Structural Hazzard Assessment Report

Condition Assessment of Parking Garage and Stair/Elevator Tower
at Partially Demolished St. Joseph Hospital and Health Center
205 West 20th Street Lorain, Ohio.

Prepared for
The City of Lorain
May 4, 2022

PREPARED BY:

OSBORN
ENGINEERING

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Introduction / General Information

The Osborn Engineering Company (OEC) was retained by the City of Lorain to provide a Hazzard Assessment of the Parking Garage located at 205 West 20th Street Lorain, Ohio. The parking garage was previously part of the St. Joseph Hospital and Health Center, which has been partially demolished. The date of the Hospitals demolition or the reason for interruption of Demolition Work was not known at the time of this report. The area has been designated Unsafe for Human Occupancy by the City of Lorain and is posted (See Photo 1). The area is encompassed by a chain link fence to prevent trespassing.

The purpose of our assessment is to report on the overall integrity of the parking garage structure and to determine if the structure is a hazard or if the structure is sound on its own and could possibly be salvageable for reuse as a parking structure. Osborn's assessment focused on the parking garage and elevator/stair tower structures' safety hazards, areas of deterioration, and repairs that would be necessary to return the structure to use.

This assessment report also discusses select maintenance and renovation items that would be necessary to return the structure to use that are beyond structural safety.

While not specifically included in the scope of this assessment additional observation of the overall sites safety and hazards are also included in this report. These elements include site security and hazards at incomplete demolition on the adjacent property within the fenced in area.

A Limited Option of Rough Probable Structural Cost is also included in this report. This section is limited to structural repairs, identification of potential safety hazards, and essential routine maintenance that would be required to return the parking structure to operation. Costs associated with non-parking garage structures that would also affect re-use of the garage are not included.

While the condition survey was performed with care by experienced persons, OEC makes no warranty that all defects or existing conditions were discovered. The purpose of the information presented within this document is to report on the present condition of the Parking Structure's structural elements and is not to be used for construction. Preparation of engineering/construction documents to implement the recommendations, repairs, and improvements is not part of this task.

The scope of services relevant to this Hazzard Condition Assessment per our proposal includes the following:

- Conduct an on-site condition survey of the Parking Garage structure.
- Measure structural elements as required and photograph existing conditions.
- Document and quantify visible areas of deterioration of the Parking Garage Structure.
- Review, analyze and evaluate the information recorded during our condition survey.
- Preparation of this Hazzard Assessment Report including Recommended next steps.

- Conduct a meeting with the City of Lorain to discuss the findings, recommendations, and limited costs presented with this report.

Our condition survey occurred in April of 2022.

The table below contains basic parameters of the Parking Garage Structures geometry gathered during our survey. Note: Existing drawings for the parking garage were not available at the time of our survey.

Parking Garage Parameters	
Year Built (Approximate)	1970
Approximate Overall Dimensions (FT)	260 by 125
Approximate Area Per Floor (SF)	31132
Number of Floors (EA)	6
Height of Structure (FT)	60
Approximate Number of Parking Spaces (EA)	575

Definitions

For the purposes of our condition survey, the following definitions will be used for descriptive purposes:

Very Good	"Like new" state, and is performing function as intended
Good	Little deterioration, and is performing function as intended
Fair	Minor deterioration, and is performing function as intended, but rate of deterioration has begun to accelerate
Poor	Significantly deteriorated and/or is no longer functioning as intended
Obsolete	Completely deteriorated, and state represents a potential hazard to the overall condition of the facility

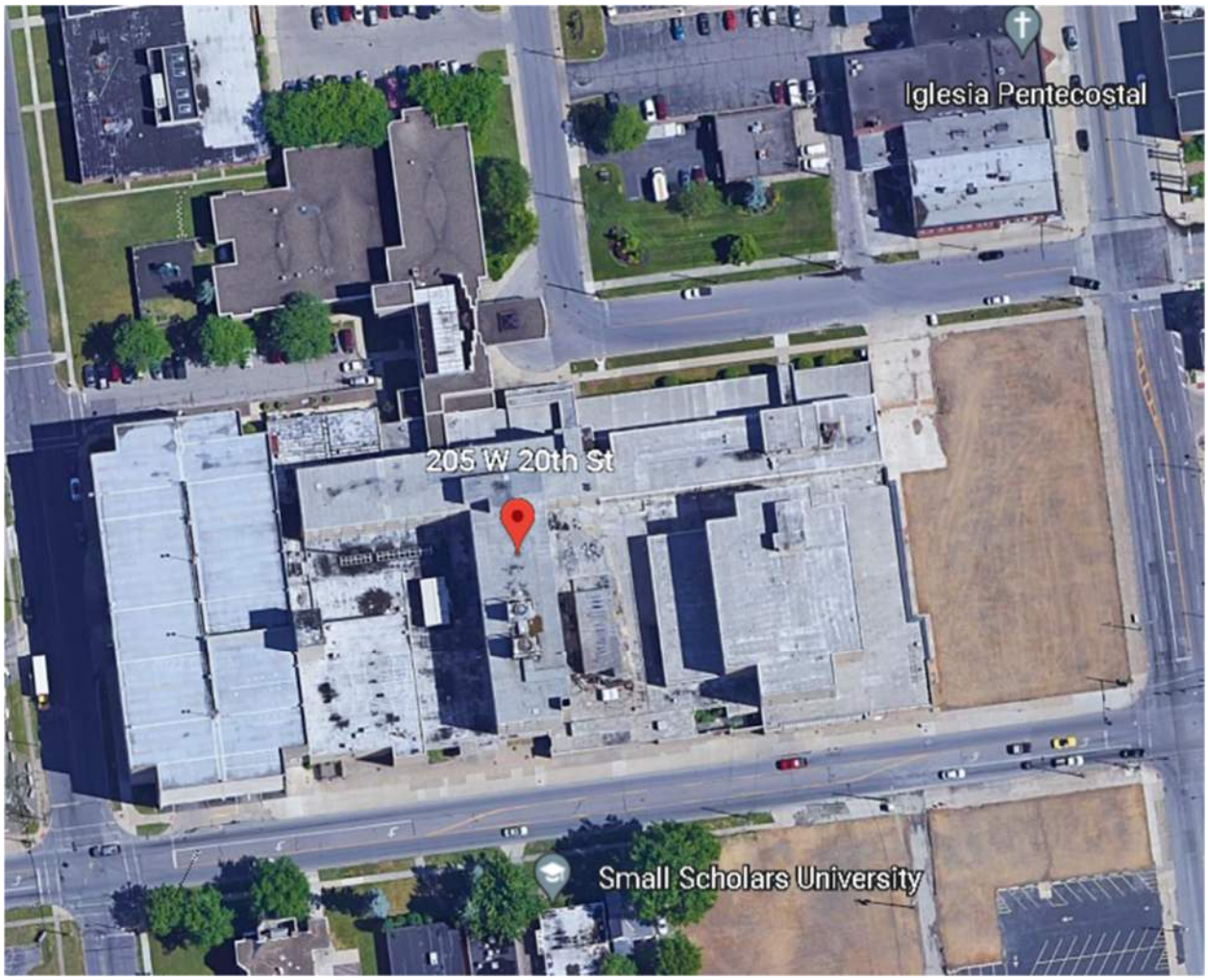
Observations and Discussion

The parking garage consists of six elevated floors and one level on grade. The on-grade level contains entry ramps, a portion of partially demolished previously occupied space, mechanical areas, and a partially demolished vestibule area at a previous 2nd floor entry to the hospital (exit blocked in). The remainder of the parking structure is utilized for parking.

In addition to the parking structure, the hospitals shared stair and elevator tower partially remains. This area has several safety concerns due to partial demolition.

The overall site also has several safety concerns regarding partial demolition, dangerous debris, falling hazards, and unauthorized access to the site through openings in the fence.

The image below shows the site and overall hospital and parking garage structure prior to partial demolition of the hospital.



Nearly all of the hospital has been demolished however a portion of the Northwest Structure, the shared Stair/Elevator Tower, and debris remain on the site.

Safety concerns associated with the overall Site include unintended access through fence openings (See Photos 2 &3), unsatiable debris and pits, partially demolished structures with falling debris or dangerous rubble (See Photos 4 - 8). Pedestrians were observed traversing through the site through the two openings in the fence on the north side of the site. In addition, several observed objects and conditions within the parking structure and stair tower indicate that individuals have occupied the area after demolition.

Safety concerns associated with the Elevator/Stair Tower include fall hazards at the elevator tower openings due to accessible doors and broken out window systems and fall hazard at the 2nd floor exit to the stair tower at previous entry into hospital. Several of the doors from the garage to the elevator lobby were observed to have been welded shut however 3 were observed to be operable due to damage at the henges or lock plates resulting in access to the area. In addition, several building elements were observed to be dislodged at the perimeter of the Elevator/Stair tower and at the east face of the garage along the hospital demolition line. These include the window systems and miscellaneous building elements at the

adjacent east face of the parking structure. These elements could fall to grade below resulting in site safety risks. See Photos 9 - 17 for typical condition of safety elements described above at the Elevator/Stair Tower.

The Site and Elevator tower safety concerns discussed above should be addressed Immediately to prevent Hazards to Human Life. See Recommendations section below for additional information.

The existing guard/handrail system of the stair tower were observed to lack code defined closure allowing greater than 4" gaps. The existing guardrail system would require replacement to allow re-use of the structure. In addition, the roof hatch was observed to be open, its operability was not assessed due to uncertainty in the stability of the existing ladder system. See photos 18 & 19 for typical conditions of railing and hatch conditions.

The partially demolished building structures on the site and adjacent to the south side of the parking structure are considered to be in Obsolete condition with the exception of the Stair and Elevator Tower which in general is in Poor condition. The elevator and stair tower could be reused but would require extensive repair and modification. A condition assessment of the elevator cars, mechanical equipment, and electrical systems of the stair and elevator tower were not including in the scope of this report.

In general, the primary structure of the parking garage is in Fair to Poor condition. Several areas of significant concrete deterioration were observed on Cast in Place and Precast Concrete elements. The parking garage is composed of four sets of shear walls at each corner. The sheer walls are in general in Fair Condition. The primary framing of the structure is concrete columns with precast beams and barrier walls and precast singe T's. Typical precast T's are 9'-0" wide with a 4" flange and 8"X24" joist stem.

The precast beams and cast-in-place concrete columns are in general in Good to Fair condition with select areas experiencing deterioration (See Photos 21 - 29). Select locations of both beams and columns have experienced moderate to severe spalling however these conditions were observed to be isolated.

The Precast T's joist stems are in general in Fair condition with select areas experiencing deterioration typically at bearing locations (See Photos 30 - 33). Some deteriorated areas were observed to have occurred at previous repairs. These locations exhibit substantial corrosion of reinforcing steel and may have been repaired using subpar quality techniques including a lack of corrosion inhibiting bonding agents and poor edge conditioning of patches. These conditions can lead to premature and rapid deterioration of repaired areas.

The Precast T's slabs/flanges are typically in Fair to Poor Condition and have experienced significant systemic deterioration at joints (See Photos 34 - 40). A multitude of previously repaired areas were observed. The wide nature of these precast elements with centralized bearing is prone to rocking. This causes stress at the existing embedded steel T to T connectors. This stress in conjunction with the failed waterproofing system has resulted in failure and spalling at many of the T to T connectors. A substantial amount of soffit spalling was observed along the precast joints including extensive piles of debris on the slabs below illustrating the risk to occupants from falling concrete. Approximately 50 locations with substantial delaminated concrete observed on the parking deck floor indicate an accelerated rate of decay since demolition/stop in use (See Photos 41 & 42).

The lower levels of parking deck were observed to have extensive scaling on the deck slabs top surface. In addition, cracking and the presence of failed sealants were observed (See Photos 43 & 44). The upper levels of the paring deck have had a newer epoxy overlay added to the deck as a protective layer and waterproofing system. The thickness of the system and brittle nature of the epoxy overlay system resulted in cracking along many of the T to T joints allowing water to infiltrate into the joint causing spalling through expansion of reinforcing steel and connectors as well as through expansion of water during freeze thaw cycles. The presence of chlorides from de-icing chemical exacerbates this process. Areas of cracking and failed sealants were observed as well as select areas of delaminated coating. In general, the epoxy overlay system is in poor condition (See Photos 45 - 49).

At the entry/lower ramp area of the parking structure the slab is on grade. Moderate deterioration of slab, wall, and curbs was observed. In addion, parking gates were observed to not be precent for future use (See photos 50 & 51). New gates and payment systems would be required for use of the structure.

Areas of significant ponding water were observed indicating that at select locations, additional long term exposure to water and freeze thaw cycles may be further accelerating deterioration of the parking decks slabs due to lack of drainage (See Photos 52 & 53). Additional exposure to water is also occurring due to damaged drain boxes and pipes. Instances of broken pipes and spalling around drains were observed (See Photos 54 - 56). A full condition assessment of drainage systems is not included within the scope of this report.

While significant areas of deterioration were observed, the parking garage structure could be repaired. The required repairs are however likely cost prohibitive without a significant immediate need for a parking garage in this area due to the immediate cost of repair and preventative maintenance required to return this structure to use. Information regarding the possibility or type of future use of this site was not available at the time of this report.

In addition to the structural observations noted above, the parking structure was also observed to have deficient pedestrian guard systems at the exterior perimeter and along the interior ramps. The typical barrier walls are 32” tall rather than the code defined 42” (See Photos 57 - 59). This would require modification with new steel rails at both the exterior perimeter and between the deck ramp section along the center line of the garage. Hand/guard rail modifications would also be requited at the stair tower for proper elevation and closure. These modifications are required for fall protection of pedestrians within the parking and stair areas.

In addition, while not included directly within the scope of this report several the electrical system, lighting, and mechanical systems appear to be in Poor to Obsolete condition. The existing lighting system is composed in incandescent lighting with areas observed to be damaged or missing (See Photos 60 - 66).

The finishes and facilities of the previously occupied areas of the garage on the first floor are in Poor condition. Portions of this area are partially demolished. Due to remaining finishes and insulation, portions of the structure in this area could not be observed. An evaluation of the condition of existing mechanical, electrical, and plumbing elements of this area are not included in the scope of this report. Costs associated with these elements are omitted from the Limited Opinion of Probable Costs included within this report. In addition, evaluation of mold and indoor air quality effected by finishes and water

intrusion are not included however remediation would be expected if the structure would be returned to service. See photos 67- 72 for typical conditions of the previously occupied area discussed above.

Recommendations

Safety Recommendations:

Osborn observed three pedestrians utilizing the openings in the fence on the north side of the site to cross through. In addition, evidence of squatting/trespassing was observed within the parking and stair tower structures. Due to the presence of multiple life safety concerns Osborn recommends prioritizing improvements to the perimeter fence system.

Due to locals using the north side as a cross through, the fence should be connected rather than extending to the adjacent building to allow for a path outside of the fence. This will reduce the probability that individuals continue to move fence panels allowing for unauthorized access.

If the duration until finalized demolition and/or renovations of the parking garage and stair tower structure are expected to exceed 3 months, Osborn recommends considering a more permanent barrier system be installed for added security/reduced risk of unauthorized access.

The remaining partially demolished portion of the hospitals structure on the north side of the site, on the east face of the garage, and the remaining sites rubble piles should be removed/demolished. This includes final clean up of the site as well as infill of any below grade voids. Partially demolished structures represent a high risk of falling steel and concrete building elements from remaining elevated structures including roofs. In addion, partially exposed rebar extending from concrete and debris piles can pose safety hazards. This reports primary scope does not include the hospitals' structure or verification of demolition and infill of any below grade voids at basement or vault areas. Additional below grade voids may exit in addion to the observed site pits.

The existing stair and elevator tower has multiple safety concerns/observed hazards. The overall stair/elevator tower's structure is currently capable of supporting itself and could be renovated however it's partially demolished condition and limitations for re-use may justify demolition and reconstruction if the parking structure were to be repaired and renovated. Pending decisions regarding the overall site's future plans, the existing safety hazards should be addressed. These include demolition and removal of the remaining portions of the low roof flashing, window systems, and at grade adjacent structures. In addion to demolition, all access doors should be re-sealed. Where openings at windows or abandoned exits to the demolished hospital exist, closure/fall protection barriers should be constructed. The existing roof hatch should also be secured to prevent roof access and reduce water intrusion.

Structural Recommendations:

The overall parking garage structure currently has capacity to support itself without any danger of collapse. The existing deterioration observed appears to accelerating at a rapid pace even while unoccupied which results in a limited time frame in which the garage can remain without repairs and maintenance. Observed water intrusion, deterioration of the epoxy overlay system, and the high instance

of concrete debris on the floor slab indicates rapid deterioration over the past two years. A continued high rate of deterioration is expected.

If the parking structure is to remain unused for a period of time, Osborn recommends select repairs be completed within the next 6 months to prevent loss of capacity for design loads. This includes select repair of concrete at columns, beams, precast T joist stems, and slabs. These recommended repairs focus on primary structural members for moment and shear capacity at service levels.

In order to return the structure to use, additional structural repairs would be required at slabs and precast T joist stems. These repairs would focus on local elements for design loads at drive and parking areas. In addition, to slow the rate of deterioration of concrete elements and prolong the usable life of the structure, replacement/repair of the epoxy overlay waterproofing system and deteriorated drainage elements would be required to make re-use of the parking structure economically viable in the long term.

All concrete repairs should be performed with high performance repair mortars utilizing proper installation techniques. This includes the use of corrosion inhibiting bonding agents, cut in edges, supplement and replacement of corroded reinforcing steel, and top side joint sealants.

To prevent cracking and spalling at the precast T joints, the installation of FRP biscuits is recommended. These post installed T to T connectors are corrosion resistant and prevent rocking of the precast T's that is causing the systemic spalling observed along the joints. Preventing movement at these joints will provide greater efficacy of the epoxy overlay waterproofing system.

Other Recommendations:

To allow for reuse of the parking garage structure in lieu of demolition, several other observed elements would require remediation. Several of these elements are outside of the primary scope of this report but are included briefly to allow for a greater understanding of the work involved in reuse of the facility. In general, these elements are not included in the cost information provided in the limited opinion of probable cost section but may affect the feasibility of reuse of the structure.

Reuse of the structure would require updating the pedestrian guard system at the perimeter of the garage and at the gap between slabs at the interior ramp.

If the existing stair and elevator tower were to be reused, replacement of the existing hand and guardrails system would be required. In addition, installation of a new window/glazing system would be required at each level. At level 2, the stair would need to continue to grade for egress. Recommendations for mechanical, electrical, and architectural elements for this area are beyond the scope of this report.

Finalized demolition and renovations of the occupiable/non-parking area would also be required. This may include some required abatement. Recommendations for mechanical, electrical, and architectural elements for this area are beyond the scope of this report.

Electrical upgrades would be required throughout the garage, stair/elevator tower, and occupiable areas at level 1. The current electrical fixtures are obsolete and beyond their usable life. May elements were observed to be damaged or missing. A complete electrical upgrade would likely be required. Costs for this work are not included in this report.

An evaluation of mechanical equipment associated with garage ventilation, the occupiable area, and the elevators is not included in the scope of this report. Replacement of all system/equipment would likely be necessary as part of renovations. To utilize this garage as a revenue generator, parking and payment equipment would also be required. Recommendations and costs associated with these elements are not included in the scope of this report.

Limited Opinion of Rough Probable Structural Cost

The scope of this Hazzard Assesment report does not require cost information. Select information is incuded for informtional purposes only and should be used in conjunction with a total cost analysis for validation of the finacial feasability of reuse of the parking garage or stair/elevator tower structures. The rough order of magnitude costs below are typicaly limited to stuctural elements. See the recommendations section above for additional cost items for consideration. Additional costs beyond those discussed or provided in this report my exist.

Limited Opinion of Rough Probable Structural Costs (0-3 years)			
Cost Item	Estimated Units	Unit Cost	Cost
Column Spall (SF)	150	$ 100.00	$ 15,000.00
Beam Spall (SF)	400	$ 120.00	$ 48,000.00
Joist Stem Spall (SF)	200	$ 100.00	$ 20,000.00
Slab Spall (SF)	10800	$ 60.00	$ 648,000.00
FRP T to T Connectors (EA)	500	$ 120.00	$ 60,000.00
Precast Anchor Repair (EA)	25	$ 350.00	$ 8,750.00
Epoxy Overlay Repair/Maintenance	187000	$ 6.00	$ 1,122,000.00
Pedestrian Guard Modifications (LF)	3950	$ 120.00	$ 474,000.00
Total			$ 2,395,750.00

Notes:

1. Costs are expressed in 2022 dollars. Inflation and escalation have not been included in the cost estimates.
2. A premium cost of 10% to 15% over estimated costs is possible if a single work item is divided over multiple years due to budget constraints.
3. Figures are exclusive of any abatement of hazardous materials or revenue control system changes.
4. Engineering and other 'soft' costs are not included in the above and are typically 7-9% of the noted construction costs.
5. Osborn Engineering does not have control over the cost of labor, materials, or equipment, or Contractor's methods of determining prices, or over competitive bidding, market, or negotiating conditions. Accordingly, Osborn Engineering does not warrant or represent that bids or negotiated prices will not vary from any probable cost or evaluation prepared, or agreed to, by Osborn Engineering.

Photographs

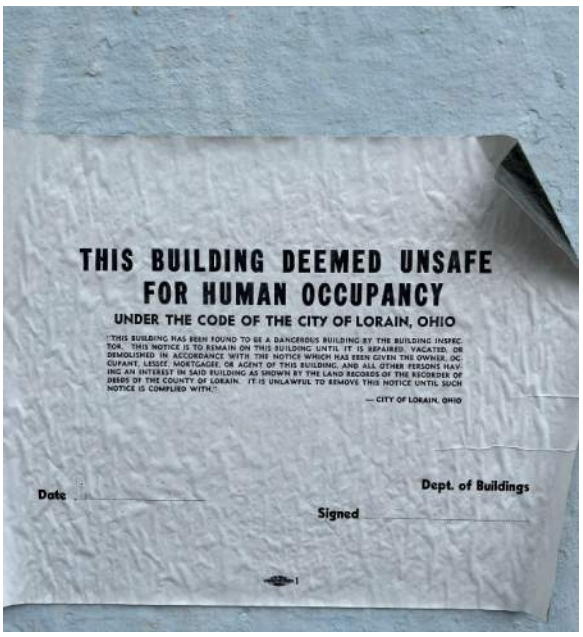


Photo 1: Posting of Unsafe condition for Human Occupancy by the City of Lorain Building Department.


Photo 2: Incomplete closure of fence at adjacent building to the north of the site.


Photo 3: Incomplete closure of fence at adjacent building to the north of the site.


Photo 4: Partially demolished hospital structure on the north side of the site. Exposed portions of embedded rebar and concrete falling hazards exist.

Photo 5: Rubble and debris on site. Open pits, exposed reinforcing, etc. may represent safety hazards.

Photo 6: Rubble and debris on site.

Photo 7: Rubble and debris on site. Exposed reinforcing, falling concrete, etc. may represent safety hazards.

Photo 8: Rubble and debris at partially demolished structure adjacent to parking garage. Falling concrete hazard observed.

Photo 9: Overall view of east face of elevator/stair tower. Broken window systems do not provide safety closure. Several fall and falling debris hazards exist.

Photo 10: South face of stair tower has two unsecured openings a previous entry to the demolished hospital. Dislodged low roof flashing exists.

Photo 11: Remaining portion of low roof flashing at east face of garage could fall.

Photo 12: Typical welded shut elevator lobby door (from inside garage).

Photo 13: Unsecured Elevator lobby door. Weld plate dislodged.

Photo 14: Unsecured elevator lobby door. Weld plate dislodged.

Photo 15: Detached weld plate at door jamb.

Photo 16: Broken out window system. Fall hazard at accessible area of elevator lobby.

Photo 17: Unsecured exist at bottom of stair at 2nd floor. Fall hazard to grade.

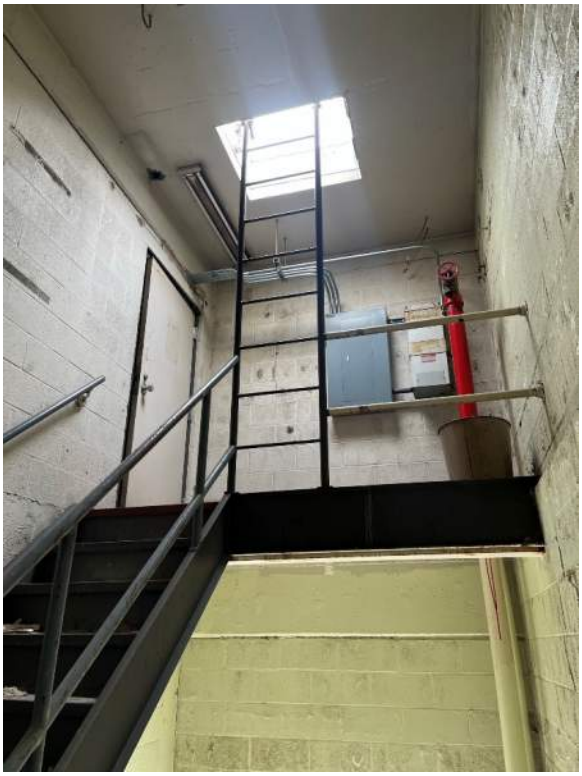


Photo 18: Unsecured roof access hatch at stair tower. Improper closure of hand/guardrail system.

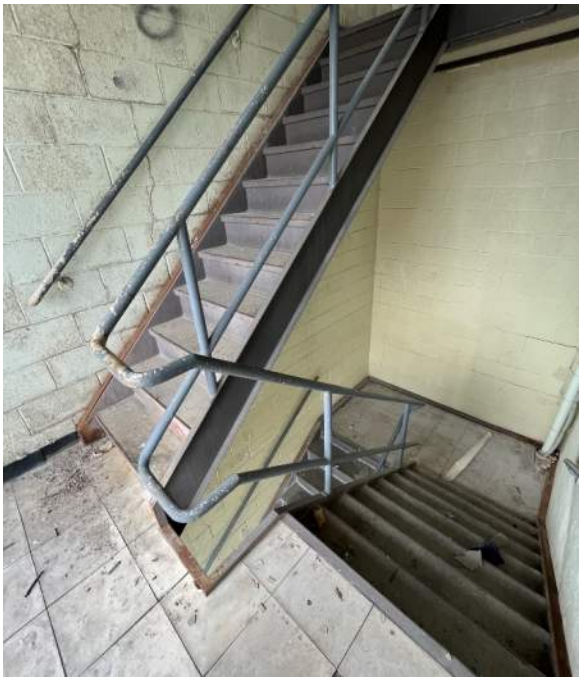


Photo 19: Improper closure of handrail system at stair.

Photo 20: Damaged door at mechanical area at level 1 mechanical room.

Photo 21: Typical moderate beam spall

Photo 22: Typical moderate to severe beam spall at joist bearing. Moderate joist stem spall.

Photo 23: Typical severe beam spall at bearing at column. Efflorescence from de-icing chemicals observed and corroded exposed reinforcing steel.

Photo 24: Typical severe beam spall at previous repair.

Photo 25: Severe beam spall with exposed corroded reinforcing. spalling of previous repair observed.

Photo 26: Spalling of beam at stirrups.

Photo 27: Typical moderate column spall.

Photo 28: Typical minor to moderate column spall.

Photo 29: Minor columns spall at corroded precast beam anchor.

Photo 30: Typical severe spall at joist stem. Exposed corroded reinforcing.

Photo 31: Typical delaminated joist stem.

Photo 32: Spall at joist stem bearing at previous repair mortar and corroded bearing plate.

Photo 33: Typical severe spall at joist stem. Exposed corroded reinforcing and embed plate. Spalling of previous repair mortar observed.

Photo 34: Spall at column and at joist flanges. Spalling of original and repair materials observed. Exposed corroded reinforcing observed.

Photo 35: Typical soffit spall at Precast T joint. Spalling of original and repair materials observed.

Photo 36: Severe spall of soffit/precast flange. Highly corroded exposed reinforcing.

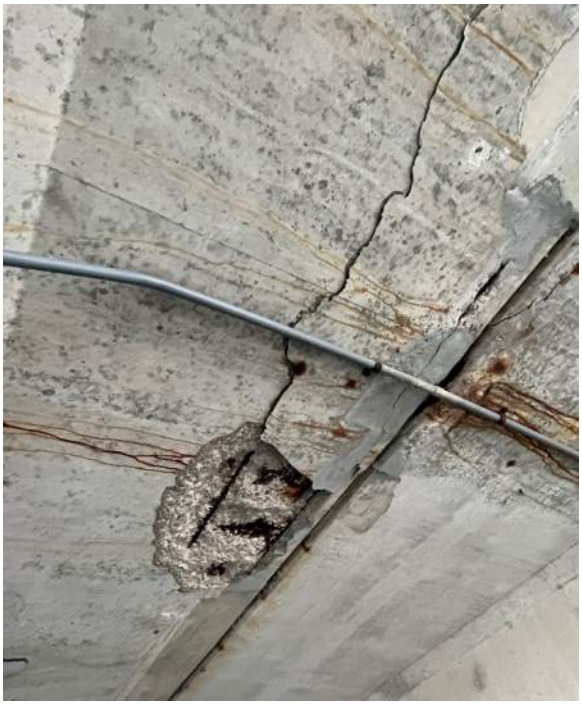


Photo 37: Typical soffit spall at Precast T joint.

Photo 38: Typical soffit spall at precast T joint.

Photo 39: Soffit spall with concrete debris below.

Photo 40: Precast T flange embedded steel connection.

Photo 41: Typical debris on slab at overhead spalls. Size of falling concrete debris represents safety hazard.

Photo 42: Typical debris on slab at overhead spalls.

Photo 43: Scaling of top of slab at lower section of garage. Start of newer coated area.

Photo 44: Heavy scaling of top surface of parking deck slab surface. Cracks with failed sealants observed.

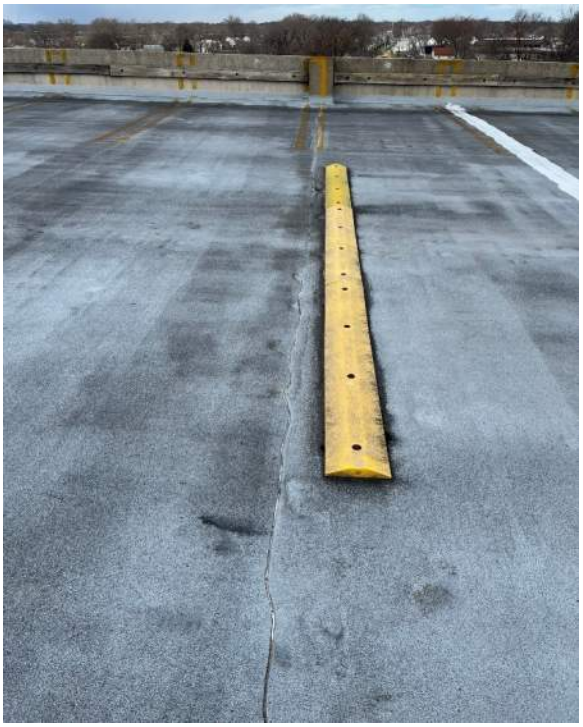


Photo 45: Typical condition of epoxy overly. Failed sealant at T to T joint crack.

Photo 46: Delaminated epoxy overlay with probable concrete spall below.

Photo 47: Delaminated epoxy overlay coating.

Photo 48: Epoxy overlay system cross section. Epoxy thickness is the result of going over highly scaled slab.

Photo 49: Spall in deck with standing water.

Photo 50: Entry area at slab on grade.

Photo 51: Entry/ramp area.

Photo 52: Observed area of ponding below drain above.

Photo 53: Observed area of ponding below drain above.

Photo 54: Spalling and deterioration of concrete at trench drain box. Exposed corroded reinforcing and previous repair martials visible.

Photo 55: Broken iron drainpipe.

Photo 56: Corroded through drainpipe with missing vertical section at occupied area.

Photo 57: Observed height of perimeter guard walls less than required by code (32” observed, 42” required) for pedestrian fall protection.

Photo 58: Improper closure at interior ramp vehicular guard rails. Fall Hazzard.

Photo 59: Fall hazard at interior ramps gap between slab sections.

Photo 60: Typical light fixture.

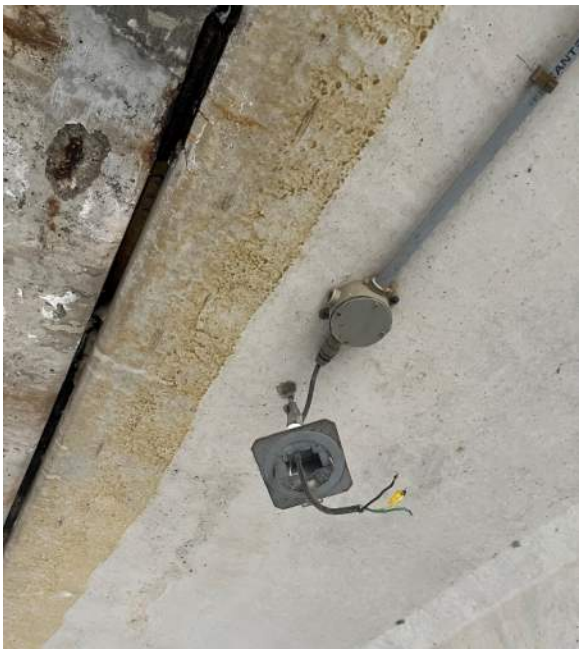


Photo 61: Missing light fixture with exposed wires.

Photo 62: Missing light fixture with detached box and exposed wires.

Photo 63: Damaged rooftop light fixture with exposed wires.

Photo 64: Missing rooftop light fixture with exposed wires.

Photo 65: Missing light on post at top level.

Photo 66: Existing condition of elevator machine room.

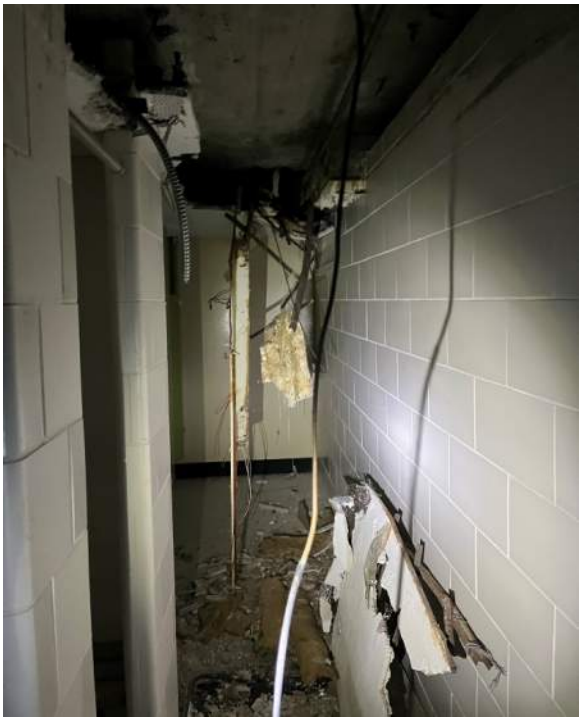


Photo 67: Partially demolished interior fixtures at previously occupied area. Exposed electrical wires and falling debris hazards.

Photo 68: Existing condition of previously occupied area. Mold probable on drywall finished areas.

Photo 69: Typical condition of previously occupied area. area. Water intrusion evident within insulation. Structure above not visible.

Photo 70: Typical condition of previously occupied area. Water intrusion evident within insulation. Structure above not visible.

Photo 71: Typical condition of previously occupied area. Mold probable on CMU wall.

Photo 72: Existing condition of previously occupied area restroom.