

Milestone Inspection Report

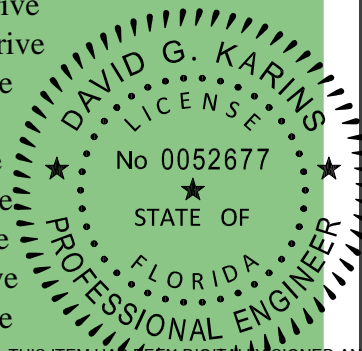
Project #23RS-0013
July 24th 2023
FINAL COPY

Report for:

Longboat Harbour Owners Association, Inc.
4454 Gulf of Mexico Drive
Longboat Key
FL 34228

Buildings:

- Building A - 4310 Falmouth Drive
- Building B - 4320 Falmouth Drive
- Building C - 4330 Falmouth Drive
- Building D - 4340 Falmouth Drive
- Building E - 4350 Chatham Drive
- Building F - 4360 Chatham Drive
- Building G - 4370 Chatham Drive
- Building H - 4380 Exeter Drive
- Building I - 4390 Exeter Drive
- Building J - 4400 Exeter Drive
- Building K - 4410 Exeter Drive
- Building L - 4420 Exeter Drive
- Building M - 4430 Exeter Drive
- Building N - 4440 Exeter Drive



THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY
DAVID G. KARINS, PE ON THE DATE ADJACENT TO THE SE
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July 24th 2023

Mr. Igor Solovyev
Longboat Harbour Owners Association, Inc.
4454 Gulf of Mexico
Longboat Key, FL 34228

Via Email: lbhmanager@outlook.com

RE: *Longboat Harbour Structural Evaluation*
4454 Gulf of Mexico Drive, Longboat Key, FL 34228
KE File # 23RS-0013
Professional Engineering Services – Milestone Inspection, Structural Integrity Reserve Study

Dear Mr. Solovyev and Members of the Board of Directors:

Karins Engineering (KE) has agreed to render professional engineering services in connection with a Milestone Inspection per F.S. 553.899 at **Longboat Harbour** (hereinafter called the “Project”), located at **4454 Gulf of Mexico Drive, Longboat Key, FL 34228**, for **Longboat Harbour Owners Association, Inc. of 14 Buildings. See Page 3.** (hereinafter called the “Client”), on January 9, 2023. Per the signed Letter of Agreement by the Client dated January 11, 2023, KE completed a limited condition observation and evaluation of the current conditions and construction.

Our observations are intended to identify significant deficiencies, problems, or on-going maintenance concerns that are visible at the time of our observations; the intent of our review was to ascertain the general condition of these components and to make recommendations for appropriate repair and protection.

This structural inspection is for the sole purpose of identifying structural deficiencies of the building or structure that pose an immediate threat to life, safety, or where failure of a critical component is imminent. This structural inspection shall be for the purpose of determining the structural condition of the building or structure to the extent reasonably possible of any part, material, or assembly of a building or structure which affects the safety of such building or structure and/or which supports any dead or designed lived load.

Neither our observations nor this report is intended to address hidden defects, mechanical, electrical, architectural, code compliance, or other areas of the building not specifically mentioned herein. Our investigation was not intended to be exhaustive or to detect efficiencies except as specifically mentioned herein. Due to the limited scope of this investigation, we cannot attest to the structure’s compliance with applicable building codes and/or accepted construction techniques, excepted as noted herein. KE did not attempt to verify the adequacy of original design or supplant the responsibility of the Engineer of Record.



Executive Summary:

The purpose of this report is to summarize our findings related to the investigation and assessment of the subject building as it relates to F. S. 553.899¹, commonly known as, a **Milestone Inspection**. This inspection is defined as, “*a structural inspection of a building, including an inspection of load-bearing walls and the primary structural members and primary structural system...*”¹ Additionally, as is further defined, “*the purpose of such inspection is not to determine if the condition of an existing building is in compliance with Florida Building Code or the fire safety code.*”¹

Furthermore, this report addresses **substantial structural deterioration**, this term is defined as, “*substantial structural distress that negatively affects a building’s general structural condition and integrity. The term does not include surface imperfections such as cracks, distortion, sagging, deflections, misalignment, signs of leakage, or peeling of finishes...*”¹

The Milestone Inspection consists of two phases (if applicable), Phase 1 and Phase 2:

The **Phase 1** definition is summarized as, “*perform a visual examination... including the major structural components of a building, and provide a qualitative assessment of the structural conditions of the building.*”¹ Furthermore, if no signs of substantial structural deterioration are discovered, Phase 2 is not required. The **Phase 2** definition is summarized as, “*if any substantial structural deterioration is identified during phase one. A phase two inspection may involve destructive or nondestructive testing... and may be as extensive or as limited as necessary... and to recommend a program for fully assessing and repairing distressed and damaged portions of the building.*”¹

The multiple buildings of Longboat Harbour all sit within 1000 feet of the Gulf of Mexico Shoreline. This approximately 20-acre community consists of 15 buildings, 14 of which are three-story residential buildings and 1 clubhouse, totaling 300 units.

The building’s structural elements *appear* to be built with Reinforced concrete floors slabs and beams, filled Concrete Masonry Units (CMU) columns and poured in place stair cases. The roofing has a coating over the existing roofing membrane. The interior finishes appear to consist of conventionally built framing and drywall. The exterior-facing balconies and walkways connect to columns surrounding the exterior.

Thus, through our investigation and assessment and as this report shall conclude, **none of the subject buildings exhibit signs of substantial structural deterioration and passes Phase 1**, which means they do not require a Phase 2.

¹ Appendix A



FINDINGS:

Longboat Harbour all buildings were completed in 1972.

Longboat Harbour all buildings are within 3 miles of the coast.

Longboat Harbour all building are approximately 53 years old.

- Building A 4310 Falmouth Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building B 4320 Falmouth Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building C 4330 Falmouth Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building D 4340 Falmouth Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building E 4350 Chatham Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building F 4360 Chatham Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building G 4370 Chatham Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building H 4380 Exeter Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building I 4390 Exeter Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building J 4400 Exeter Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building K 4410 Exeter Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building L 4420 Exeter Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building M 4430 Exeter Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**
- Building N 4440 Exeter Drive – A (3) three-story residential building
 - Phase 1 Milestone **PASS**



Statute Summary:

Per Florida Statue 553.899 a statewide building Milestone Inspection requirement for condominiums and cooperative buildings that are three (3) stories or higher in height and thirty (30) years after initial occupancy or twenty-five (25) years after initial occupancy for buildings located within three (3) miles of the coast.

An inspection every ten (10) years following this initial Milestone Inspection will be required.

The engineer is to provide this a summarize Milestone Inspection report to the local building official.

The following is for informational purposes only. KE is in no position to provide legal advice:

The Client is to “distribute a copy of the inspector-prepared summary of the inspection report to each unit owner, regardless of the findings or recommendations in the report, ...; must post a copy of the inspector-prepared summary in a conspicuous place on the condominium property; and must publish the full report and inspector-prepared summary on the association’s website”¹

Furthermore, the Client is to procure a Structural Integrity Reserve Study (SIRS) every ten (10) years per F. S. 718.112 (2) (g)... as related to the structural integrity and safety of the building, with reserve accounts for the following components:

- *Roof*
- *Load-bearing walls*
- *Floor*
- *Foundation*
- *Fireproofing and fire protection system*
- *Plumbing*
- *Electrical system*
- *Waterproofing*
- *Exterior painting*
- *Windows*
- *Any other item that has a deferred maintenance expense or replacement cost that exceeds \$10,000 and the failure to replace or maintain such item negatively affects the items listed in sub-subparagraphs a.-i., as determined by the licensed engineer or architect performing the visual inspection portion of the structural integrity reserve study.*



Reference Documents

In preparation of this report, KE reviewed the following documentation:

- KE does not have any documentation relating to drawings for Longboat Harbour Owners Association, Inc. on file.
- Any reference reports / material to be indicated here and included as part of Appendix.

Unless noted otherwise, KE did not review every subsection of any documents, make attempts to acquire public records, and assess the full history of the building. Furthermore, historical or association documents may have been provided by the Client. However, KE reviewed all past internal documentation in relevance to this report and shall be noted as necessary. *Updates to this edition can be made if further information is provided.*

Reference Contacts

In preparation of this report, KE procured correspondence with the following parties:

- Igor Solovyev - Property Manager



General Information:

KE visited the site on the following dates: 01/13/23, 01/24/23, 01/27/23, 02/03/23, and 02/10/23. During our visits, KE observed the condition of the buildings' components and areas as outlined below.

KE visits were observational only. No destructive testing was undertaken during the tenure of our visits. At no time did KE move or alter any unit configuration to view components or access items whether structural or non-structural. KE conducted qualitative soundings to determine the conditions of elements at all buildings.

KE did not investigate the following components beyond obvious corrosion, deterioration, or operational issues:

- Major electrical components
- Major mechanical components
- Major plumbing components
- Doors and windows; other than condition of sealant
- Exterior finishes; beyond view from ground level and balconies
- Foundations including pile caps
- Major drainage system; beyond its influence on erosion



Figure 1: Ariel View of Parcel and Buildings.



Scope of Observations:

The structural elements and related components are found at different areas amongst the buildings.

- Building Exterior
- Roof
- Elevators
- Stairwells
- Operational Rooms
- Doors and Windows
- Balconies and Walkways
- Life Safety

The following units were entered for access to balconies & terraces:

Building A

- Unit A101
- Unit A201
- Unit A304

Building B

- Unit B106
- Unit B206
- Unit B303

Building C

- Unit C107
- Unit C202
- Unit C308

Building D

- Unit D101
- Unit D203
- Unit D305

Building E

- Unit E103
- Unit E202
- Unit E301

Building F

- Unit F107
- Unit F201
- Unit F308

Building G

- Unit G102
- Unit G205
- Unit G306

Building H

- Unit H101
- Unit H204
- Unit H301

Building I

- Unit I101
- Unit I201
- Unit I303

Building J

- Unit J108
- Unit J203
- Unit J304

Building K

- Unit K103
- Unit K203
- Unit K305

Building L

- Unit L108
- Unit L203
- Unit L308

Building M

- Unit M101
- Unit M203
- Unit M307

Building N

- Unit N101
- Unit N201
- Unit N306



OBSERVATIONS:

The following section provides our observations as they relate to Longboat Harbour, the **primary structural system**.



Figure 2: Longboat Harbour

Refer to Photo Exhibit for non-structural deficiencies.

Primary Structural System: Foundations

The foundation, soils, and accompanying systems were not observed or exhaustively investigated at Longboat Harbour as these areas were not easily accessible for observation. It should be noted that KEG did not observe any obvious signs of distress on the accessible observable components related to the foundation.



Primary Structural System: Beams

Type: Conventionally reinforced concrete.

Commentary: Fundamentally, the primary purpose of a beam is to transfer loads from a wall or floor. Generally, exterior beams spanning between columns or that are cantilevered are easily identifiable. However, interior beams are typically covered with a finishes and can be difficult to distinguish. Additionally, dependent on the type of finish, it may not be possible to directly observe any sort of deterioration or deficiencies. Of course, this is dependent on the type of design for the structure as some structures do not utilize beams, see Floors section.

Observations: No observed structural deficiencies were noted. All observable beams were noted to be in good condition. The following photo shows the current condition of the beams observed around the property in a unit that had all interior finished removed for easy identification.



Figure 3: Typical Concrete Beams Observed.

Refer to Photo Exhibit for non-structural deficiencies.



Primary Structural System: Columns

Type: Appears to be poured CMU blocks. .

Commentary: Concrete Masonry Units appear to be filled with concrete and rebar and are used as columns and are employed throughout the building structure.

Observations: Exposed columns were observed from the exterior elevations. The following photos depict a sampling of columns observed.



Figure 4: Typical columns observed.



Figure 5: Typical columns observed.



Primary Structural System: Walls

Type: More than likely conventionally reinforced concrete shear walls and non-load bearing concrete masonry unit (CMU) in-fill walls.

Limitations: Shearwalls, if any, were not observed but may have not been employed at the time of construction.

Commentary: Fundamentally, the purpose of a wall is to provide protection for the structure and its occupants from the elements. In conventional concrete design, walls are typically not load-bearing and are filled-in with standard masonry units between the column and beam construction. However, large structures with numerous stories utilize Shearwalls for lateral wind resistance.

Observations: No structural deficiencies observed.



Figure 6: Example of CMU demising wall at Unit I 208

Refer to Photo Exhibit for non-structural deficiencies.



Primary Structural System: Floors

Type: Conventionally reinforced concrete floors with cantilevered walkways and balconies.

Limitations: Exterior walkways, balconies, and stairwells were observed. Interior floors and exterior walkways covered in finish were not visually observable except for a portion of Unit I 208.

Commentary: Fundamentally, the purpose of a floor is to distribute loading from occupants and material to the beams. Dependent on the type of design, the loading may be distributed to the walls and / or columns instead. Interior floors are typically covered with finishes and it may not be possible to directly observe any sort of deterioration or deficiencies.

Observations: No structural deficiencies observed.

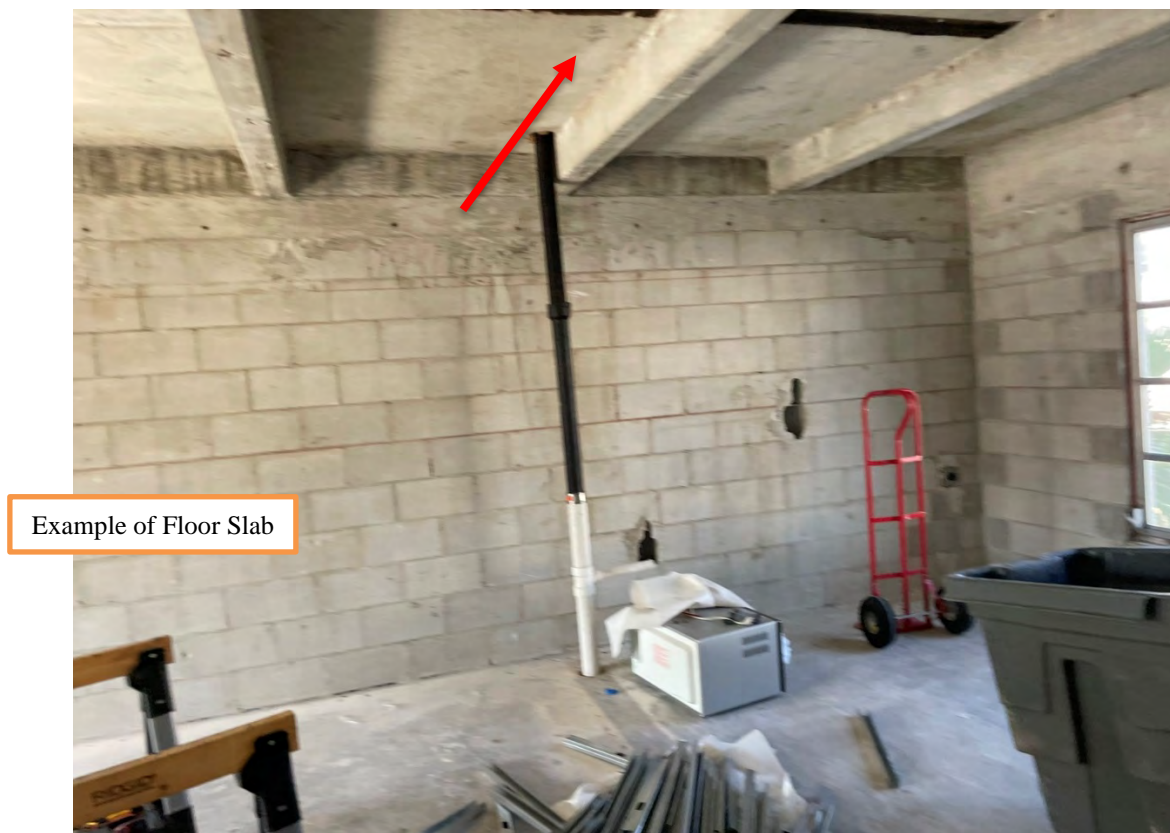


Figure 7: Flooring system with beams

Refer to Photo Exhibit for non-structural deficiencies.



Primary Structural System: Seawall

Type: Unknown however local comparables would suggest a concrete cap over wall panels with tie backs to deadmen.

Limitations: Deadman or tie back observations were not feasible at the time of this report.

Commentary: None.



Figure 8: Seawall Observed.



Typical Roof System & Rooftop Structures:

The following potential structural deficiencies were observed:

- N/A

The following non-structural deficiencies, problems, or maintenance concerns were observed:

- There is a great presence of rust accumulated on the A/C units across all buildings.
- Ponding water residue is present across all buildings.
- The roof copings surrounding all buildings appear to be aged. Many locations of sealant failures at joints, punctures, and warped sections were observed.
- A slight presence of debris was accumulated on all rooftops.



Figure 9: Typical rooftop overview.



Typical Building Exterior, Cladding, & Features:

The following potential structural deficiencies were observed:

- N/A

The following non-structural deficiencies, problems, or maintenance concerns were observed:

- N/A



Figure 10: Typical building exterior overview.



Typical Windows & Doors:

The following potential structural deficiencies were observed:

- N/A

The following non-structural deficiencies, problems, or maintenance concerns were observed:

- N/A



Figure 11: Typical exterior window overview.



Typical Balconies, Terraces, & Walkways:

The following potential structural deficiencies were observed:

- Locations of cracking were observed in structural columns and beams across the property.

The following non-structural deficiencies, problems, or maintenance concerns were observed:

- Locations of stair-stepping were observed in CMU connected to balconies



Vertical crack running up structural column

Figure 12: Typical walkway section.



Typical Stairwells & Shafts:

The following potential structural deficiencies were observed:

- N/A

The following non-structural deficiencies, problems, or maintenance concerns were observed:

- Traction tracks attached to stair steps appear to be becoming loose in some locations.



Figure 13: Typical stairwell overview.



Typical Operational Rooms:

The following potential structural deficiencies were observed:

- N/A

The following non-structural deficiencies, problems, or maintenance concerns were observed:

- Sloped ceilings experiencing deteriorating conditions in some buildings' mechanical rooms.



Figure 14: Typical mechanical room overview.



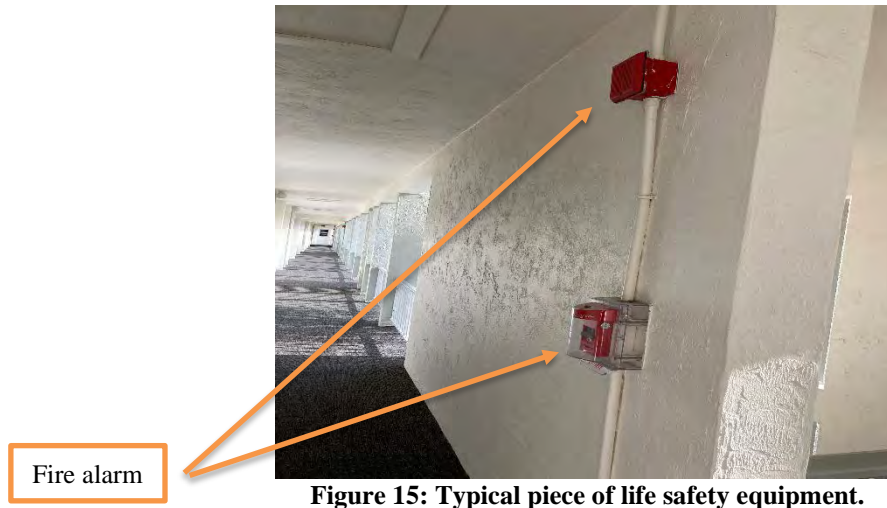
Typical Life Safety:

The following potential structural deficiencies were observed:

- N/A

The following non-structural deficiencies, problems, or maintenance concerns were observed:

- See Stairwells and Shafts section above



RECOMMENDATIONS:

Based upon our visual observations of the above-listed systems at Longboat Harbour, Karins has provided a list of recommendations below broken down by Building using an Eisenhower Matrix, with the most important items listed first, for the prudent implementation and scheduling by Longboat Harbour

All recommendations as of this report are nonstructural and comprise all “other deficiencies” noted.

It is our professional opinion that the following course of action should be taken to protect the building in the future:

Substantial Structural Issues:

- N/A

Other Deficiencies:

- **Broken Down by Building**
 - **Important and Urgent**
 - **Important and Not Urgent**
 - **Not Important and Urgent**
 - **Not Important and Not Urgent**



RECOMMENDATIONS BASED ON INDIVIDUAL BUILDINGS:

Building A

- Important and Urgent
 - N/A
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.

Building B

- Important and Urgent
 - N/A
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.



Building C

- Important and Urgent
 - N/A
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - Some control boxes on A/C units appeared to be detached from the A/C unit to which they should be attached. Reattach per code requirements.
 - Evidence of stair-stepping on the balcony CMU wall of Unit C202. Repair in accordance with International Concrete Repair Institute guidelines.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.

Building D

- Important and Urgent
 - A review of all columns should take place for structural integrity. One location of a deficiency was noticed was on level three. The location is a potential concrete spall at the base of the column in the future if not addressed.
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - Some control boxes on A/C units appeared to be detached from the A/C unit to which they should be attached. Reattach per code requirements.
 - One location of stair-stepping in a CMU wall was observed on level one.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent



- A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
- Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.

Building E

- Important and Urgent
 - Review Unit E301 for cracking issues. Multiple locations of cracking were noticed within the unit. Repair using ICRI guidelines.
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - There appeared to be a crack in the sealant used for the tile around the front door of Unit E105. This could be a potential source for a leak.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.

Building F

- Important and Urgent
 - A review of all columns should take place. A location observed was on level two in a column where there appeared to be cracking in the stucco. Repair using ICRI Guidelines.
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - A review of the exterior surrounding Unit F308 should take place. A location of a rusting connection plate on the exterior of the balcony was noticed.
 - A review of the balcony of Unit F201 should take place. Locations of ponding water under the balcony carpet and cracking in the concrete supporting the slider were noticed.



- A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.

Building G

- Important and Urgent
 - A review of all columns should take place. One location noticed was on level three where a crack and a potential concrete spall were present on a column. Another location noticed was on level two where a previous repair had occurred. Repair with ICRI Guidelines.
- Important and Not Urgent
 - A review of the mechanical room should take place. Leading down to the mechanical room, the concrete sloped ceiling appeared to be honeycombing. Deteriorating concrete should be addressed with ICRI Guidelines.
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - A review of the balcony in Unit 306 should take place. A location of stair-stepping was observed in the CMU balcony wall.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.



Building H

- Important and Urgent
 - N/A
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - Some control boxes on A/C units appeared to be detached from the A/C unit to which they should be attached. Reattach per code requirements.
 - Any extrusions on the rooftop should be properly sealed. A location of an electrical box not properly sealed was observed.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.

Building I

- Important and Urgent
 - A review of the mechanical room should take place. Leading down to the mechanical room, the concrete sloped ceiling appeared to be spalling. Deteriorating concrete should be addressed in the near future.
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
 - Paint delamination was noticed on a structural column on level three.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.



Building J

- Important and Urgent
 - A review of the interior of Unit 203 should take place. The ceiling was observed to have “flaky” properties and possible hairline cracks. Repair in accordance with ICRI Guidelines.
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - A review of Unit 108 should take place. A crack in a column was chased with sealant.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.
 - A track on the edge of the walkway of level three was observed to be missing. This should be replaced.

Building K

- Important and Urgent
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
 - A review of the mechanical room should take place. Leading down to the mechanical room, the concrete sloped ceiling appeared to be honeycombing. Deteriorating concrete should be addressed using ICRI Guidelines.
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - Any extrusions on the rooftop should be properly sealed. An electrical box not properly sealed was observed.
 - Stair-stepping was observed on the rooftop parapet wall.
 - Cracks were observed in the CMU wall of the storage room.



- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.
 - A review of the exterior fascia should take place. Damaged exterior fascia was observed.

Building L

- Important and Urgent
 - A review of all columns and beams should take place. Cracking was found on two columns on level three, one column on level two, and one column on level one. Cracking was found on one beam on level three. Repair per ICRI guidelines.
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - Any extrusions on the rooftop should be properly sealed. A location of an electrical box not properly sealed was observed.
 - Cracking was also found on an exterior wall on level one along with stair-stepping in a CMU wall near a vent.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.



Building M

- Important and Urgent
 - A section of roof tiles was observed to be missing. These tiles should be replaced to not allow any more water to penetrate the roofing system.
 - A review of all walls should take place. Cracking was found in in walls on levels two and three. Repair per ICRI Guidelines.
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - Any extrusions on the rooftop should be properly sealed. A location of an electrical box not properly sealed was observed.
 - Stair-stepping was observed on the rooftop parapet wall.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
- Not Important and Urgent
 - N/A
- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.
 - A rusted walkway railing bolt was observed on level three.

Building N

- Important and Urgent
 - A review of all beams should take place. Cracking was found on a beam on the underside of level two.
- Important and Not Urgent
 - A review of the coping on the rooftop should take place. Areas of the coping were observed to be punctured, loose, missing, or warped.
 - The TPO in place was observed to be blistered or punctured. A review should take place to address these issues.
 - Stair-stepping was observed on the rooftop parapet wall.
 - A plan should be implemented to review A/C connections on the roof. Many A/C units were noted to have rusted brackets/fasteners.
 - Cracking was found on a wall in the community laundry room. Investigate.
- Not Important and Urgent
 - N/A



- Not Important and Not Urgent
 - To extend the expected lifespan of exterior coatings, plants should be trimmed back away from the building exterior.
 - A general scrubbing of the rooftop should take place. Ponding residue should be cleaned along with any debris accumulated on the rooftop surface.
 - Ensure that all traction tracks on stair steps in stairwells are secure. Locations of loose tracks were noticed.

FINDINGS

- Building A 4310 Falmouth Drive – A (3) three-story residential building
 - Building B 4320 Falmouth Drive – A (3) three-story residential building
 - Building C 4330 Falmouth Drive – A (3) three-story residential building
 - Building D 4340 Falmouth Drive – A (3) three-story residential building
 - Building E 4350 Chatham Drive – A (3) three-story residential building
 - Building F 4360 Chatham Drive – A (3) three-story residential building
 - Building G 4370 Chatham Drive – A (3) three-story residential building
 - Building H 4380 Exeter Drive – A (3) three-story residential building
 - Building I 4390 Exeter Drive – A (3) three-story residential building
 - Building J 4400 Exeter Drive – A (3) three-story residential building
 - Building K 4410 Exeter Drive – A (3) three-story residential building
 - Building L 4420 Exeter Drive – A (3) three-story residential building
 - Building M 4430 Exeter Drive – A (3) three-story residential building
 - Building N 4440 Exeter Drive – A (3) three-story residential building
- Phase 1 Milestone **PASS ALL BUILDINGS**



Conclusion:

Based on the scope of the inspection and for the areas that were able to be assessed, within a reasonable degree of engineering certainty, we have not observed any conditions that would compromise the safety of the buildings for their intended use and occupancy. We reserve the right to amend our opinion should new information be brought to our attention.

The subject buildings **PASS Phase 1** of the Milestone Inspection.

The subject buildings are required to facilitate a Milestone Inspection in 10 years.

This report is prepared for the sole benefit of the client. Any unauthorized use without our permission shall result in no liability or legal exposure to Karins Engineering, Inc.

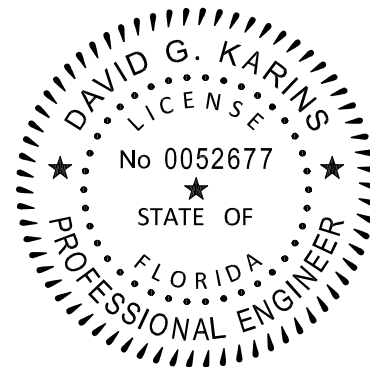
We trust this information is helpful. Should questions arise, please do not hesitate to contact us!

Sincerely,

Karins Engineering

David G Karins, PE
President / CEO
FL Reg. # 52677

Attachments: *Photo Exhibit*
 Appendix A – Florida Statute
 Appendix B – General Considerations
 Appendix C - Spalling in Concrete



THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY DAVID G. KARINS, PE ON THE DATE ADJACENT TO THE SE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.



Photo Exhibit:



Figure 1: Aerial view of Longboat Harbour from Google Earth

Typical deficiencies across all buildings:



Figure 2 – Ponding residue on rooftops





Figure 3 – Damaged coping along rooftop



Figure 4 – Rusted A/C components



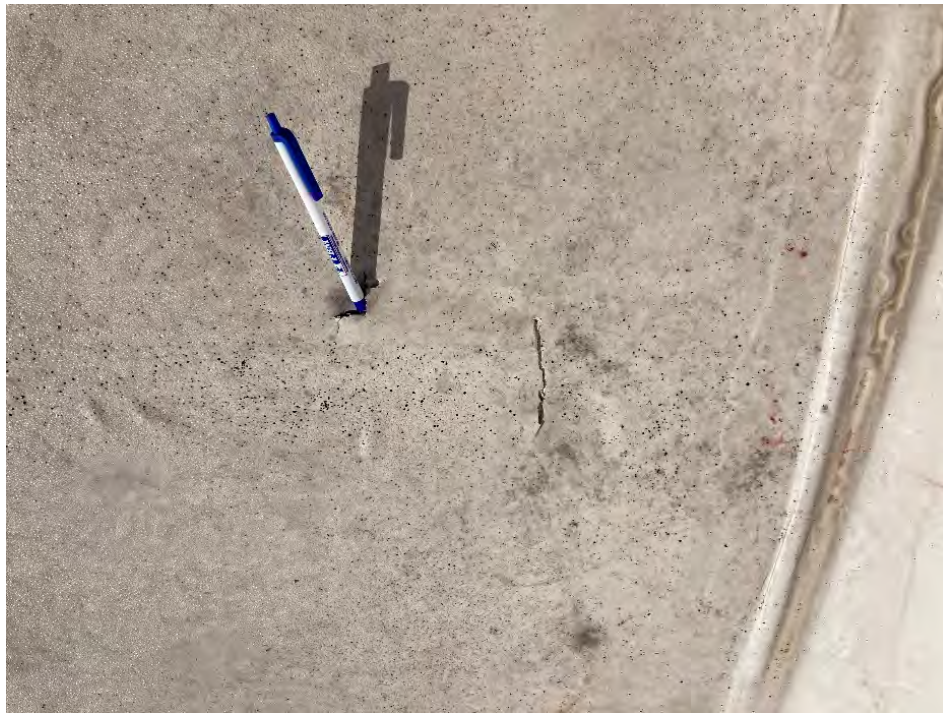


Figure 5 – Punctured TPO membrane



Figure 6 – Traction tracks on stairs starting to detach from stairs



Building A:



Figure 7 - Plants rubbing against exterior wall, typical

Building B:



Figure 8 - Plants rubbing against exterior wall, typical



Building C:



Figure 9 – A/C control box detached from unit



Figure 10 – Stair-stepping in Unit C202



Building D:



Figure 11 – A/C control box not properly secured



Figure 12 – Paint peeling on column





Figure 13 – Stairstepping on ground floor

Building E:



Figure 14 - Cracking of stucco and sealant in Unit E301





Figure 15 – Cracking sealant in front of Unit E105

Building F:



Figure 16 - Cracking in stucco on column on 2nd floor walkway





Figure 17 - Rusted connection plate by window of Unit F308



Figure 18 - Water damage under carpet of Unit F201



Building G:



Figure 19 – Honeycombing of concrete in mechanical room



Figure 20 - Locations of potential spalling on column on 3rd floor





Figure 21 - Previous repair made



Figure 22 - Stair-stepping in Unit G306



Building H:



Figure 23 - A/C control box detached from unit



Figure 24 - Extrusion not sealed properly



Building I:



Figure 25 – Honeycombing of concrete in mechanical room



Figure 26 - Paint delamination on column on level three



Building J:



Figure 27 - Cracking in ceiling of unit J203



Figure 28 - Crack chased with sealant in Unit 108



Building K:



Figure 29 – Honeycombing in concrete in mechanical room



Figure 30 - Extrusion to be sealed properly





Figure 31 - Stair-stepping in rooftop parapet wall



Figure 32 - Cracking in CMU wall in storage room





Figure 33 - Damaged fascia on exterior of the building

Building L:



Figure 34 - Spalling on column on 3rd floor





Figure 35 - Cracking on column on 3rd floor



Figure 36 - Cracking on column on level two





Figure 37 - Cracking on column on level one



Figure 38 - Cracking on beam on level three





Figure 39 - Stair-stepping on ground floor

Building M:



Figure 40 - Extrusion not properly sealed





Figure 41 - Section of missing roof tiles



Figure 42 - Cracking in wall on 3rd floor





Figure 43 - Cracking in wall on level two



Figure 44 - Rusted walkway railing bolt on 3rd floor



Building N:



Figure 45 - Stair-stepping on parapet wall



Figure 46 – Surface cracking on beam on the underside of level two





Figure 47 - Cracking on wall in laundry room



Select Year:

The 2022 Florida Statutes (including Special Session A)

Title XXXIII	Chapter 553	View Entire Chapter
REGULATION OF TRADE, COMMERCE, INVESTMENTS, AND SOLICITATIONS	BUILDING CONSTRUCTION STANDARDS	

553.899 Mandatory structural inspections for condominium and cooperative buildings. —

(1) The Legislature finds that maintaining the structural integrity of a building throughout its service life is of paramount importance in order to ensure that buildings are structurally sound so as to not pose a threat to the public health, safety, or welfare. As such, the Legislature finds that the imposition of a statewide structural inspection program for aging condominium and cooperative buildings in this state is necessary to ensure that such buildings are safe for continued use.

(2) As used in this section, the terms:

(a) “Milestone inspection” means a structural inspection of a building, including an inspection of load-bearing walls and the primary structural members and primary structural systems as those terms are defined in s. [627.706](#), by a licensed architect or engineer authorized to practice in this state for the purposes of attesting to the life safety and adequacy of the structural components of the building and, to the extent reasonably possible, determining the general structural condition of the building as it affects the safety of such building, including a determination of any necessary maintenance, repair, or replacement of any structural component of the building. The purpose of such inspection is not to determine if the condition of an existing building is in compliance with the Florida Building Code or the firesafety code.

(b) “Substantial structural deterioration” means substantial structural distress that negatively affects a building’s general structural condition and integrity. The term does not include surface imperfections such as cracks, distortion, sagging, deflections, misalignment, signs of leakage, or peeling of finishes unless the licensed engineer or architect performing the phase one or phase two inspection determines that such surface imperfections are a sign of substantial structural deterioration.

(3) A condominium association under chapter 718 and a cooperative association under chapter 719 must have a milestone inspection performed for each building that is three stories or more in height by December 31 of the year in which the building reaches 30 years of age, based on the date the certificate of occupancy for the building was issued, and every 10 years thereafter. If the building is located within 3 miles of a coastline as defined in s. [376.031](#), the condominium association or cooperative association must have a milestone inspection performed by December 31 of the year in which the building reaches 25 years of age, based on the date the certificate of occupancy for the building was issued, and every 10 years thereafter. The condominium association or cooperative association must arrange for the milestone inspection to be performed and is responsible for ensuring compliance with the requirements of this section. The condominium association or cooperative association is responsible for all costs associated with the inspection. This subsection does not apply to a single-family, two-family, or three-family dwelling with three or fewer habitable stories above ground.

(4) If a milestone inspection is required under this section and the building’s certificate of occupancy was issued on or before July 1, 1992, the building’s initial milestone inspection must be performed before December 31, 2024. If the date of issuance for the certificate of occupancy is not available, the date of issuance of the building’s certificate of occupancy shall be the date of occupancy evidenced in any record of the local building official.

(5) Upon determining that a building must have a milestone inspection, the local enforcement agency must provide written notice of such required inspection to the condominium association or cooperative association by

Appendix A

certified mail, return receipt requested.

(6) Within 180 days after receiving the written notice under subsection (5), the condominium association or cooperative association must complete phase one of the milestone inspection. For purposes of this section, completion of phase one of the milestone inspection means the licensed engineer or architect who performed the phase one inspection submitted the inspection report by e-mail, United States Postal Service, or commercial delivery service to the local enforcement agency.

(7) A milestone inspection consists of two phases:

(a) For phase one of the milestone inspection, a licensed architect or engineer authorized to practice in this state shall perform a visual examination of habitable and nonhabitable areas of a building, including the major structural components of a building, and provide a qualitative assessment of the structural conditions of the building. If the architect or engineer finds no signs of substantial structural deterioration to any building components under visual examination, phase two of the inspection, as provided in paragraph (b), is not required. An architect or engineer who completes a phase one milestone inspection shall prepare and submit an inspection report pursuant to subsection (8).

(b) A phase two of the milestone inspection must be performed if any substantial structural deterioration is identified during phase one. A phase two inspection may involve destructive or nondestructive testing at the inspector's direction. The inspection may be as extensive or as limited as necessary to fully assess areas of structural distress in order to confirm that the building is structurally sound and safe for its intended use and to recommend a program for fully assessing and repairing distressed and damaged portions of the building. When determining testing locations, the inspector must give preference to locations that are the least disruptive and most easily repairable while still being representative of the structure. An inspector who completes a phase two milestone inspection shall prepare and submit an inspection report pursuant to subsection (8).

(8) Upon completion of a phase one or phase two milestone inspection, the architect or engineer who performed the inspection must submit a sealed copy of the inspection report with a separate summary of, at minimum, the material findings and recommendations in the inspection report to the condominium association or cooperative association, and to the building official of the local government which has jurisdiction. The inspection report must, at a minimum, meet all of the following criteria:

(a) Bear the seal and signature, or the electronic signature, of the licensed engineer or architect who performed the inspection.

(b) Indicate the manner and type of inspection forming the basis for the inspection report.

(c) Identify any substantial structural deterioration, within a reasonable professional probability based on the scope of the inspection, describe the extent of such deterioration, and identify any recommended repairs for such deterioration.

(d) State whether unsafe or dangerous conditions, as those terms are defined in the Florida Building Code, were observed.

(e) Recommend any remedial or preventive repair for any items that are damaged but are not substantial structural deterioration.

(f) Identify and describe any items requiring further inspection.

(9) The association must distribute a copy of the inspector-prepared summary of the inspection report to each condominium unit owner or cooperative unit owner, regardless of the findings or recommendations in the report, by United States mail or personal delivery and by electronic transmission to unit owners who previously consented to receive notice by electronic transmission; must post a copy of the inspector-prepared summary in a conspicuous place on the condominium or cooperative property; and must publish the full report and inspector-prepared summary on the association's website, if the association is required to have a website.

(10) A local enforcement agency may prescribe timelines and penalties with respect to compliance with this section.

(11) A board of county commissioners may adopt an ordinance requiring that a condominium or cooperative association schedule or commence repairs for substantial structural deterioration within a specified timeframe after the local enforcement agency receives a phase two inspection report; however, such repairs must be

Appendix A

commenced within 365 days after receiving such report. If an association fails to submit proof to the local enforcement agency that repairs have been scheduled or have commenced for substantial structural deterioration identified in a phase two inspection report within the required timeframe, the local enforcement agency must review and determine if the building is unsafe for human occupancy.

(12) The Florida Building Commission shall review the milestone inspection requirements under this section and make recommendations, if any, to the Legislature to ensure inspections are sufficient to determine the structural integrity of a building. The commission must provide a written report of any recommendations to the Governor, the President of the Senate, and the Speaker of the House of Representatives by December 31, 2022.

(13) The Florida Building Commission shall consult with the State Fire Marshal to provide recommendations to the Legislature for the adoption of comprehensive structural and life safety standards for maintaining and inspecting all types of buildings and structures in this state that are three stories or more in height. The commission shall provide a written report of its recommendations to the Governor, the President of the Senate, and the Speaker of the House of Representatives by December 31, 2023.

History.—s. 3, ch. 2022-269.

GENERAL CONSIDERATIONS

SCOPE OF STRUCTURAL INSPECTION

The fundamental purpose of the required inspection and report is to confirm in reasonable fashion that the building or structure under consideration is safe for continued use under the present occupancy. As implied by the title of this document, this is a recommended procedure, and under no circumstances are these minimum recommendations intended to supplant proper professional judgment.

Such inspection shall be for the purpose of determining the general structural condition of the building or structure to the extent reasonably possible of any part, material or assembly of a building or structure which affects the safety of such building or structure and/or which supports any dead or designed live load, and the general condition of its electrical systems pursuant to the Building Code.

In general, unless there is obvious overloading, or significant deterioration of important structure elements there is little need to verify the original design. It is obvious that this has been "time tested" if still offering satisfactory performance. Rather, it is of importance that the effects of time with respect to deterioration of the original construction materials be evaluated. It will rarely be possible to visually examine all concealed construction, nor should such be generally necessary. However, a sufficient number of typical structure members should be examined to permit reasonable conclusions to be drawn.

Visual Examination will, in most cases, be considered adequate when executed systematically. The visual examination must be conducted throughout all habitable and non-habitable areas of the building, as deemed necessary by the inspecting professional to establish compliance. Surface imperfections such as cracks, distortion, sagging, excessive deflections, significant misalignment, signs of leakage, and peeling of finishes should be viewed critically as indications of possible difficulty.

Testing Procedures and quantitative analysis will not generally be required for structural members or systems except for such cases where visual examination has revealed such need, or where apparent loading conditions may be critical.

Manual Procedures such as chipping small areas of concrete and surface finishes for closer examinations are encouraged in preference to sampling and/or testing where visual examination alone is deemed insufficient. Generally, unfinished areas of buildings such as utility spaces, maintenance areas, stairwells and elevator shafts should be utilized for such purposes. In some cases, to be held to a minimum, ceilings or other construction finishes may have to be opened for selective examination of critical structural elements. In that event, such locations should be carefully located to be least disruptive, most easily repaired and held to a minimum. In an event, a sufficient number of structural members must be examined to afford reasonable assurance that such are representative of the total structure.

Evaluating an existing structure for the effect of time, must take into account two, basic considerations; movement of structural components with respect to each other, and deterioration of materials.

With respect to the former, volume change considerations, principally from ambient temperature changes, and possible long-time deflections, are likely to be most significant. Foundation movements will frequently be of importance, usually settlement, although upward movement due to expansive soils actually may occur. However, it is infrequent in this area. Older buildings on spread footings may exhibit continual, even recent settlements if founded on deep unconsolidated fine grained or cohesive soils or from subterranean losses or movements from several possible causes.

With very little qualification, such as rather rare chemically reactive conditions, deterioration of building materials can only occur in the presence of moisture, largely to metals and their natural tendency to return to the oxide state in the corrosive process.

In this marine climate, highly aggressive conditions exist year-round. For most of the year, outside relative humidity may frequently be about 90 or 95%, while within air-conditioned buildings, relative humidity will normally be about 35 to 60%. Under these conditions moisture vapor pressures ranging from about 1/3 to 1/2 pounds per square inch will exist much of the time. Moisture vapor will migrate to lower pressure areas. Common building materials such as stucco, masonry and even concrete, are permeable even with these slight pressures. Since most of our local construction does not use vapor barriers, condensation will take place within the enclosed walls of the building. As a result, deterioration is most likely adjacent to exterior walls, or wherever else moisture or direct leakage has been permitted to penetrate the building shell.

Structural deterioration will always require repair. The type of repair, however, will depend on the importance of the member in the structural system and degree of deterioration. Cosmetic type repairs may suffice in certain non-sensitive members such as tie beams and columns, provided that the remaining sound material is sufficient for the required function. For members carrying assigned gravity or other loads, cosmetic type repairs will only be permitted if it can be demonstrated by rational analysis that the remaining material, if protected from further deterioration can still perform its assigned function at acceptable stress levels. Failing that, adequate repairs or reinforcement will be considered mandatory.

Written Reports shall be required attesting to each required inspection. Each such report shall note the location of the structure, description of type of construction, and general magnitude of the structure, the existence of drawings and location thereof, history of the structure to the extent reasonably known, and description of the type and manner of the inspection, noting problem areas and recommending repairs, if required to maintain structural integrity.

FOUNDATION:

If all of the supporting subterranean materials were completely uniform beneath a structure, with no significant variations in grain size, density, moisture content or other mechanical properties; and if dead load pressures were completely uniform, settlements would probably be uniform and of little practical consequence. In the real world, however, neither is likely. Significant deviations from either of these two idealisms are likely to result in unequal vertical movements.

Monolithic masonry, generally incapable of accepting such movements will crack. Such cracks are most likely to occur at corners, and large openings. Since, in most cases, differential shears are involved, cracks will typically be diagonal.

Small movements, in themselves, are most likely to be structurally important only if long term leakage through fine cracks may have resulted in deterioration. In the event of large movements, continuous structural elements such as floor and roof systems must be evaluated for possible fracture or loss of bearing.

Pile foundations are, in general, less likely to exhibit such difficulties. Where such does occur, special investigation will be required.

ROOFING SYSTEMS:

Sloping roofs, usually having clay or cement tiles, are of concern in the event that the covered membrane may have deteriorated, or that the tiles may have become loose. Large deflections, if merely resulting from deteriorated rafters or joists will be of greater importance. Valley Flashing, and Base Flashing at roof penetration will also be matters of concern.

Flat roofs with built up membrane roofs will be similarly critical with respect to deflection considerations. Additionally, since they will generally be approaching expected life limits at the age when building recertification is required, careful examination is important. Blisters, wrinkling, alligatoring, and loss of gravel are usually signs of difficulty. Punctures or loss of adhesion of base flashing, coupled with loose counterflashing will also signify possible problems. Wind-blown gravel, if excessive, and the possibility of other debris, may result in pounding, which if permitted, may become critical.

MASONRY BEARING WALLS

Random cracking, or if discernible, definitive patterns of cracking, will of course, be of interest. Bulging, sagging, or other signs of misalignment may also indicate related problems in other structural elements. Masonry walls where commonly constructed of either concrete masonry units or scored clay tile, may have been constructed with either reinforced concrete columns tie beams, or lintels.

Steel bar joists are, of course, sensitive to corrosion. Most critical locations will be web member welds, especially near supports, where shear stresses are high possible failure may be sudden, and without warning.

Cold formed steel joists, usually of relatively light gage steel, are likely to be critically sensitive to corrosion, and are highly dependent upon at least normal lateral support to carry designed loads. Bridging and the floor or roof system itself, if in good condition, will serve the purpose.

Wood joists and rafters are most often in difficult from "dry rot", or the presence of termites. The former (a misnomer) is most often prevalent in the presence of sustained moisture or lack of adequate ventilation. A member may usually be deemed in acceptable condition if a sharp pointed tool will penetrate no more than about one eighth of an inch under moderate hand pressure. Sagging floors will most often indicate problem areas. Gypsum roof decks will usually perform satisfactorily except in the presence of moisture. Disintegration of the material and the foam-board may result from sustained leakage. Anchorage of the supporting bulb tees against uplift may also be of importance, with significant deterioration. Floor and roof systems of cast in place concrete with self-centering reinforcing, such as paper backed mesh and rib-lath, may be critical with respect to corrosion of the unprotected reinforcing. Loss of uplift anchorage on roof decks will also be important if significant deterioration has taken place, in the event that dead loads are otherwise inadequate for that purpose.

STEEL FRAMING SYSTEM

Corrosion, obviously enough, will be the determining factor in the deterioration of structural steel. Most likely suspect areas will be fasteners, welds, and the interface area where bearings are embedded in masonry. Column bases may often be suspect in areas where flooding has been experienced, especially if salt water has been involved.

Thin cracks may indicate only minor corrosion, requiring minor patching. Extensive spalling may indicate a much more serious condition requiring further investigation.

Of most probable importance will be the vertical and horizontal cracks where masonry units abut tie columns, or other frame elements such as floor slabs. Of interest here is the observation that although the raw materials of which these masonry materials are made may have much the same mechanical properties as the reinforced concrete framing, their actual behavior in the structure, however, is likely to differ with respect to volume change resulting from moisture content, and variations in ambient thermal conditions.

Moisture vapor penetration, sometimes abetted by salt laden aggregate and corroding rebars, will usually be the most common cause of deterioration. Tie columns are rarely structurally sensitive, and a fair amount of deterioration may be tolerated before structural impairment becomes important. Usually, if rebar loss is such that the remaining steel area is still about 0.0075 of the concrete area, structural repair will not be necessary. Cosmetic type repair involving cleaning, and patching to effectively seal the member, may often suffice. A similar approach may not be unreasonable for tie beams, provided they are not also serving as lintels. In that event, a rudimentary analysis of load capability using the remaining actual rebar area, may be required.

FLOOR AND ROOF SYSTEMS

Cast in place reinforced concrete slabs and/or beams and joists may often show problems due to corroding rebars resulting from cracks or merely inadequate protecting cover of concrete. Patching procedures will usually suffice where such damage has not been extensive. Where corrosion and spalling has been extensive in structurally critical areas, competent analysis with respect to remaining structural capacity, relative to actual supported loads, will be necessary. Type and extent of repair will be dependent upon the results of such investigation.

Precast members may present similar deterioration conditions. End support conditions may be important. Adequacy of bearing, indications of end shear problems, and restraint conditions are important, and should be evaluated in at least a few typical locations.

CONCRETE FRAMING SYSTEMS

Concrete deterioration will, in most cases be similarly related to rebar corrosion possibly abetted by the presence of salt-water aggregate or excessively permeable concrete. In this respect, honeycomb areas may contribute adversely to the rate of deterioration. Columns are frequently most suspect. Extensive honeycomb is most prevalent at the base of columns, where fresh concrete was permitted to segregate, dropping into form boxes. This type of problem has been known to be compounded in areas where flooding has occurred, especially involving salt water.

In spall areas, chipping away a few small loose samples of concrete may be very revealing. Especially, since loose material will have to be removed even for cosmetic type repairs, anyway. Fairly reliable

quantitative conclusions may be drawn with respect to the quality of the concrete. Even though our cement and local aggregate are essentially derived from the same sources, cement will have a characteristically dark grayish brown color in contrast to the almost white aggregate. A typically white, almost alabaster like coloration will usually indicate reasonably good overall strength. The original gradation of aggregate can be seen through a magnifying glass. Depending upon the structural importance of the specific location, this type of examination may obviate the need for further testing if a value of 2000 psi to 2500 psi is sufficient for required strength, in the event that visual inspection indicates good quality for the factors mentioned.

WINDOWS

Window condition is of considerable importance with respect to two considerations. Continued leakage may have resulted in other adjacent damage and deteriorating anchorage may result in loss of the entire unit in the event of severe windstorms short of hurricane velocity. Perimeter sealant, glazing, seals, and latches should be examined with a view toward deterioration of materials and anchorage of units for inward as well as outward (section) pressures, most importantly in high buildings.

WOOD FRAMING

Older wood framed structures, especially of the industrial type, are of concern in that long term deflections may have opened important joints, even in the absence of deterioration. Corrosion of ferrous fasteners will in most cases be obvious enough. Dry rot must be considered suspect in all sealed areas where ventilation has been inhibited, and at bearings and at fasteners. Here too, penetration with a pointed tool greater than about one eighth inch with moderate hand pressure, will indicate the possibility of further difficulty.

LOADING

It is of importance to note that even in the absence of any observable deterioration, loading conditions must be viewed with caution. Recognizing that there will generally be no need to verify the original design, since it will have already been "time tested", this premise has validity only if loading patterns and conditions remain **unchanged**. Any material change in type and/or magnitude or loading in older buildings should be viewed as sufficient jurisdiction to examine load carrying capability of the affected structural system.

Overview of Structural Spalling

Evidence of cracking and deterioration generally becomes visible at beams, slabs, columns and slab edges at the onset of spalling and exposed reinforcement. Concrete deterioration occurs due to nature's universal characteristic that all things tend toward a more stable state. Reinforcing steel as installed in concrete structures is a refined product whereby iron alloys are made to exhibit favorable strength characteristics. Unfortunately, these metal alloys are not chemically inert; i.e. outer electron valences are not full. Under favorable conditions, the metal reacts with available oxygen to create iron oxides, which are more stable than the original metal.

When reinforced concrete is first placed, the surrounding concrete protects the reinforcing steel. Chemical characteristics of the concrete affect the oxidation reaction, creating a protective layer of non-expansive iron oxide around the reinforcing steel. This protective layer is known as a "passivating layer."

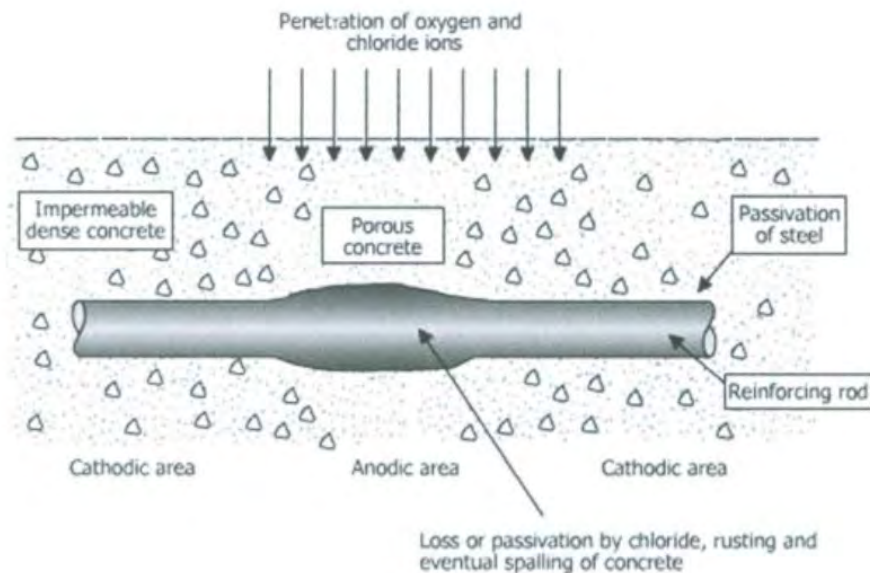


Figure 1 Corrosion of rebar

Following formation of the passivating layer, further oxidation does not occur if the characteristics of the concrete remain unchanged. However, as concrete is exposed to the elements, the chemical characteristics of the concrete change, resulting in an environment conducive to corrosive oxidation of the metal. The oxides formed by this reaction are considerably more voluminous than the base metal (up to eight times greater) and are commonly known as rust. Unlike the passivating layer, corrosive oxidation continues until all the base metal has been converted to iron oxides. In reinforced concrete, the results of this corrosion are a loss of strength and, eventually, collapse.

The corrosion of reinforcing steel in the concrete of coastal buildings is further affected by the presence of airborne salts. The salts are highly chemically reactive, accelerating the above-mentioned change in the chemical characteristics of the concrete. When in contact with the reinforcing steel, the salts react directly with the passivating layer and the metal, also accelerating the corrosion

process. The corrosion of reinforcing steel is not only a chemical process, but an electrical one as well. The above-described reactions take place through the exchange of electrons. Consequently, electrical currents are generated within the reinforced concrete.

As corrosive oxidation takes place, the volume increase in the reinforcing exerts large tensile forces on the surrounding concrete, easily overcoming the concrete's relatively low tensile strength. To relieve these tensile forces, cracks and failure planes form in the concrete. As the corrosion continues, the concrete continues to crack (or delaminate) and eventually breaks off. Cracks that have propagated to the extent where concrete has broken off are known as spalls.

To reduce this problem of corrosion, the American Concrete Institute (ACI) has established minimum requirements for concrete cover. ACI currently prescribes a cover of 1-1/2" for smaller bar sizes in structural elements that are not protected from the elements. In normal environments, this cover should provide protection adequate to extend the life of a structure to its anticipated useful life, generally 50 years.

Prior to the 1970's, the requirement was 3/4" but was increased to its current level following studies of concrete porosity and resistance to chloride penetration by the U.S. Army Corps of Engineers, ACI, the International Concrete Repair Institute (ICRI), and others.

These minimum concrete cover requirements recognize that the chemical changes in the concrete as described above take time to occur, and, in general, protect the reinforcing for the anticipated life of the structure. However, corrosion frequently occurs before the design life of the structure is reached. Premature corrosion occurs due to concrete cover that is less than prescribed (generally due to construction errors in steel or concrete placement), poor quality concrete, cracks (which allow reactive chlorides a direct path to reinforcing steel), or exposure to corrosive environments.

Removing chloride-contaminated concrete and replacing it with fresh concrete is more likely to produce a durable repair rather than simply repairing what appears to be wrong. However, there is still no guarantee that the procedure will be 100% successful. **This is because it is extremely difficult to identify precisely how much concrete needs to be removed to ensure that future corrosion sites are eliminated. It is also very difficult to remove all chloride contamination from the reinforcement; particularly where pitting corrosion has occurred. And, most of all, a repair of this nature may, in many situations, accentuate corrosion in the reinforcing steel adjacent to the repair area. This phenomenon is often called ring anode corrosion or halo effect.**



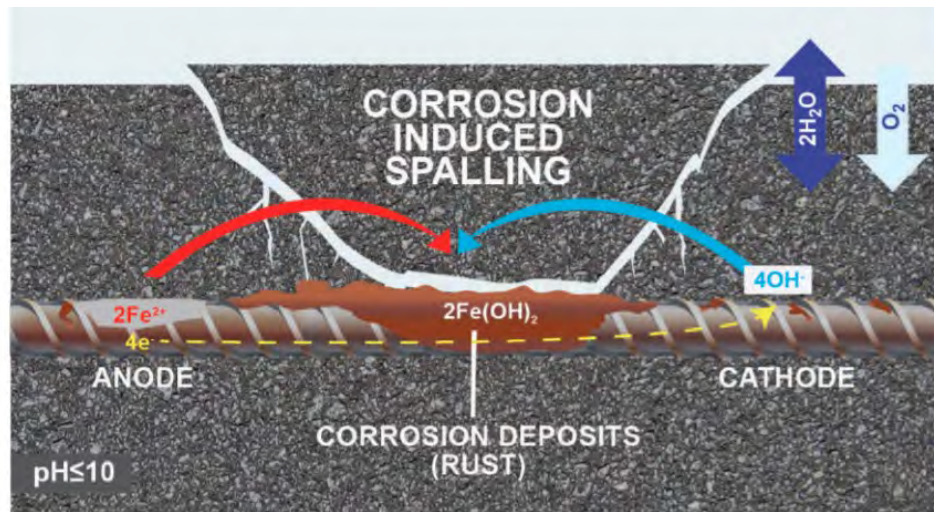


Figure 2 Before Halo Effect

Ring anode corrosion results from electro-chemical incompatibilities between the repair and the substrate concrete. Differences between the base concrete and the repair can create differences in electrical potentials that drive new corrosion cells across the interface between the patch and the substrate concrete.

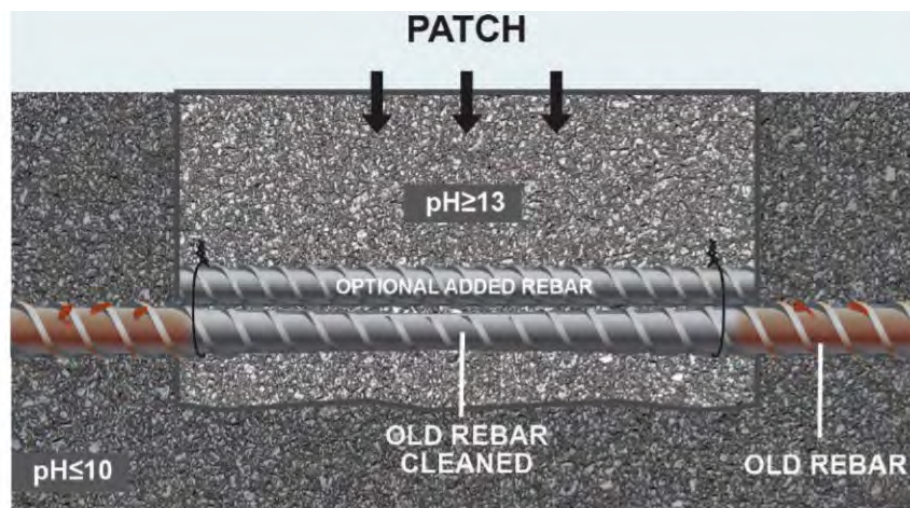


Figure 3 Ring anode corrosion

Factors that can lead to corrosion problems include differences in chloride ion content, pH, permeability, or even different types of reinforcing steel that are coupled together. These factors may accelerate corrosion in the repair itself, but more often results in deterioration of the concrete adjacent to the repair. The rate of deterioration due to ring anode corrosion is dependent upon the same factors that control the overall rate of corrosion. These include the amount and difference in chloride content, moisture availability, temperature, and permeability of the concrete.

