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Milestone Inspection Report

KEG Project #21RS-0682
May24th 2023

Report for:
174 golden Gate Milestone Inspection

At:

174 Golden Gate Point Association, Inc.
174 Golden Gate Point
Sarasota, FL 34236

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Digitally signed by David Karins
DN: E=david@karins.com, CN=David Karins, OU=Engineering, O="Karins Engineering Group, Inc.", L=Sarasota, S=Florida, C=US
Date: 2023.06.08 11:07:35-04'00'

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May 24th, 2023

Diane Rue, President,
174 Golden Gate Point Association, Inc.
174 Golden Gate Point
Sarasota, FL 34236

Mail To: diane@ezpi.us

RE: ***174 Golden Gate Point, Milestone Inspection***
Sarasota FL 34236 KEG File# 21RS-0682

Dear Diane Rue and Members of the Board of Directors:

Karins Engineering Group, Inc. (KEG) agreed to render professional engineering services in connection with a Building Envelope and Structural Component Existing Condition Survey at the 174 Golden Gate Point Association, Inc. (174GGP), located at 174 Golden Gate Point, Sarasota, FL 34236 (hereinafter called the "Project" and the "Client"). Per the agreement dated October 5th 2022 KEG made site visits to 174GGP on May 24th, 2023, to complete a limited condition observation and evaluation of the building conditions and construction, as it relates to the building envelope and related structural components that were readily accessible.

Our observations were intended to identify significant deficiencies, problems or on-going maintenance concerns that were 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 included an observation from the ground, accessible portions of the roof, walkways, paint coatings, sealants, parking garages, foundation, and exterior ground.

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 live 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 deficiencies 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, except as noted herein. KEG did not attempt to verify the adequacy of the 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. 553.899 [1], 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]

174GGP was built in 1967 and located at 174 Golden Gate Point in Sarasota, Florida. 174GGP is a small building with 13 units.

[1] Appendix A

FINDINGS:

It is the understanding of KEG that the buildings' main construction is comprised of conventionally reinforced concrete beams and columns with traditionally reinforced concrete slabs. The foundation for the building tower is highly likely to be comprised of reinforced concrete piles and pile caps & and in some cases grade beams. The ground floor consists of a traditional slab-on-grade. Traditionally reinforced shear walls are more than likely utilized in the structure to resist in-plane lateral forces. The walls of the building are constructed using infill concrete masonry unit (CMU) block. Roof appears to be standing seam metal roofing over wooden trusses with flat roofing at flat sections.

- 174GPP – A (5) five-story residential building
    - Phase 1 Milestone **PASS**

Statute Summary:

Per Florida Statue 553.899 a statewide building Milestone Inspection is required 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 a summarized 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.

Reference Documents

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

- KE has not received any documents relating to 174 Golden Gate Point

As such, KE did not review any documents, make attempts to acquire public records, or assess the full history of the building. 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:

- Diane Rue – President

General Information:

KEG visited 174GGP on May 24th ,2023. During our visit, KEG observed the following building components:

- General overview of the exterior elevations
- Walkways
- Windows
- Doors
- Staircases
- Attic
- Seawall

KE's visit was observational only. No destructive testing was undertaken during the tenure of our visit. At no time did KE move or alter any unit configuration to view components or access items whether structural or non-structural.

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
- Major drainage system; beyond its influence on erosion
- Evacuation routes
- Stairwells

Figure 1: Aerial View of 174GGP from Google Earth Outlined in Red

Scope of Observations:

The structural elements and related components are found in different areas among the buildings and as such, KE observed the following locations:

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

OBSERVATIONS:

The following section provides our observations as they relate to 174GGP, the **primary structural system**.

Figure 2: 174 Golden Gate Point

Figure 3: 174 Golden Gate Point

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 174GGP 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. All observable beams were noted to be in good condition. The following photo shows the current condition of the beams observed around the property.

Figure 4: Typical Concrete Beams Observed.

Refer to Photo Exhibit for non-structural deficiencies.

Primary Structural System: Columns

Type: Traditionally reinforced concrete columns.

Commentary: Traditionally reinforced concrete columns are employed throughout the building structure.

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

Figure 5: Typical columns observed.

Figure 6: 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, within the units covered with a finish were not visually observable

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 between the column and beam construction. However, large structures with numerous stories utilize Shearwalls for lateral wind resistance.

Observations: No structural deficiencies observed.

Figure 7: Example of CMU wall connected to an exterior column

Refer to Photo Exhibit for non-structural deficiencies.

<u>Primary Structural System: Floors</u>

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

Limitations: Exterior unfinished walkways, balconies, and stairwells were observed. Interior floors and exterior walkways covered in finish were not visually observable.

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 8: Flooring system

Refer to Photo Exhibit for non-structural deficiencies.

Primary Structural System: Seawall

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

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

Commentary: None.

Figure 9: Seawall Observed.

Slab On Grade

Commentary: The areas of concrete slab on-grade were observed at the covered parking areas under the residential building. All other areas were not observable at the time of our inspection. The finishes for the slab on-grade appear to be in good condition with no structural deficiencies noted.

Other deficiencies include a few non structural cracks.

Figure 10 Existing condition of Slab-on-Grade with some nonstructural cracking

Refer to Photo Exhibit for non-structural deficiencies.

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:

- Spalling on windowsill

Figure 11 Typical building exterior.

Refer to Photo Exhibit for non-structural deficiencies.

Typical Windows & Doors:

The following potential structural deficiencies were observed:
- N/A

The following non-structural deficiencies, problems, or maintenance concerns were observed:
- Ground floor glazing around some window panels observed

Figure 12: Typical window overview.

Refer to Photo Exhibit for non-structural deficiencies.

Typical Balconies, Terraces, & Walkways:

The following potential structural deficiencies were observed:

- N/A

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

- Possible delamination of the top finish layer near post pockets part of the 3rd floor balcony was noted
- Paint chipping off of 3rd floor balcony was noted.

Figure 13: Typical walkway area observed.

Refer to Photo Exhibit for non-structural deficiencies.

Typical Stairwells & Shafts:

The following potential structural deficiencies were observed:

- N/A

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

- Rusted post pocket connection observed.

Figure 14: Typical stairwell overview.

Refer to Photo Exhibit for non-structural deficiencies.

<u>Typical Operational Rooms:</u>

The following potential structural deficiencies were observed.

- N/A

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

- N/A

Figure 15: Typical mechanical room overview.

Refer to Photo Exhibit for non-structural deficiencies.

Typical Life Safety:

The following potential structural deficiencies were observed:

- N/A

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

- A few railing connections were found to be loose.
- A fire alarm pull station appearsdisconnected/broken.

Figure 16: Typical Loose railing connection near stairwell

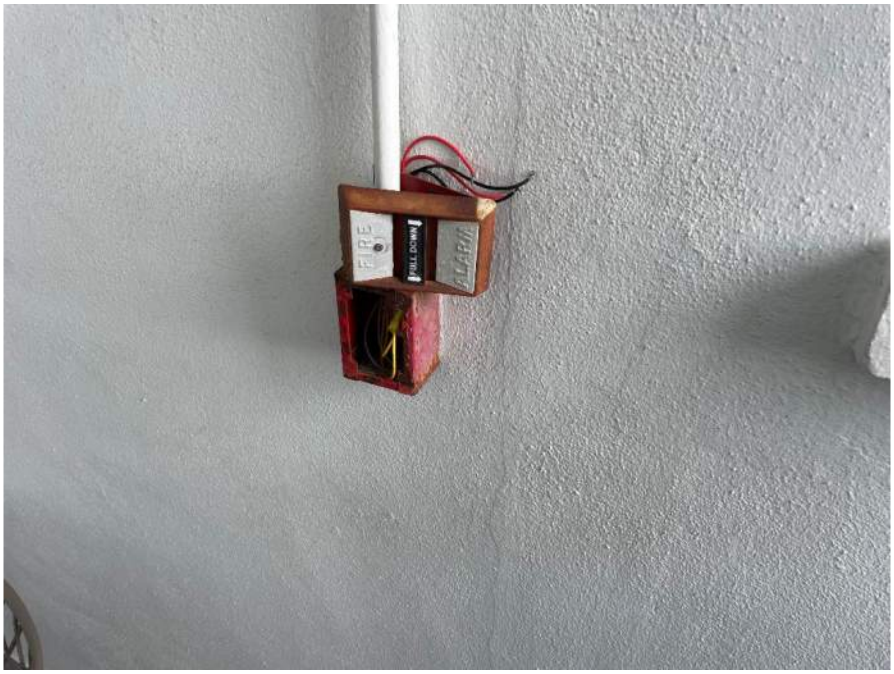


Figure 17: Disconnected fire alarm system.

Refer to Photo Exhibit for non-structural deficiencies.

Typical Roof: Standing Seam Metal roof with Modified Bitumen at flat sections

The following potential structural deficiencies were observed:

- N/A

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

- N/A

Figure 18: Roof existing condition

Figure 19: Attic and trusses

RECOMMENDATIONS:

Based upon our visual observations of the above-listed systems at 174 Golden Gate Point, 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 174 Golden Gate Point

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:

Structural:

- **N/A**

Other Deficiencies:

- Important and Urgent
  - The disconnected fire station should be addressed.
- Important and Not Urgent
  - Spalling on ground floor windowsill should be repaired per International Concrete Repair Institute guidelines.
- Not Important and Urgent
  - Cracking at ground floor slab to be repaired.
  - The loose railing(s) should be looked at and fixed.
  - The rusted post pocket(s) at slab connections should be investigated.
  - Possible delamination under the top layer of some of part of the 3rd floor walkways should be investigated.
- Not Important and Not Urgent
  - Paint chipping off 3rd floor balcony was noted.

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 building for its intended use and occupancy. We reserve the right to amend our opinion should new information be brought to our attention.

Findings:

- 174 Golden Gate point – A 5 (five) story residential building
  - Phase 1 Milestone **PASS**

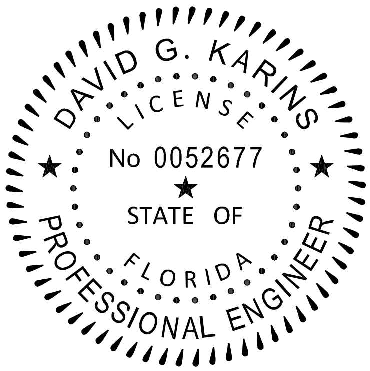
The subject buildings are required to facilitate a Milestone Inspection in 10 years.

This report has been 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



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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

PHOTO EXHIBIT:

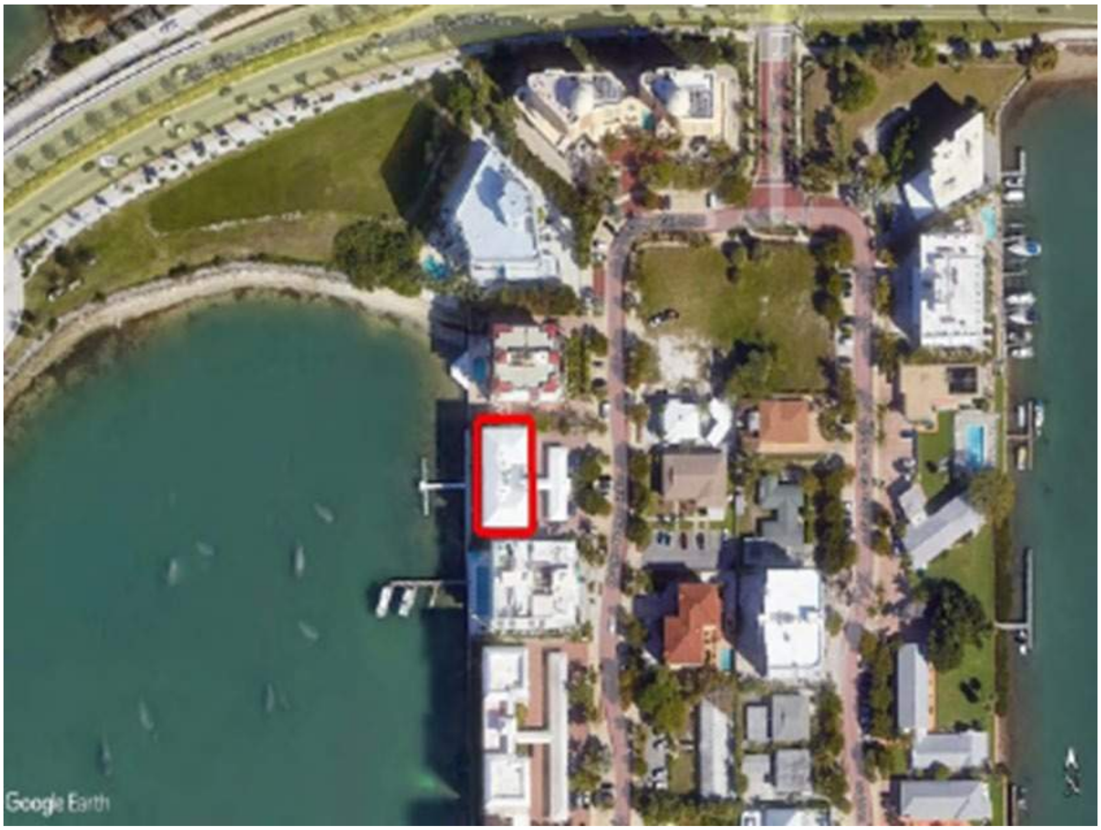

Figure 1 - Aerial view of 174 GGP

Typical deficiencies:

Figure 2 – Missing sealant at ground floor light fixtures.

Figure 3 – Flashing and sealant opening on shed roof.

Figure 4 – Glazing pulling apart on sliding door.

Figure 5 – Spalling at windowsill on ground floor.

Figure 6: Possible delamination of 3rd floor balcony at post pocket.

Figure 7 – rusted railing at post pocket connection.

Appendix A

Select Year: 2022 Go

The 2022 Florida Statutes (including Special Session A)

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

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

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.

APPENDIX B

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 subterraneous 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 remits 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 case 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 or 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.

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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."

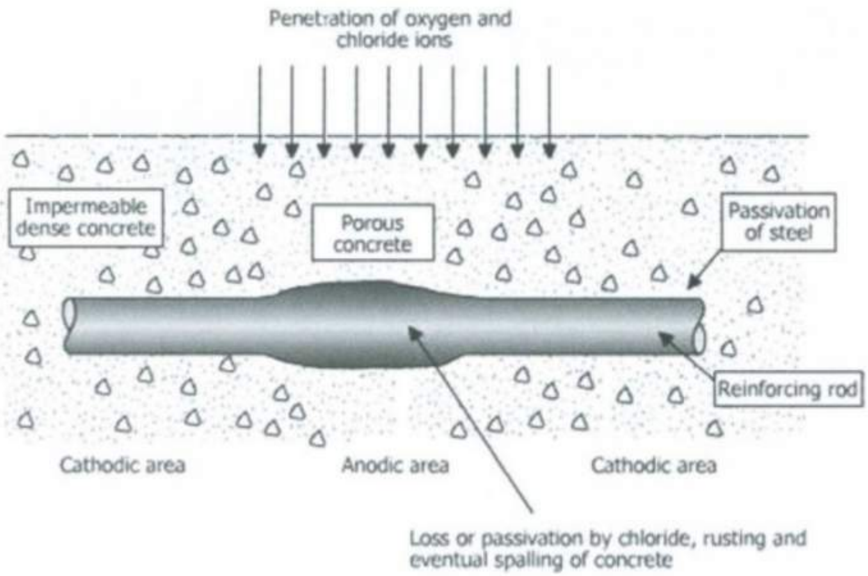

Figure 1 Corrosion of rebar

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 oxidization 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**.

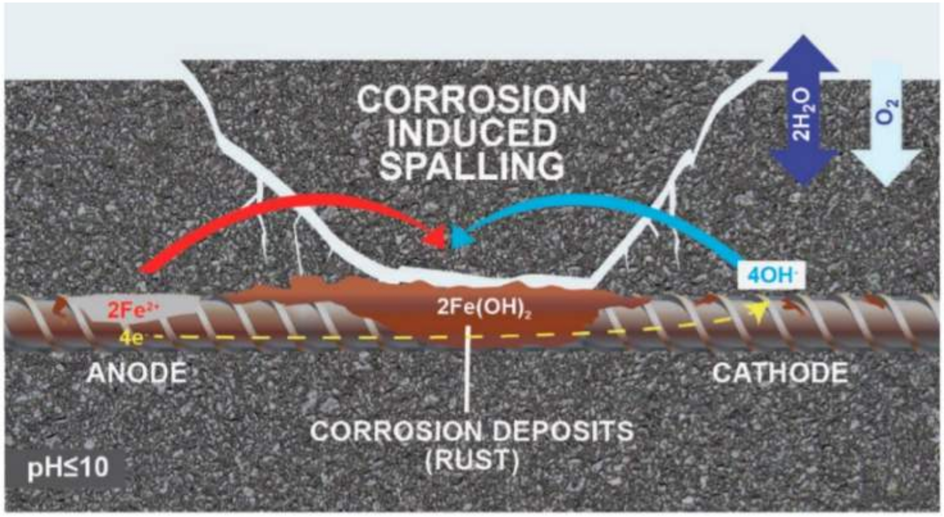

Figure 2 Before Halo Effect

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.

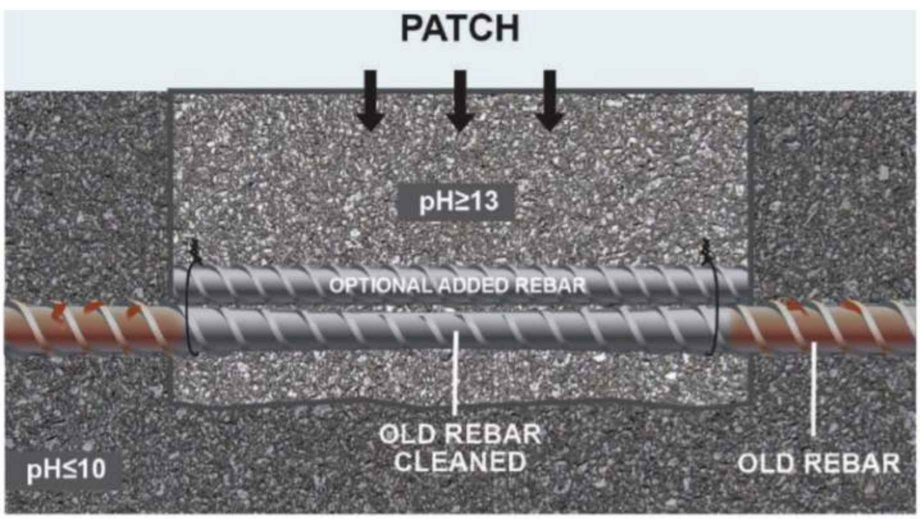

Figure 3 Ring anode corrosion

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.