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July 22, 2021

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

Via Email: longboatharbour@comcast.net

#### RE: Longboat Harbour Karins File No. 21RS-0463 Professional Engineering Services – KE Project History

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

Karins Engineering (KE) has been involved in multiple projects at Longboat Harbour Condominium (LHC) over the last two years. These projects have included a 2020 capital reserve study with engineering inspections, a roof coating project in 2020 of all residential buildings, repair of the settlement of Pool #2 that is currently underway, a 2020 seawall inspection project and we are currently completing an update of the 2020 reserve study.

During the KE review of the accessible portions of the roofing systems, seawall, carports, exterior building structure, pool and walkways, we did not observe any signs of structural deterioration requiring immediate action, except for the Pool #2 settlement that is currently being addressed. Additionally, KE was provided detailed documents of prior projects completed at the well-maintained property.

It is anticipated that there will be new inspections requirements implemented by the state and insurance providers due to the Champlain Towers tragedy. Given the prior review completed by KE and LHC's proactive approach to maintaining the buildings and property, KE recommends the association hold off on completing an additional full property inspection until the anticipated new inspection requirement are provided by the state or association insurance provider. However, if LBC ever has a concern about the elements of the property, KE recommends we are contacted for a review of the observed concern. Enclosed is a visual damage identification guide.



Enclosed: Visual Damage Identification Guide

Florida Certification of Authorization #008371

While the causes of the Champlain Towers South in Surfside Florida on June 24, 2021 is still yet to be determined, many condo owners, managers, and Association board members of similar concrete structures are eager to become educated and aware of the structural conditions that can exist on their own structure. Community managers and board members have contacted Karins Engineering to provide guidance and inspections.

Being long time members with the American Concrete Institute (ACI) and International Concrete Restoration Institute (ICRI) with members in each of the organizations being actively involved in both National and Local committees, Karins Engineering provides comprehensive services to address every need for design and restoration for the longevity and integrity of your building. Karins Engineering has provided existing condition surveys since the late 1990's to assess current condition of structures of any size throughout the State of Florida from our six different office locations.

Many property managers have inquired what visually can condo owners and maintenance personnel identify damages that would indicate an emergency type condition that would require an immediate engineer's inspection. This document was created to provide initial guidance and education to bring awareness to significant structural concerns.

This document is for initial guidance only and addresses most common types of damage or deterioration and should not be limited to just these items alone. Part of preventing these types of damages from manifesting into larger deficiencies is being proactive in addressing minor problems or providing the proper protection to the structural elements utilizing waterproofing systems and details. If any have any questions regarding damages on your property, contact your Professional Engineer at Karins Engineering.



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## Post Tension Cables

This issue only occurs in buildings that have been constructed using post tensioned cables. Post tension (PT) cables are bands of braided steel that have been installed in poured concrete before force is applied to the cables in order to stress the concrete in compression. This allows slabs to span longer distances between columns without having conflicting with code related deflection concerns.

The type of damage that are concerning with regards to post tensioned cables is when cables break or become visible. The most common cause of this type of damage is from construction from remodeling, installation of sliding glass doors, new penetrations or other maintenance procedures inadvertently damaging the cables. Loss of cables will cause the load to be distributed to the other cables and steel reinforcing, increasing the stress on the remainder of the slab, which become susceptible to deflection and cracking. A broken cable can be identified by loud noises, similar to gunshots, without an apparent cause and exposure of the end of the cable popping out of the building or portion of ceiling or slab popping. Exposure of cables should be addressed immediately to prevent cables from deteriorating especially if the plastic sheathing around the steel cable has been compromised.



PT Cable End "Popping" Outside of Building



PT Cable Exposure on Top Side of Slab With Sheathing Cut



Cable Breakthrough Ceiling Slab from Installation of Co-Axial Cable Hanger 40 Feet Away



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Post Tension cables are stressed by pulling the cable on the live end. The cable is pulled and then set into wedge anchors to maintain the tension. When the live ends, including the cable, wedge anchors, or reinforcing (bursting bars or back up bars), are subjected to corrosion, failure to one or multiple post tension cables can occur simultaneously. The failure of the post tension cables can potentially cause sudden collapse of the slab.



## Concrete Spalls

Concrete spalls are the result of oxidation of the reinforcement stressing the surrounding concrete. When concrete cracks, it can expose the embedded reinforcement to oxygen and moisture. Exposure to these factors will increase the speed of the oxidation process and deterioration of structural members.

This process increases the cross sectional area of the reinforcement, due to the significantly larger atomic size of the Iron Oxide molecule (Rust) compared to the Iron molecule. The larger cross section will in turn stress the surrounding concrete, causing further cracking and subsequently further exposure. Spalling is the term used to describe the result when the process has advanced enough to progress from cracks to material loss and loose sections of concrete.

Spalls can be easily identified when the concrete or stucco have broken loose from the rest of the structure. In some cases spalling can occur behind the stucco, drywall, or other decorative finishes, which make it harder to visually see and would require destructive investigation.

Structural members, such as columns, slabs, pool shells, walls in stairwells and elevator pits, are key components to the structural integrity of the building to resist both gravity loads and horizontal forces from high winds.



Deteriorated and Exposed Steel Slab Ceiling are Easy to Identify when Stucco / Concrete has Complete Popped





Large Reinforcement Exposed from Concrete Spall in Garage Concrete Beam

Concrete Column with Spalls Easy to Identify with Finishes Removed



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Large Spall on Top Side of Garage Slab with Concrete still Intact



Large Spall on Top Side of Garage Slab Ceiling with Concrete still Intact



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Concrete Column Spall with Stucco Finish



Concrete Slab Spall Under Deck Coating



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### Stucco Spalls

Stucco spalls are very similar in appearance to concrete spalls with sections of the cementitious finish pulling away from the underlaying substrate. However, they are not the result of reinforcement oxidation. Instead, stucco spalling is frequently caused by moisture intrusion behind the finishes. Oher failures can be a result of corrosion of accessories or poor application, including improper surface prep, mixing of materials, and curing.



Stucco Spall with Cracks of Large Size Can become Failing Debris

Stucco has two different methods of installation, direct applied applications, and metal lath applications. Direct applied stucco is used on concrete and masonry surfaces and consists of applying the stucco directly to the substrate.

The second method of installation is used on building with framing and require sheathing. In the situations where sheathing is required, metal lath is applied to the sheathing material. The metal lath, which is secured to the sheathing, serves as the element that the stucco adheres to through mechanical interlock. Moisture intrusion related failures for systems like this occur because the moisture oxidizes and degrades the lath and lath securing fasteners.

Metal framing can occur on concrete structures between slabs and columns. Failure of stucco can be an indication of a much more serious issue than just a decorative finish failure.



Metal Lath Failure with Stucco Failure



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## Falling Debris

As we noted earlier in this document, Stucco and concrete can debond and spall. Depending on the level of progression for this process, these items can become dislodged from their locations and, in the case of vertical and the underside of slabs, fall. While less likely, falling wood or other material finishes should also be noted and a source of concern. Due to the high likelihood of injury caused by falling items to residents and pedestrians, this is an item that should be addressed immediately with limited access and an inspection. This is especially true for larger buildings, where the fall distance is significant and a higher likelihood of pedestrian access.



Failing Stucco and Possible Falling Debris



## Cracking (1/4" or Larger)

Structures with cementitious structural elements (concrete, concrete masonry units) are prone to cracking due to the relatively low shear and tension strengths of those materials. The cracks can be visually unappealing and eventually create concerns with moisture intrusion. However, significant cracking (greater than ¼") is a significant cause for concern. Cracking of this size is typically indicative of excessive movement of the building elements. It is especially concerning if the building is older and the cracks have begun to appear recently. Cracks of this size are not limited to evidence of building structural component movements but failure from overloading or failure due to reduce capacity from deteriorated steel reinforcement.



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#### Guide for Emergency Inspections



Smaller cracks can also be of great concern with they are numerous smaller cracks in one location and create a radiating pattern from a support column. Small crack cause vertical or horizontal displacement can also be an indication of immediate attention.



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### Guide for Emergency Inspections

#### Moisture Intrusion

Moisture intrusion is the term used to describe moisture that has penetrated the exterior drainage planes, like paint coatings, stucco, sheathing and other exterior layers. Typically moisture intrusion is experienced when damage to finishes can be seen in forms of cracking or water staining and the smell of mold or mildew within the structure. Severe or continual water intrusion can be a sign of the previously mentioned spalls, cracks, or failures on the exterior that could be cause for immediate inspection.



Severe Moisture Damage on Window Finishes





In a concrete or cementitious, damage is often not readily observed until it has progressed to cracks and spalling. Staining of the concrete by either moisture or deposits left after moisture passes through the material is the best way to note any issues. The deposits are called efflorescence and appear to be a white powder that has been deposited on the surface of the cementitious element.



Guide for Emergency Inspections

# Guard Rails

Guard Rail failures can be a significant problem for any Association due to life safety concerns. Deteriorate post, loose or broken railings should be inspected immediately to determine replacement or repair.





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## **Building Element Collapse**

This term is being used to describe when a system has failed due to any number of factors, such as age or overloading, and as a result, has become no longer safe. When this happens, there is usually significant movement of the building element that has failed, if not a complete collapse. When the damage has reached this point, the damaged section of the building must be inspected for proper shoring, replacement or repair.

Partial collapses can occur from impact, natural designs, but also can occur from overloading of a structure. Any Association that decides to change the use of an area or modifications to the structure shall consult with an engineer to design for the changes of the structure and the load paths. Converting a common area room into a storage room or adding planters with trees to a balcony or roof will change the magnitude of loads.



Partially Collapsed Roof due to Ponding Moisture from Improper Roof Sloping



Steel Bar Joist Loss of Member Sections



Constant Moisture on Underside of Roof - Partial Collapse



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