Wiss, Janney, Elstner Associates, Inc.
110 East Broward Boulevard, Suite 1860
Fort Lauderdale, Florida 33301
561.226.1220 tel
www.wje.com

May 31, 2023

Condominium Association of Ocean Towers, Inc.
139 Sunrise Avenue
Palm Beach, Florida 33480

Ocean Towers South - Structural Milestone Inspection

2023 Inspection Report
WJE No. 2021.3595.2

Dear Condominium Association of Ocean Towers, Inc.:

Wiss, Janney, Elstner Associates, Inc. (WJE) performed a limited visual structural condition assessment at the Ocean Towers Condominium South Building at 139 Sunrise Avenue in Palm Beach, Florida. These services are intended to fulfill phase one of the milestone inspection requirements for condominium buildings included in the *Florida Senate Bill SB 4-D: Building Safety*. Additionally, some non-structural items that were observed during the structural assessment have also been recorded.

BACKGROUND

The Ocean Towers Condominium South is a 42-unit, 4-story concrete building constructed circa 1964. The property is located in a coastal environment, approximately 550 feet from the Atlantic Ocean. An aerial view of Ocean Towers South is shown below in Figure 1.

The building has continuous cantilevered balconies on the north and south elevations at each elevated floor (two through four). The balconies are constructed of conventionally reinforced concrete and cantilever from the face of the building, approximately five feet two inches on the north elevation and approximately six feet on the south elevation. There is an approximately two-inch step down from the top of the interior concrete slab to the top of the exterior concrete balcony. The balconies have a guardrail that runs continuously along their leading edges. The guardrails are constructed of precast ornamental concrete panels inset between concrete posts and an aluminum top rail. Balconies on the south side are separated between units via brick masonry knee walls. The exterior surfaces of the balconies on the north side are coated with a textured high-build protective coating.

Concrete repairs had been recently completed on the south balcony slabs and railings (June-October 2022). In addition, a new polyurethane traffic coating system has been applied on the south balcony slabs. A facade coating application project was ongoing during the time of the visit; which included (1) repairs to the stucco cladding substrate, (2) limited partial depth concrete repairs; and (3) application of a new paint coating to the majority of the exterior facade surfaces.

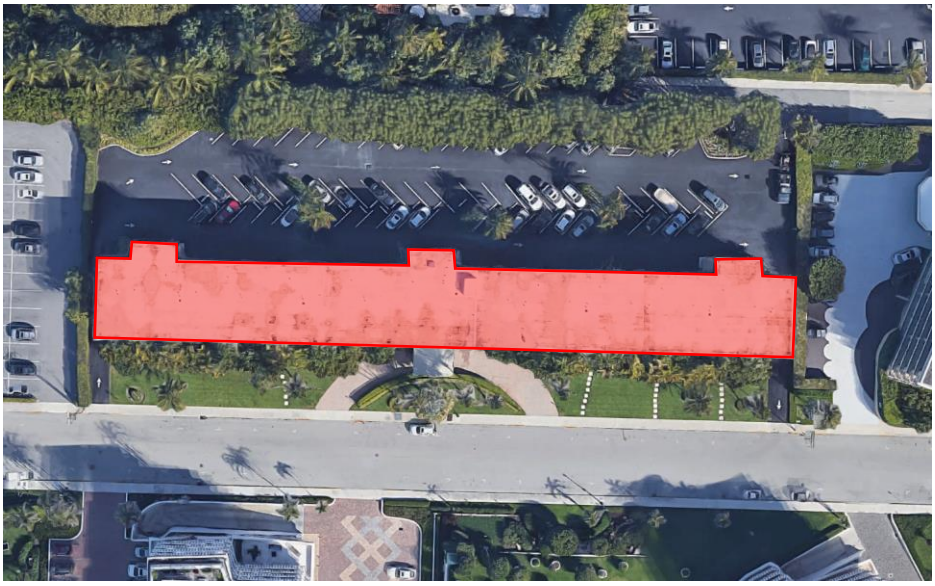


Figure 1. Aerial view of Ocean Towers South (red – main tower)

MANNER AND TYPE OF INSPECTION

WJE visually assessed exposed and accessible structural elements and the exterior facade. The assessment included a visual evaluation of structural elements at the exterior building facade, the balconies at each level, the east and west stairs, and the roof. It included access to the following areas of the building:

- First floor: Units 102, 106, 107, 110, the lobby, the elevator room, the bike room, and the electrical room.
- Second floor: Units 201, 206, and 208.
- Third floor: Units 301, 303, and 305.
- Fourth floor: Units 403, 408, 409, the storage room, and the laundry room.

Observations from the visual evaluation of these locations form the basis for this inspection report. No exploratory openings were created.

SITE OBSERVATIONS

On November 10, 2022, Ms. Crisol Ortiz visited the Ocean Towers Condominium South Building and visually inspected the exposed structural members at the previously mentioned locations. No exploratory openings were created, and no non-destructive evaluation was conducted. Mr. Martin Concepcion and Ms. Darlene Shapiro escorted Ms. Ortiz. The observations are organized in the following categories: Structural and maintenance observations. A summary of the observations is given below.

Structural Observations

Overall, the observed structural components of the building's primary structural systems generally did not exhibit visual evidence of significant structural distress. Further, WJE did not identify conditions that warrant significant strengthening or repairs to restore substantial reductions in structural capacity.

During our assessment, WJE did not observe evidence of conditions that indicated the structural capacity of the primary structural systems at the building had been significantly reduced or were performing in an unintended way. Accordingly, no evidence of deterioration or distress that would constitute "Substantial Structural Deterioration" or "Dangerous" conditions was observed during the assessment. Phase Two of the milestone inspection is not required.

Maintenance Structural Observations

Pertinent conditions associated with the maintenance of the structural systems that do not require immediate action remained consistent with items identified in our July 23, 2021 condition assessment report (attached in Appendix A). It should be noted that during our structural milestone inspection, all the maintenance items on the South Elevation of the property that WJE previously identified in our July 23, 2021 report had already been repaired during the concrete repairs and coating project completed in October 2022. Further, some additional maintenance level repairs associated with the stucco facade and the concrete elements on the north elevation were being performed as part of the in-progress facade coating project. At this time, remaining maintenance level repairs for the property are largely limited to:

- Limited areas of partial depth concrete repairs on the north elevation have not been performed as part of the two recent repair projects.
- Repairs to address deteriorated concrete units on the north elevation balcony guardrails were discussed in our July 23, 2021 report.

As stated above, the conditions associated with these maintenance items are not currently significant in terms of the performance of the primary structural systems at the building.

Given the age, types of construction, and proximity to the ocean associated with Ocean Towers South, regular maintenance of the building enclosure (roof, stucco, paint, sealant, balcony/terrace waterproofing, windows/doors) and structural elements are important to reduce the amount of corrosion-induced deterioration, and ultimately to help preserve the structural reliability of the building. Periodic inspection, repairs, cleaning/maintenance of the exterior coating systems and roofing should limit the extent and rate of distress to the exterior concrete elements. The corrosion-related distress identified at the property often s over time, necessitating monitoring of the building condition during the typical maintenance intervals. Doing so can promptly identify and address any signs of corrosion-related distress, minimizing the likelihood of extensive repairs, which can lead to appreciably lower life cycle costs. Still, the Association should expect some new areas of isolated concrete distress to continue to manifest/worsen each year. The Association should continue following the applicable maintenance/repair option guidance in our July 23, 2021 condition assessment report.

CLOSING

WJE did not perform any structural analysis or calculations of "as-designed" or "as-built/existing" conditions as part of our inspections. The opinions and recommendations in this report are based on limited visual field observations of the conditions at the subject property at the time they were made. Other conditions may exist which were not found during our site visit or may develop over time. We reserve the right to modify our opinions and recommendations should additional information that may

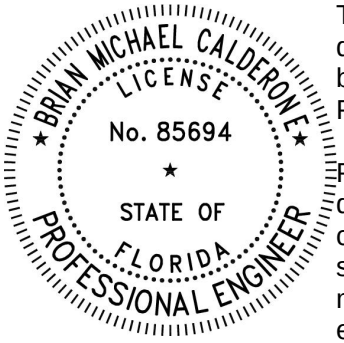
warrant such modification become available. This report, and other related correspondence, was prepared on behalf of and for the exclusive use of the Condominium Association of Ocean Towers.

WJE appreciates the opportunity to provide consulting services to the Condominium Association of Ocean Towers. Please do not hesitate to contact us if you have any questions.

Sincerely,

WISS, JANNEY, ELSTNER ASSOCIATES, INC.

Brian M. Calderone, PE
Associate Principal and Unit Manager
Florida PE No. 85694



This item has been digitally signed and sealed by Brian M. Calderone, PE, on 5/31/2023.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

APPENDIX A. WJE'S JULY 23, 2021 CONCRETE BALCONY ASSESSMENT REPORT

Ocean Towers Condominiums South

Concrete Balcony Assessment

139 Sunrise Avenue
Palm Beach, Florida 33480

REPORT
July 23, 2021
WJE No. 2021.3595

PREPARED FOR:
Condominium Association of Ocean Towers, Inc
139 Sunrise Avenue
Palm Beach, Florida 33480

PREPARED BY:
Wiss, Janney, Elstner Associates, Inc.
110 East Broward Boulevard, Suite 1860
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CONTENTS

INTRODUCTION

At the request of the Condominium Association of Ocean Towers, Inc., Wiss, Janney, Elstner Associates, Inc. (WJE) has completed an assessment of the concrete balconies at the Ocean Towers Condominium South Building located at 139 Sunrise Avenue, Palm Beach, Florida. The objective of WJE's survey was to assess the general condition of the concrete balcony structures, the balcony guard rails, and the existing protective coating system. This report summarizes the tasks performed and WJE's pertinent findings.

Description of Building

The Ocean Towers Condominium South is a 42-unit, 4-story concrete building constructed circa 1964. The building has continuous cantilevered balconies on both the north and south elevations at each elevated floor of the building (Floors two through Four). The balconies are constructed of conventionally reinforced concrete, and cantilever from the face of the building five-feet two-inches on the north elevation and six-feet on the south elevation. The balconies taper in thickness from approximately six-inches at the exterior walls of the building to approximately five-and-one-half-inches at the leading edge and are sloped away from the building (Figure 1 through Figure 3). There is an approximately two-inch step down from the top of the interior concrete slab to the top of the exterior concrete balcony. The exterior surfaces of the balconies are coated with a textured high build protective coating. The chemical composition and/or product name of the coating used is unknown. The walking surfaces of the balconies on the south side of the building have various surface finishes including tile, stone, marble, coating and exposed concrete (Figure 4). Balconies on the south side are separated between units via brick masonry knee walls (Figure 5). The balconies have a guardrail that runs continuously along their leading edges. The guardrails are constructed of precast ornamental concrete panels inset between concrete posts and an aluminum top rail. The building is located in a coastal environment, approximately 550 feet from the Atlantic Ocean.

Document Review

WJE reviewed available 1964 structural and architectural construction documents that were developed by John Adair, Jr. & Associates Engineers and D.B. Scoville Architecture to understand the general understanding of the configuration, design, and construction of the balconies. The original guardrail design and connection details were not identified in these documents.

SITE VISIT OBSERVATIONS

WJE performed a one-day field visit on June 25th, 2021, where Mr. Brian M. Calderone, PE and Mr. Zachary W. Sumislaski, EIT, both of WJE, visually assessed and mechanically sounded open and accessible portions of the concrete balconies and guardrails. The mechanical sounding on the walking surfaces of the balconies was performed using chain dragging techniques (Figure 6), while the soffits and slab edges were sounded with a rotary percussion device (Figure 7). Small areas of specific interest were sounded with a mason's hammer. In total, approximately 28,000 square feet (sq. ft.) of balcony concrete surfaces were mechanically sounded. The following sections summarize pertinent observations related to the subject balcony components identified by WJE during our assessment.

Concrete Balcony Slabs

Delaminations

- Planar delaminations were detected sporadically throughout the exposed concrete surfaces of the balconies. These delaminations ranged in size from under 1 sq. ft. to approximately 7 sq. ft. (Figure 8). Approximate locations of delamination's detected by the survey are shown in Appendix A.
- When sounded, the delaminations produced an acoustical response typical of shallow near surface delaminations.
- Approximately 88 instances of near surface delamination were observed, totaling approximately 128 sq. ft (average of approximately 1.5 sq. ft. per occurrence), on the underside portions of the balconies (soffits) across all levels surveyed, including the soffit of the roof overhand above the Fourth Floor
  - Approximately 58% of the soffit delaminations observed were located on the south side of the building.
- Approximately 71 instances of delamination were observed, totaling approximately 121 sq. ft (average of approximately 1.7 sq. ft. per occurrence), on the walking surfaces (slabs) across all levels surveyed.
  - Approximately 80% of the delamination observed was located on the south side of the building.
- Some of the observed delaminations occurred within unsound previous repairs (Figure 9).

Other Distress

- One instance of corrosion staining totaling 1 sq. ft was detected on the North side of the 4th Floor Soffit.
- A few cracks were observed across at sporadic locations through the south balconies. Most cracks were located in exposed portions of walking surfaces and near the balcony slab edges. The observed cracks were general small in width (less than .010 inches), and occurred in various locations, orientations, and lengths (Figure 10)

Balcony Floor Finishes

- 14 units had decorative floor finishes (tiles, stone, marble, etc.) that covered and prevented observing and directly sounding the top surfaces of the concrete slabs.
- WJE mechanically sounded the decorative floor finishes and observed significant areas of debonded finishes in most of the balconies with the decorative floor finishes that between concrete slab and the finish or cracking of the finish itself.
- WJE also identified other areas of floor finish distress including bowed (vertically displaced) tile or cracked tile finishes (Figure 11 through Figure 13).
- One bowed and unbonded loose tile was removed on the balcony of Unit 307. Cracked and delaminated concrete was observed underneath the removed tile (Figure 14 and Figure 15). In addition, waterproofing was not present on the surface of the concrete slab beneath the removed tile.

Concrete Protective Coating

- Coating failures consisting of missing, debonded, or blistered coatings were observed sporadically throughout the balconies. The coating failures observed ranged in size between 1 sq. ft and 4 sq. ft. Approximate locations of the coating failures identified during our survey are shown in Appendix A.
- Approximately 46 occurrences of protective coating failure were observed, totaling approximately 53 sq. ft., were observed on the soffits of the balconies and roof overhangs. Approximately 56% of the coating failure observed on the soffits were located on the south side of the building (Figure 17 and 17).
- Approximately 5 occurrences of protective coating failure, totaling approximately 197 sq. ft., were observed on the walking surfaces of the balconies. All of the coating failure observed on the walking surfaces were located on the south side of the building.
- The coating covering the entire surface of Unit 409 has failed or otherwise been removed, exposing the concrete slab beneath (Figure 18).
- 17 instances of previous repairs, totaling approximately 27 sq. ft., were detected on the soffit across all levels surveyed (Figure 19).

Table 1. Approximate Extent of Soffit Distress Observed

Type		Second Level		Third Level		Fourth Level		Roof Overhang		Totals		
		N	S	N	S	N	S	N	S	N	S	All
Delamination	#	4	13	6	27	5	26	3	4	18	70	88
	sq. ft.	6	14	9	38	5	37	7	12	27	101	128
Coating Failure	#	0	9	1	12	5	3	14	2	20	26	46
	sq. ft.	0	9	1	15	5	3	18	2	24	29	53

Note: The minimum square footage able to be measured per instance is 1

Table 2. Approximate Extent of Floor Slab Distress Observed

Type		Second Level		Third Level		Fourth Level		Totals		
		N	S	N	S	N	S	N	S	All
Delamination	#	9	22	4	10	17	9	30	41	71
	sq. ft.	12	50	7	17	18	17	37	84	121
Coating Failure	#	0	3	0	1	0	1	0	5	5
	sq. ft.	0	3	0	1	0	193	0	197	197

Note: The minimum square footage able to be measured per instance is 1

Balcony Guardrails

- Delaminated, cracked, and spalled concrete, as well as corrosion stains and exposed corroded reinforcing steel were observed on the precast ornamental inset panels and cast-in-place concrete posts of the balcony guard rails (Figure 20 through, Figure 24).
- At locations where the embedded reinforcing steel within the inset panels were exposed due to concrete spalls, WJE observed the concrete cover on the reinforcing steel was typically shallow with several areas of cover observed to be less than one-half inch.
- Damage or deterioration was not observed in the aluminum handrail portions of the guardrail (Figure 25).
- To catalog the approximate extent of distress, WJE enumerated the number of precast panels and concrete posts that exhibited any of the above-mentioned distress. The results of that survey are provided in Tables 3 and 4.
- Note that the south guardrails had a significantly higher observed deterioration percentage of approximately 43.6% of all precast ornamental panels and 11.3% of all columns compared to 19.0% of ornamental panels and 5.5% of columns on the north side.
- The fourth floor experienced the most amount of precast concrete deterioration on both the north and south sides.

Table 3. North Side Guardrail Assessment

Level #	Count of Deteriorated Ornamental Panels	Approximate Total Ornamental Panels	Count of Deteriorated Posts	Approximate Total Posts
2	41	264	4	88
3	45	264	5	88
4	60	264	5	88
Totals	146	792	14	264
Percentage of Deterioration	18.4%		5.3%	

Table 4. South Side Guardrail Assessment

Level #	Count of Deteriorated Ornamental Panels	Approximate Total Ornamental Panels	Count of Deteriorated Posts	Approximate Total Posts
2	112	264	6	88
3	92	264	8	88
4	131	264	15	88
Totals	335	792	29	264
Percentage of Deterioration	42.3%		10.9%	

DISCUSSION

Concrete Balcony Slabs

A relatively low frequency of occurrence and extent of distress was identified in the concrete balconies at the building. By far, the most prevalent distress identified in the concrete consisted of shallow near surface delaminations, that were most commonly one square foot or less in size. The total area of observed delaminated concrete represented less than one percent of the area surveyed. Additionally, given the shallow acoustical response associated with most of the conditions identified as concrete delaminations and the presence of a high-build protective coating at most locations, it was it difficult for WJE engineers to distinguish the difference between delamination or debonding of the protective coating and delamination of the concrete below. Due to this challenge, WJE conservatively designated "borderline" conditions as concrete delaminations. Thus, the number and extent of conditions identified as concrete delaminations in the areas assessed (i.e. not including the areas under floor finishes) are likely to be slightly conservative.

Based on the observed conditions and the location of the building, the most common/likely deterioration mechanism that would cause the observed delaminations is corrosion of the embedded reinforcing steel. The corrosion of steel is an electrochemical reaction that results in the formation of an iron oxide byproduct When reinforcing steel corrodes it will expand reaching up to approximately ten times its original volume. This expansion induces stresses due to confinement of the reinforcing steel by the surrounding concrete. The stresses result in cracking of the surrounding concrete in a plane parallel to the concrete surface (known as a delamination). Delaminations that break away from the concrete substrate produce spalling.

Several factors likely have contributed to the corrosion of the embedded reinforcing steel. One such factor is carbonation, a process in which constituents of the portland cement paste (principally calcium hydroxide) in the concrete reacts with carbon dioxide in the air to form calcium carbonate. This time-dependent process progresses from the outside surface inward and reduces the alkalinity of the concrete. When the depth of carbonation reaches the level of the embedded reinforcing steel, this loss of alkalinity breaks down the passivated film provided by the cement paste that normally provides corrosion protection to the embedded reinforcing steel. Similar to carbonation, chloride ions can penetrate the concrete cement matrix and break down the passivated film on the embedded reinforcing steel. In coastal environments, like that found at Ocean Towers South, these chloride ions are typically present due to the salts deposited on the concrete surface from sea spray and ocean winds. These salts dissolve in water which allow aqueous solutions to carry chloride ions into the concrete. The depth and rate to which the chloride ions are able to penetrate depends on the concrete material property, the presence of cracks, available moisture, and the amount of chlorides present. Once the chloride ions or carbonation reaches the depth of the reinforcing steel, the steel is no longer protected by the concrete from corrosion, and it will corrode in the presence of sufficient moisture and oxygen.

Further investigation including the extraction of samples from the concrete structure would be necessary to determine the relative significance and extent of carbonation and chloride penetration at the depth of reinforcing steel in the various structural elements. However, given that WJE understands that the Ocean Towers South intends to have and continuously maintain a protective coating system over all exposed

concrete surfaces, understanding the current depth of carbonation and chloride penetration may be somewhat less valuable. Maintaining a continuous protective coating system for the concrete reduces the rate of corrosion by impacting multiple factors that are necessary for corrosion. Protective coating systems can help keep concrete sufficiently dry to break the electrochemical reaction by preventing the hydroxide ion exchange necessary for corrosion. Further, protective coating systems can reduce the amount of oxygen present in concrete (also necessary for corrosion) and slow the rates of carbonation and chloride ion penetrations.

All of the concrete distress observed by WJE on the concrete balconies were consistent with corrosion of the near surface reinforcing steel, likely at areas with lower than average concrete cover (distance between the reinforcing steel and the concrete surface). WJE did not identify unusual or significant cracking, movement/deflections or other structural behavioral responses that may indicate the balconies were not performing as intended.

Balcony Finishes

The condition of the concrete present under the various balcony floor finishes is not fully known. Given the observed delamination under the displaced tile and the lack of waterproofing or a protective coating system observed under the one balcony tile removed, it is possible that the concrete under balconies with decorative floor finishes have more extensive concrete deterioration than other locations at the building where a protective coating system is present. The decorative floor finishes present at the building are not inherently waterproof, as water can seep through unsealed tile/stone mortar, perimeter edges, and cracks. While it is not likely that concrete deterioration has caused all of the debonding of the decorative floor finishes observed, it may account for some of the debonding or exacerbate the debonding at some locations. The areas decorative floor finishes (especially where debonded) also present a condition that allows water to be trapped on the concrete surface under the finishes. This trapped water can accelerate the rate of concrete deterioration on the surface of the concrete and can also cause concrete and coating issues on the soffit below. It is important to note that WJE did not identify an appreciable increase in the amount or extent of concrete/coating distress on the soffits of balconies below unbonded (or bonded) decorative floor finishes.

Concrete Protective Coating

As previously discussed, the role of the protective coating system is to protect the concrete it covers from exposure to the environment. Distresses in the protective coating occurred most frequently on the south side balcony of the building, this is likely because the north side more easily accessible for maintenance crews. Failures in the coating system such as breaches, debonding, blisters, or cracks create openings for water to get in between the concrete and the coating. The water that enters through theses openings can cause deterioration of the concrete. The typical life span for protective coating system typically ranges between 5 and 15 years depending on the quality of the application, the type of coating used, and the intensity of the exposure condition. While WJE did not perform a laboratory evaluation of the coating, most areas of the coating (those not debonded) appear to be performing as intended.

Balcony Guardrails

Similar to the concrete balcony slabs, the distress observed on the balcony guardrails is consistent with corrosion of the embedded reinforcing steel, again likely due to carbonation or chloride ion penetration of the concrete. By far the most prevalent and significant of the distress observed was present in the precast concrete ornamental inset panels. Numerous spalls exposed corroded reinforcing steel that were placed with shallow concrete cover (near surface) within the precast inset panels. In some cases, this shallow cover was observed to be less than one-half-inch. The ornamental design of the inset panels is such that placing embedded reinforcing steel with significant cover is practically challenging due to the relatively thin wall sections of the panels.

The concrete posts located between sets of precast concrete ornamental inset panels also exhibited evidence of concrete distress due to the corrosion of embedded reinforcing steel. Typically this distress was located towards the bottom of the posts, were the posts connected to the concrete slab of the balcony; though there was little to no observed distress in the balcony slab at the post connections. Both the prevalence and extent of distress identified on the posts were far lower than was identified on the inset panels. The guardrails on the south side of the build had more than double the amount of distress observed on the north side of the building. Again, this is likely due to the ease of maintenance accessibility associated with the north side, and potentially exacerbated from increased exposure of sea spray on the south.

WJE did not identify visible deterioration or distress in the aluminum handrail components of the guardrail. These aluminum components appear to be performing as intended.

REPAIR AND MAINTENANCE OPTIONS

Concrete Balcony Slabs

The concrete distress observed on the balcony slabs (shallow delaminations) can be appropriately mitigated using conventional partial depth concrete repair procedures. While WJE did not identify distress concrete conditions that warrant immediate action (repair, shoring, etc.), consideration should be given to the following repair/maintenance approaches.

Approach 1 | (repairs within the next 12-24 months)

- Performing repairs within the next two years will provide for the most direct, long term remediation on the distress and minimize the extent of future deterioration.
- Facility staff (or a contractor, engineer, or inspector) should visually inspect the building every six months or as needed to identify and remove any delaminations that progress to incipient spalls that may present a falling object hazard
- Paired with sufficient repair and maintenance of the protective coating systems, this approach will likely represent the lowest life cycle costs of the repair options since it will likely represent the smallest amount of total concrete to be repaired.
  - Note that new and existing areas of deterioration will grow with time, and the longer the time frame before repairs the more extensive the repairs are likely to be.
- Cost Considerations:
  - Represents the lowest total cost option associated with the concrete repairs.
  - Represents a comparatively large one time payment upfront
    - Loan or other industry financing options may be available if needed.
  - Order of Magnitude Concrete Repair Cost: $75,000 to $110,000
    - Does not include the cost of the engineering design services
    - Does not include the cost of coating/waterproofing repairs
    - Does not include unknow repair areas under floor finishes

Approach 2 | (repairs within the next 24-60 months)

- Performing repairs within five years allows for additional time for funds to be set aside for the project.
- Facility staff (or a contractor, engineer, or inspector) should visually inspect the building every six months or as needed to identify and remove any delaminations that progress to incipient spalls that may present a falling object hazard
- In this approach, a visual assessment of the structure should be performed every one-to-two years by a licensed professional engineer until the repairs are implemented. The engineer should look for evidence of structural distress and provide updated repair recommendations based on recent findings.
  - Time between assessments would be determined depending on the findings of the preceding assessment.
- Paired with sufficient repair and maintenance of the protective coating systems, it may be possible to limit the growth of areas requiring repair. Meaning that the total repair area may only increase slightly over that associated with Approach 1.

- Cost Considerations:
  - Allows for reserve funds to be built up and budgeted for.
  - Higher total costs than Approach 1 since the amount and size of repairs tend to grow over time.
  - Additional costs than Approach 1 associated with additional engineering assessments.
  - Order of Magnitude Concrete Repair Cost: $100,000 to $200,000
    - Does the include the cost of engineering inspection and reporting services
    - Does not include the cost of the engineering design services
    - Does not include the cost of coating/waterproofing repairs
    - Does not include unknow repair areas under floor finishes

Approach 3 | (limited annual repairs)

- Performing a limited amount of concrete repairs each year, always targeting the most significant distress, can allow for more manageable funding strategies, while limiting the risks associated with un-repaired concrete.
- Facility staff (or a contractor, engineer, or inspector) should visually inspect the building every six months or as needed to identify and remove any delaminations that progress to incipient spalls that may present a falling object hazard
- In this approach, a visual assessment of the structure should be performed every year by a licensed professional engineer to identify repairs to be completed, look for evidence of structural distress and provide updated repair recommendations.
- Paired with sufficient repair and maintenance of the protective coating systems, it may be possible to limit the growth of areas requiring repair. Meaning that the total repair area may only increase slightly over that associated with Approach 1. However, doing smaller repairs may result in increased unit prices of repairs since there is less efficiency for repair contractors with multiple mobilizations.
- Cost Considerations:
  - Allows for reserve funds to be built up and budgeted for.
  - Higher total costs than (Approach 1 and potentially Approach 2) since the amount and size of repairs tend to grow over time.
  - Additional costs than (Approach 1 and potentially Approach 2) associated with additional engineering assessments.
  - Order of Magnitude Concrete Repair Cost: $20,000 to $50,000 per year over the next five years.
    - Does the include the cost of engineering inspection and reporting services
    - Does not include the cost of the engineering design services
    - Does not include the cost of coating/waterproofing repairs

Balcony Floor Finishes

Given that the condition of the concrete below the floor finishes is unknown, consideration should be given to performing an evaluation of the concrete under these finishes within the next two years. Such an evaluation may include removal (and eventual re-installation) of select tile/stone units from each balcony with floor finishes to visually inspect and sound the concealed concrete. Use of non-destructive testing to

identify internal flaws within the concrete may also be appropriate for this assessment. If this investigation is not performed, the balconies in the areas of the floor finishes should be visual assessed by a licensed professional engineer every one-to-two years. The engineer should look for evidence of structural distress and provide updated repair recommendations based on recent findings.

Should any owner elect to remove floor finishes present on their balcony, consideration should be given to performing concrete repairs and installing a waterproofing system over the concrete while the finishes are removed. The association may also want to give consideration to requiring unit owners with floor finishes to undertake these repairs within a reasonable time period, as a waterproofing system on the balconies represent a best-practice long term repair solution.

Concrete Protective Coating

As discussed, the existing concrete coating system is an important component of the building that provides protection for the structural components, but also requires continual maintenance. Best maintenance practices for such a coating would include the following:

- Within the next six months (or as soon as feasible) or in conjunction with concrete repairs have a qualified coating installer remove and replace in kind areas of missing, cracked, on debonded/blistered coating.
- Have a qualified coating installer perform annual assessments and local repairs to deteriorated portions of coatings or repair coating in conjunction with concrete repairs
- Budget to have coating systems removed and replaced every 5 and 15 years.

Note: WJE is unaware of the anticipated remaining service life and performance of the existing coating on the building. If requested, WJE could perform additional field and or laboratory investigation to provide additional information regarding these aspects of the existing coating.

Balcony Guardrails

Although it is possible to perform localized repairs to the distressed portions of the precast concrete ornamental inset panels, it is not practical or likely cost effective given the unique geometry and extensiveness of the deterioration. Accordingly, WJE has developed the following conceptual repair options for the guardrails:

Option 1 | Replacement of Select Inset Panels

This option includes the removal and replacement of the ornamental inset panels in-kind. This repair would require replacement of approximately 480+ panels around the building. Doing so would require creation of a custom mold used to make replacement panels. Areas of distress concrete posts could be repaired using localized partial depth concrete repair procedures. New protective coating systems could be applied to all concrete elements after the repair.

Pros: It is feasible that this repair approach could prove to be the least expensive up-front costs and quickest repair option to implement (though the cost would need to be further understood). We believe that the railings would fall under grandfathered code design requirements, be considered maintenance repairs, and require the least amount of city involvement (additional local code review would be necessary

to confirm this understanding). It would not require architectural design services or review from a government architectural review board.

Cons: The remaining non-replaced inset panels will have been in service for almost 60 years, and while they may not be distressed now, they may become distressed in the future. Accordingly, it would be likely that multiple rounds of panel replacements would be required over the years. This would likely require the Association to maintain a stock of replacement panels since custom made ones every few years would be cost prohibitive. The existing guardrail likely does not meet the strength or opening sizing requirements associated with code requirements for new construction. While the grandfathered design prevents the existing guardrail from needing to meet the newer code requirements, it also means a new guardrail would have higher design performance than this repair option.

Option 2 | Precast Guardrail Replacement

This option would include the removal of all existing ornamental panels and the design of a new custom guard rail system. This system could possibly aim to utilize the structural capacity of the existing posts in the new design. Using the existing posts (if repaired with partial depth concrete repair procedures) could minimize the amount of work required to connect the new guardrail to the balcony.

Pros: Using the existing posts (if repaired with partial depth concrete repair procedures) could minimize the amount of work required to connect the new guardrail to the balcony. A new guardrail would be required to meet current building code requirement for new construction, meaning it would have a higher design performance than a repair option. The new guardrail would likely have lower maintenance requirements and life cycle costs than the repair option. The new guardrail could be designed to "improve" or change the look of the building. The new guardrail could be designed to improve the water management and drainage on the balconies.

Cons: This option may have higher upfront costs depending on the railing replacement system, including higher engineering and architectural design services, higher construction costs, and higher permit and review costs. This option will likely take longer to implement and require approval from government architectural review boards.

FIGURES

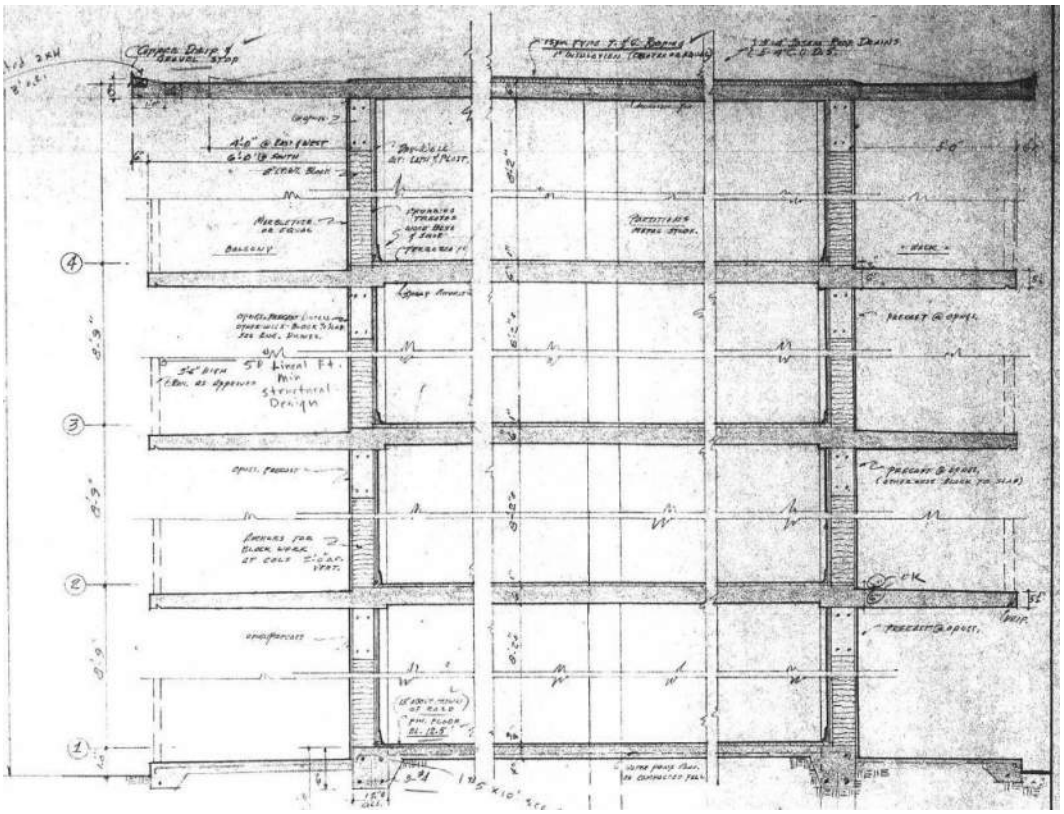


Figure 1. Construction plan's typical section view of balcony overhang

Figure 2. Balcony cantilever configuration

Figure 3. Depth of concrete balcony at slab edge

Figure 4. Various balcony finishes observed

Figure 5. Brick knee wall separating the continuous balcony by unit

Figure 6. Chain dragging

Figure 7. Rotary percussion device to sound the underside of the balconies

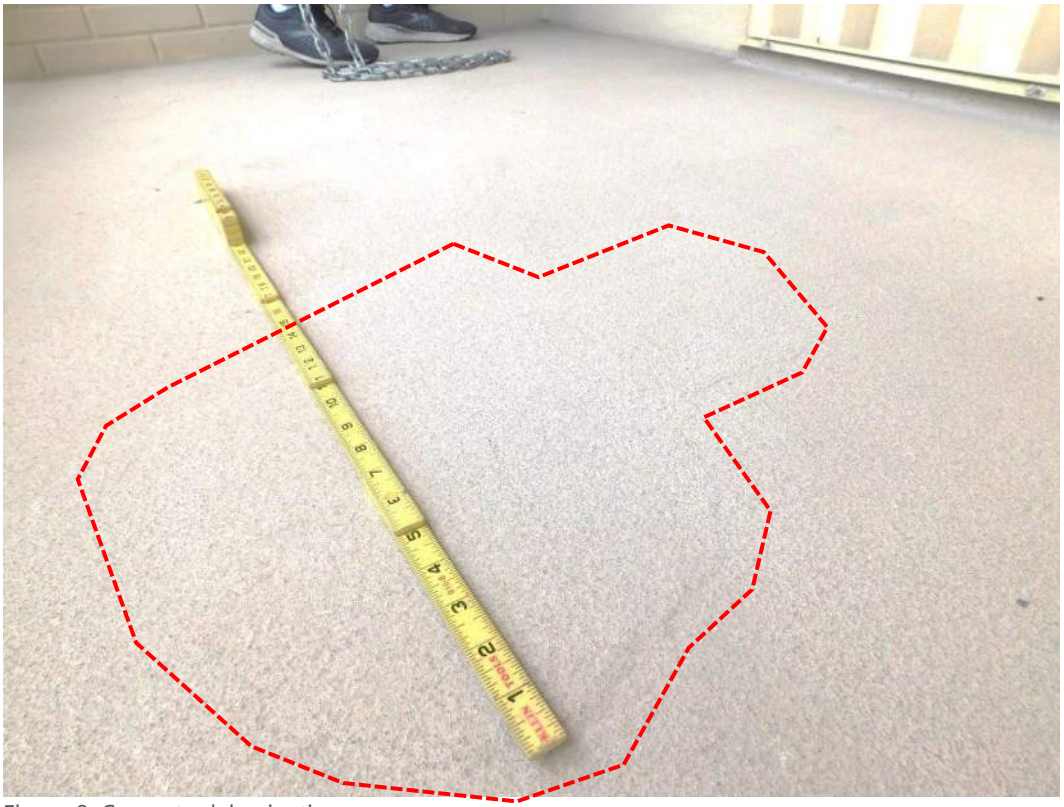


Figure 8. Concrete delamination

Figure 9. Unsound previous repair

Figure 10. Balcony slab crack

Figure 11. Tile finish cracking

Figure 12. Bowed tile above concrete slab

Figure 13. Close-up view of the vertically displaced tile

Figure 14. Inspection opening with concrete slab cracking underneath

Figure 15. Close-up view of concrete slab cracked and delaminated below tile finish

Figure 16. Coating failure on the soffit.

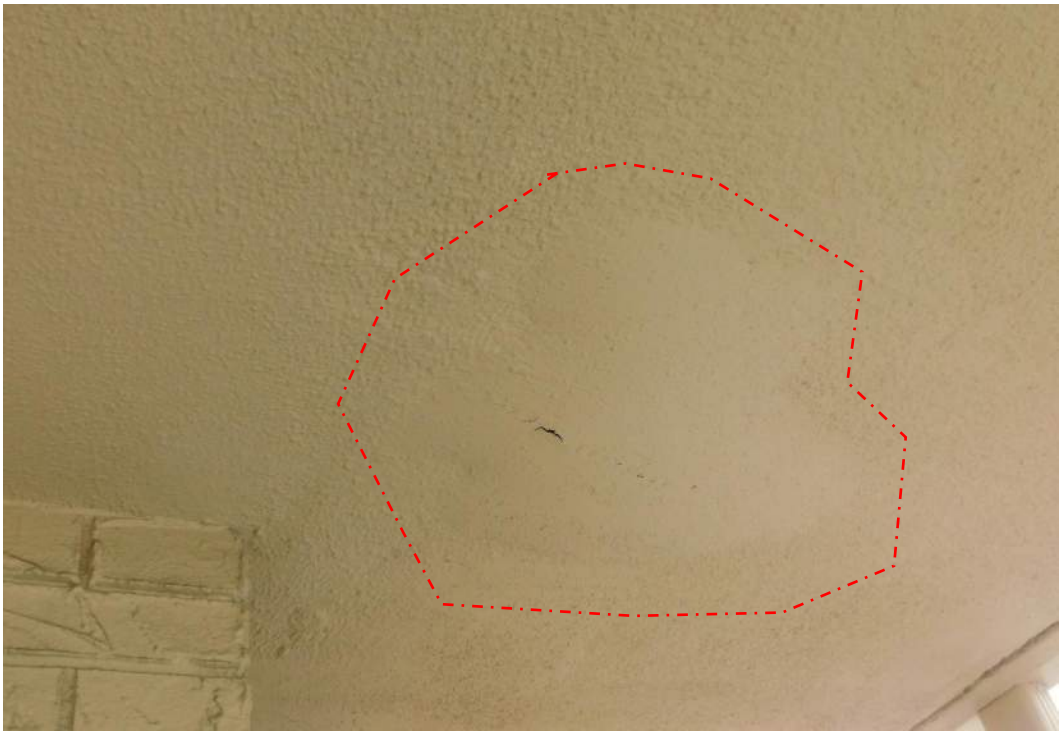


Figure 17. Coating failure (blister) on the soffit.

Figure 18. Failed or removed concrete protective coating on deck

Figure 19. Previous patch repair observed along soffit

Figure 20. Deterioration of precast ornamental guardrail

Figure 21. Exposed reinforcement on the precast ornamental panels.

Figure 22. Deterioration of the precast ornamental panels.

Figure 23. Spalling and exposed reinforcement on the ornamental precast panel

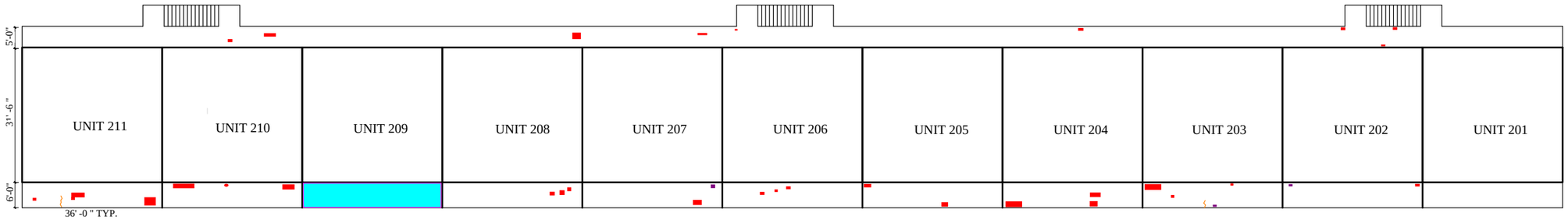
Figure 24. Corrosion staining on the ornamental precast panels.

Figure 25. Aluminum guardrail

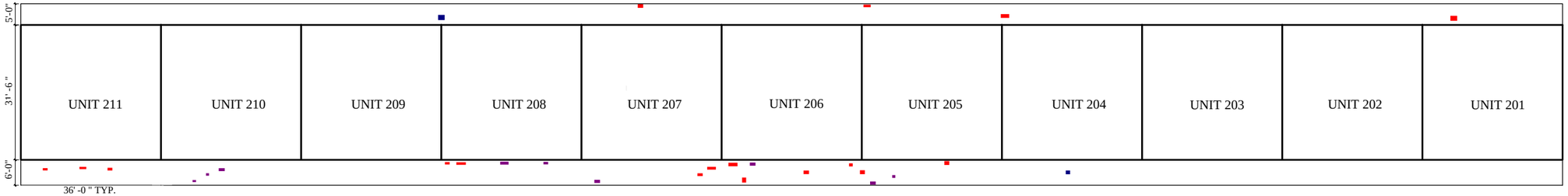
APPENDIX A: EXTENT OF DISTRESS DRAWINGS

DISTRESS LEGEND:

- CONCRETE DELAMINATION
- COATING FAILURE
- SURFACE OBSCURED BY EXTERIOR FINISHES
- EXTERIOR FINISH DELAMINATION
- EXISTING REPAIR
- FAILED REPAIR
- CRACKING
- CORROSION STAINING
- SPALLING



1 WALKING SURFACE (DECK) OF 2ND FLOOR BALCONY
SCALE: N.T.S



2 UNDERSIDE (SOFFIT) OF 2ND FLOOR BALCONY
SCALE: N.T.S

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Wiss, Janney, Elstner Associates, Inc.
110 East Broward Boulevard, Suite 1860
Fort Lauderdale, FL 33301
561.226.1220 tel | 561.981.8007 fax
www.wje.com

Headquarters & Laboratories: Northbrook, Illinois
Atlanta | Austin | Boston | Chicago | Cleveland | Dallas | Denver | Detroit
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OCEAN TOWERS SOUTH CONCRETE BALCONY ASSESSMENT

Client

CONDOMINIUM ASSOCIATION OF OCEAN TOWERS, INC

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SECOND FLOOR BALCONY EXTENT OF DISTRESS

Sheet Title

Sheet No. **R001**

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DISTRESS LEGEND:

- CONCRETE DELAMINATION
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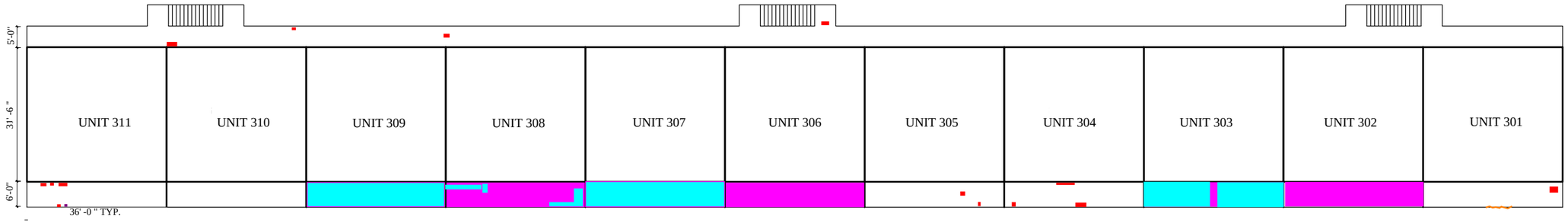

1 WALKING SURFACE (DECK) OF 3RD FLOOR BALCONY
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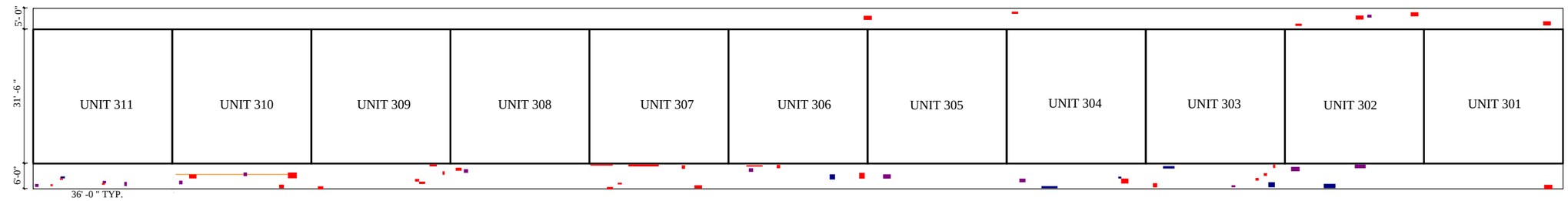

2 UNDERSIDE (SOFFIT) OF 3RD FLOOR BALCONY
SCALE: N.T.S

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THIRD FLOOR BALCONY EXTENT OF DISTRESS
Sheet Title

Sheet No. **R002**

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DISTRESS LEGEND:

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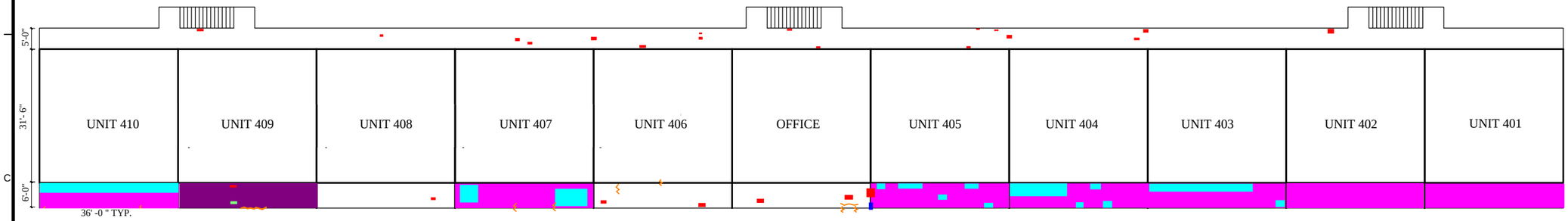
- CORROSION STAINING
- SPALLING



1 WALKING SURFACE (DECK) OF 4TH FLOOR BALCONY
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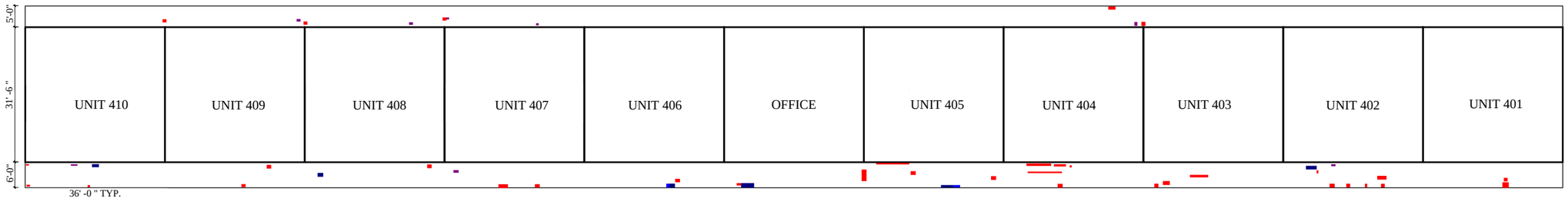

2 UNDERSIDE (SOFFIT) OF 4TH FLOOR BALCONY
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FOURTH FLOOR BALCONY EXTENT OF DISTRESS

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Sheet No. **R003**

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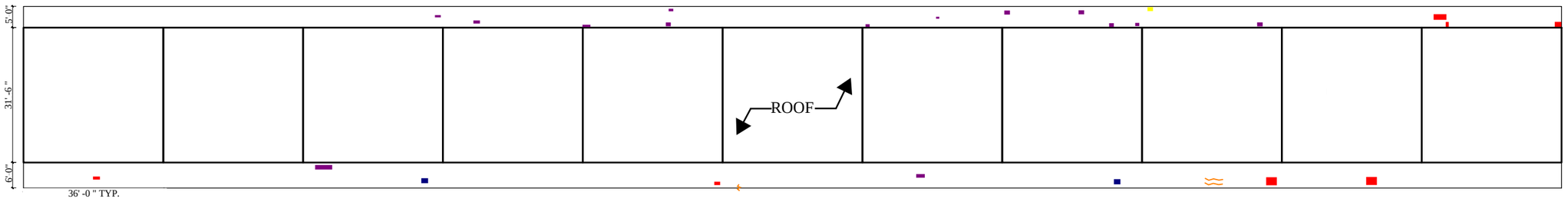
- CORROSION STAINING
- SPALLING



1 UNDERSIDE (SOFFIT) OF ROOF
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ROOF SOFFIT EXTENT
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