingency	1.00	LOT	20% \$ 307.00

Additional Scope:	Quantity	Unit	Extended Cost
Seawall in five years	290	500.00	\$ 145,000.00

Existing Structures Engineering Fees				
Engineering Design of Repair/Bid Package	1.00	LOT	Fixed Fee \$	4,200.00
Construction Engineering & Inspections/ with waterproffing	1.00	LOT	Estimated \$	9,400.00

TOTAL Project Cost (Including Contingency)			\$	117,925.00
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