

# SDVines, PE

## Structural Engineer

April 15, 2022

[REDACTED]  
City of Griffin Public Works  
100 South Hill Street  
Griffin, Georgia 30223

RE: Griffin Parking Deck Assessment  
SDVPE Job No.: 22008

Per our agreement, I have completed an assessment of the in-place condition of the subject parking structure located at 100 South Hill Street, Griffin, GA. This letter, along with attached photographs, presents my findings and recommendations.

A visual inspection of the subject parking deck was performed on March 21, 2022. Present during the inspection were Dan Vines, P.E., Rob Schulten of Barnsley Construction, and [REDACTED] of Griffin Public Works. A second site visit was made by Dan Vines, P.E. and Rob Schulten on April 14, 2022, with the hope of observing where water accumulated during a rain event. The forecasted rain did not occur.

### **Background Information:**

Based on dates inscribed in some of the precast concrete fascia panels, the parking deck was constructed c. 1972 making it approximately 50-years old at the time of our inspection. Numerous repairs and modifications have been made to the precast concrete structure over the years, most notably the addition of welded structural steel brackets installed at columns to replace the original corbels supporting inverted tee beams.

A report relating to a visual inspection of the structure prepared by Willett Engineering Company, Inc. dated 5/31/2006 (WEC Project No. 26170) described the overall condition of the parking deck at that time to be "below average to poor." Approximately twenty (20) of the above-mentioned steel brackets were in place at that time, and the report notes that similar repairs may be needed in approximately fifteen (15) additional locations due to "corrosion of the steel bearing plates cast into the column [corbels]." This report also noted apparent deficiencies with the steel angle supporting guardrails on the upper level, clogged drains, deteriorated expansion joint covers, and an apparent lack of routine maintenance.

In 2021, IMMEC, Inc. completed an additional round of repairs to various components of the parking deck structure including installation of a steel saddle at a perimeter beam to column connection, a steel saddle at a double-tee girder connection, and steel brackets two beam-column connections. Other repairs and modifications conducted at this time included a new perimeter cable rail system, reinforced fascia panel connections, grouting of beam to column connections, and patching of spalled concrete surfaces. A record set of drawings indicating the work completed was issued by IMMEC, Inc. on 12/15/2021. References to parking structure levels and gridlines noted in this report are based on those drawings.

Bill Thornton, P.E., of IMMEC, Inc. also produced a letter to [REDACTED], Public Works Director for the City of Griffin, dated 12/23/2021 which outlined additional required repairs that were outside IMMEC's scope. Items addressed in this letter included replacement of damaged/deteriorated expansion joints, repair/patching of cracks in the deck topping slab, patching additional spalled concrete areas where rebar is exposed, and coating/sealing the upper levels of the deck to prevent water intrusion.

**Observations:**

Observations were limited to visual examinations and measurements of accessible portions of the subject property. Removal of finish materials, qualitative testing, excavation, or other work not specifically described herein was not conducted.

Observations were photographed to document distress and relevant conditions at the subject property on the date of the site visit. Not all damage or distress that may be present was necessarily observed or photographed; however, the selected photographs provide an indication of their types, severity, and distribution. They may also document unusual or contributing conditions that may exist. Photographs captured to document findings and observations are attached to this report. During this investigation, the following observations were made:

- Continuous concrete curbing has been installed on the deck slab surface in many locations, generally at the heads of parking spaces. It appears that this intended to act as wheel-stops to prevent vehicles from impacting the fascia panels or railings. In many areas, these curbs are trapping rainwater and runoff and/or redirecting it away from area drains. Without a proper outlet, much of the rainfall that impacts the deck is running off between the ramps or over the edges. This appears to be the source of much of the observed steel corrosion and concrete deterioration noted below.
- Some area drains on the surface of the deck are currently, or have until very recently, been clogged with debris. During our initial inspection, [REDACTED] stated that city staff has been working recently to clear some of these drains and install new ones. One drain near the southeast corner of Level 3B appeared to have been clogged with "sandy" material from deterioration of the topping slab. Without adequate, functional drainage, rainwater runoff spills, uncontrolled, onto lower levels leading to steel corrosion and concrete deterioration.
- Decades of vehicular traffic, freeze-thaw cycles, and normal wear and tear have significantly degraded the surface of the concrete topping slab on the upper levels. As noted above, this seems to be the source of at least some of the debris that has clogged area drains. While all concrete is porous, the upper surfaces of slabs, when new, are less so due to densification from the troweling and finishing process. The topping slabs at the subject parking deck no longer have such water resistance. A fair amount of rainwater, even in locations where the slabs actually drain, will seep into the concrete matrix and cause corrosion of the steel reinforcing.
- The expansion joints on all levels have failed and are no longer watertight. This permits water from upper levels to impact lower levels.
- Spalled concrete at the surface of structural members is widespread throughout the parking deck. This type of damage is caused when water repeatedly penetrates the member and

causes corrosion of the reinforcing steel. When steel rusts, it increases in volume leading to stresses which eventually cause the concrete cover to spall or break off. Spalling is generally more pronounced on lower levels. The worst area observed is at the underside of Level 1A along the western edge of the structure.

- Steel brackets were installed at numerous column-beam joints on all framed levels as noted above. Some of these brackets were of galvanized steel, while others were of painted, plain steel. Many of the plain steel brackets exhibited peeling paint and surface corrosion.
- A handful of the reportedly re-grouted connections by IMMEC have gaps between the grout and the supported member. It appears that the wrong grout mix or mix proportions may have been used leading to shrinkage. These locations should result in a call-back for IMMEC to re-grout.
- Aluminum guardrails between ramps along the centerline of the deck are loose or broken in places. At least one guardrail on Level 2 was reportedly damaged by a recent vehicle impact. Cable railing was recently added to the outer perimeter of the deck at all levels by IMMEC, but the interior guardrails were not addressed.

**Recommendations:**

With an age of approximately 50-years and a history of deferred maintenance, the parking deck structure has reached or is rapidly approaching the end of its useful life. As documented above, numerous significant structural repairs have been performed over the past several years. While these have bought some time, the main destructive issue, uncontrolled water intrusion, has continued to cause deterioration. With that said, the following repair and maintenance items will help to mitigate further damage in the short term. They are presented in the order I believe will provide maximum benefit with least up-front cost. While each will contribute to lessening or slowing the ongoing deterioration of the structure, none of these repairs are intended or expected to extend its lifespan by more than a few years.

- 1) Existing area drains must be cleaned so that they flow freely and maintained in such a condition. Additional drains should be installed in locations where rainwater and runoff currently accumulate. Observation of the deck during a rain event will provide clues as to where additional drains may be effective. Additional observations of the behavior of runoff during a rain event would be required to provide guidance as to where additional drains will be most beneficial.
- 2) The existing concrete curbs/wheel-stops need to be reworked so as not to trap or redirect water away from area drains. This can be as simple as removing sections of the wheel-stops where they are not required as a vehicle barrier and providing relief cuts or penetrations along their length where they must remain in place. Additional observations of the behavior of runoff during a rain event would be required to provide guidance as to where modifications to the curbs will be most beneficial.
- 3) The expansion joints on all levels should be replaced.
- 4) The upper-level slabs which are directly impacted by rainwater should be coated with a waterproof traffic coating to prevent migration of water to the lower levels and supporting structure.

- 5) Guardrails along the interior edges of the ramps not addressed by IMMEC should be replaced. Cable railing attached to the concrete columns will be adequate for the lower levels. At the upper levels (Level 3B and Level 4A) standard steel pipe railing should be used.

**Budget Analysis**

I have consulted with Barnsley Construction to provide rough budget numbers for the some of the above repair items. Note that this report does not constitute a quote or proposal for these services. The budget numbers presented are intended solely for the city to determine whether the repairs are worthwhile given the age and overall condition of the structure.

Replace expansion joints	300 lin. ft.	\$63,000
Clean and coat upper-level slabs	26,000 sq. ft	\$170,000
Repair concrete spalls	approx. 100 ea.	\$15,000
Replace guardrail with cable rail	800 lin. ft.	\$80,000
Replace upper-level guardrails	200 lin. ft.	\$20,000

It is assumed that removing/reworking concrete wheel stops and cleaning/adding area drains can be accomplished by city maintenance personnel.

As noted, the proposed repairs are temporary “band-aids” intended to stretch the lifespan of an already deteriorated structure. It is my opinion that this parking deck has no more than a few years of serviceable life remaining. Based on the current construction market, we estimate that a like replacement will cost on the order of \$16 million including design fees, demolition of the existing structure, and traffic control equipment.

I appreciate the opportunity to provide consulting services related to this matter. Please contact me if you have any questions about the contents of this report or if I can be of any further assistance.

Sincerely,



Sherman D. “Dan” Vines, P.E., S.E.

## SITE PHOTOGRAPHS



Photo No. 1: Overview of Level 4A and north end of Level 3B – note concrete curbing and island



Photo No. 2: Area drain isolated by concrete curbing at southeast corner of Level 4A



## SITE PHOTOGRAPHS



Photo No. 3: Overview of Level 3B (view facing south down ramp)



Photo No. 4: Area drain at southeast corner of Level 3B reported to have been recently cleared of sandy, granular debris



## SITE PHOTOGRAPHS



Photo No. 5: South end of Level 3 (view facing west)



Photo No. 6: Concrete curbing/wheel stop at Level 3 near grid line J-2 – note section of curbing previously cut out and addition of concrete at edge of ramps



## SITE PHOTOGRAPHS



Photo No. 7: Alternate view of concrete added at edges of Level 3 ramps shown in Photo 6 above



Photo No. 8: Existing (right) and newly installed drains at Level 3 near gridline K-2



## SITE PHOTOGRAPHS



Photo No. 9: Area drain near northwest corner of ramp at Level 3A

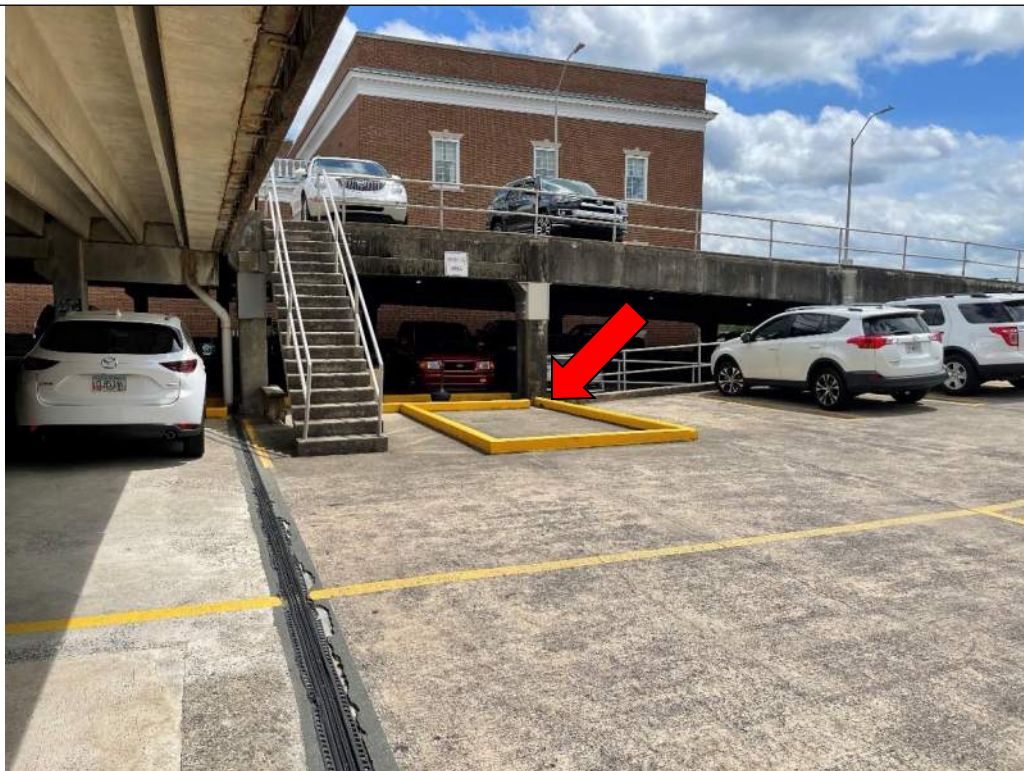


Photo No. 10: Concrete curbing installed near northeast corner of ramp at Level 3A – arrow indicates location of partially isolated drain shown in Photo 11 below



## SITE PHOTOGRAPHS



Photo No. 11: Partially isolated area drain at location shown in Photo 10 above



Photo No. 12: Partially isolated area drain at level 3A west of column at gridline B1

## SITE PHOTOGRAPHS



Photo No. 13: North end of Level 3A looking toward Level 2B

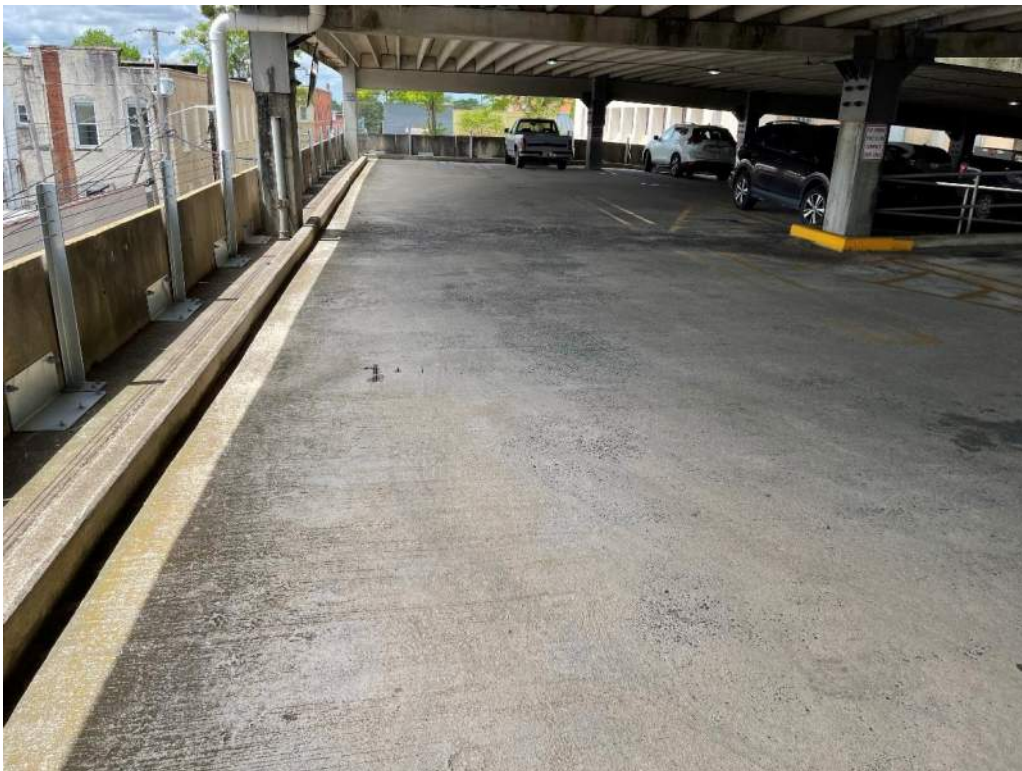


Photo No. 14: South end of Level 2B looking west toward Level 2A



## SITE PHOTOGRAPHS



Photo No. 15: Level 2B ramp up – view facing north

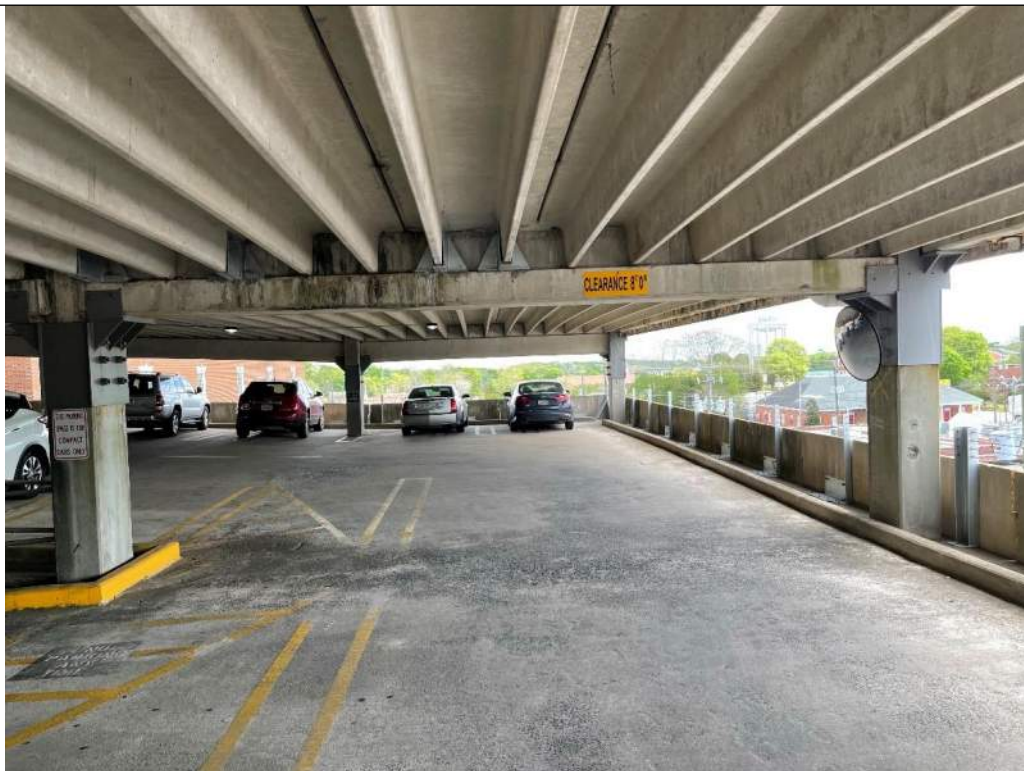


Photo No. 16: South end of Level 2A facing east toward Level 2B – note galvanized steel brackets supporting ends of double tees

## SITE PHOTOGRAPHS



Photo No. 17: Level 2A ramp (view facing north)

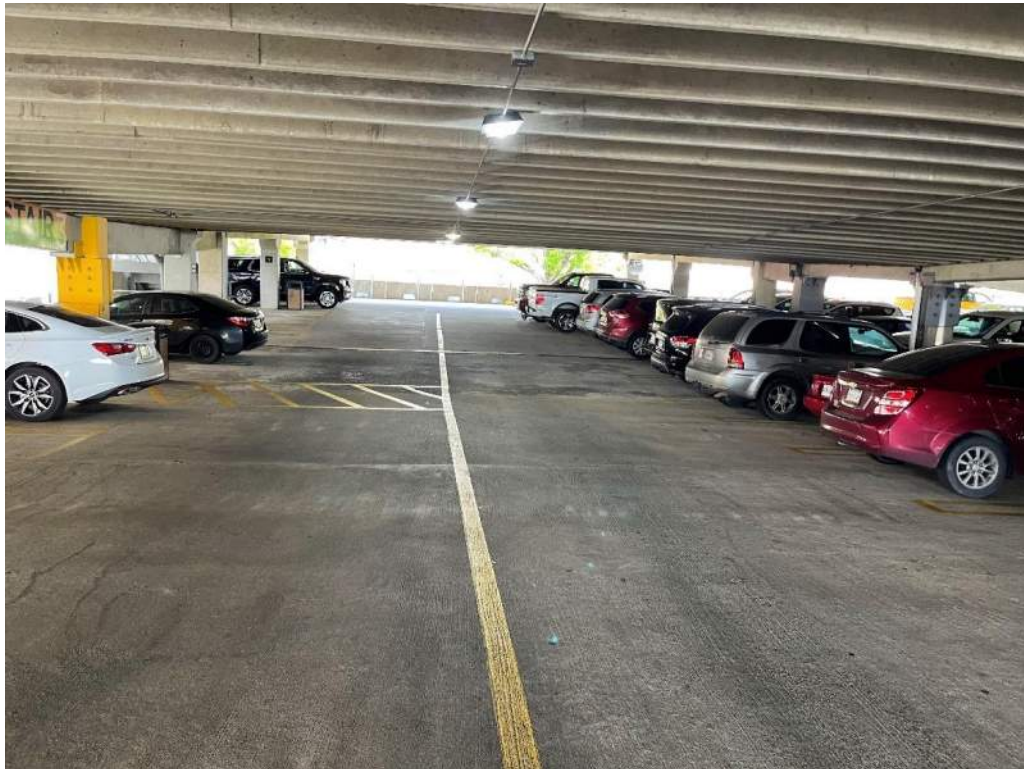


Photo No. 18: Level 2A ramp (view facing north)



## SITE PHOTOGRAPHS



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Photo No. 19: Partially isolated area drain at Level 2A west of column at gridline D-1

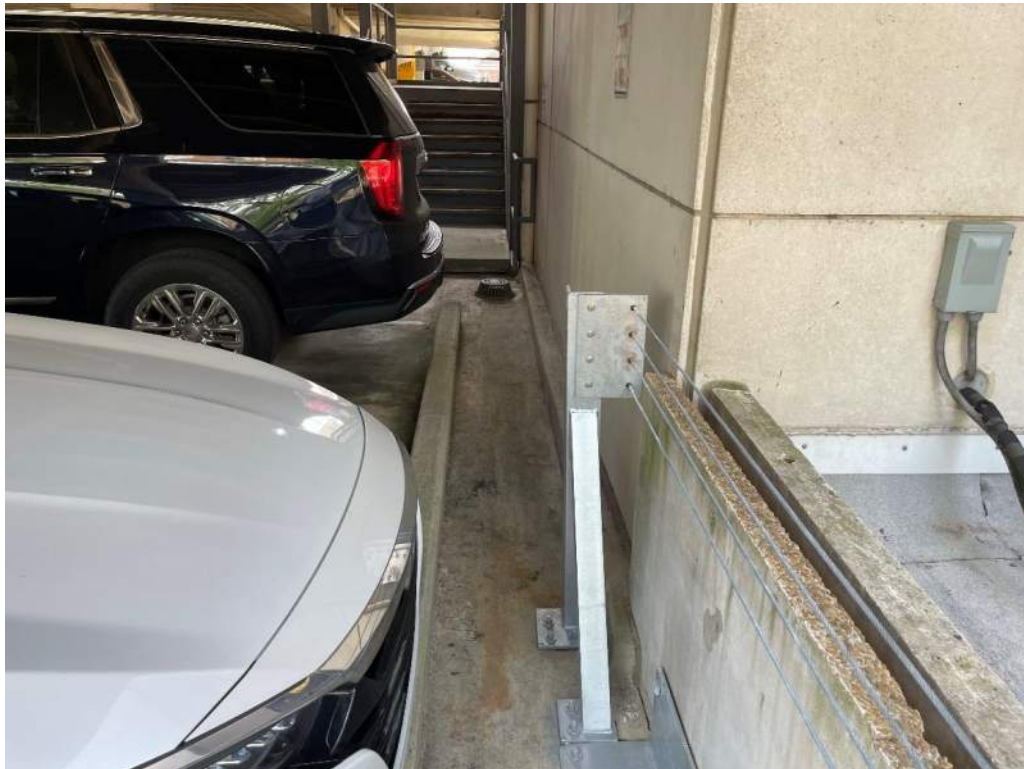


Photo No. 20: Partially isolated area drain at Level 2A west of column at gridline B-1



## SITE PHOTOGRAPHS



Photo No. 21: Level 2A facing east toward Level 1B



Photo No. 22: Level 1A ramp – view facing north toward on-grade portion of deck structure

## SITE PHOTOGRAPHS



Photo No. 23: Corroded bracket supporting Level 2 framing at gridline 2-D



Photo No. 24: Corroded bracket supporting Level 2 framing at gridline 2-F



## SITE PHOTOGRAPHS



Photo No. 25: Typical failed expansion joint – Level 3A shown

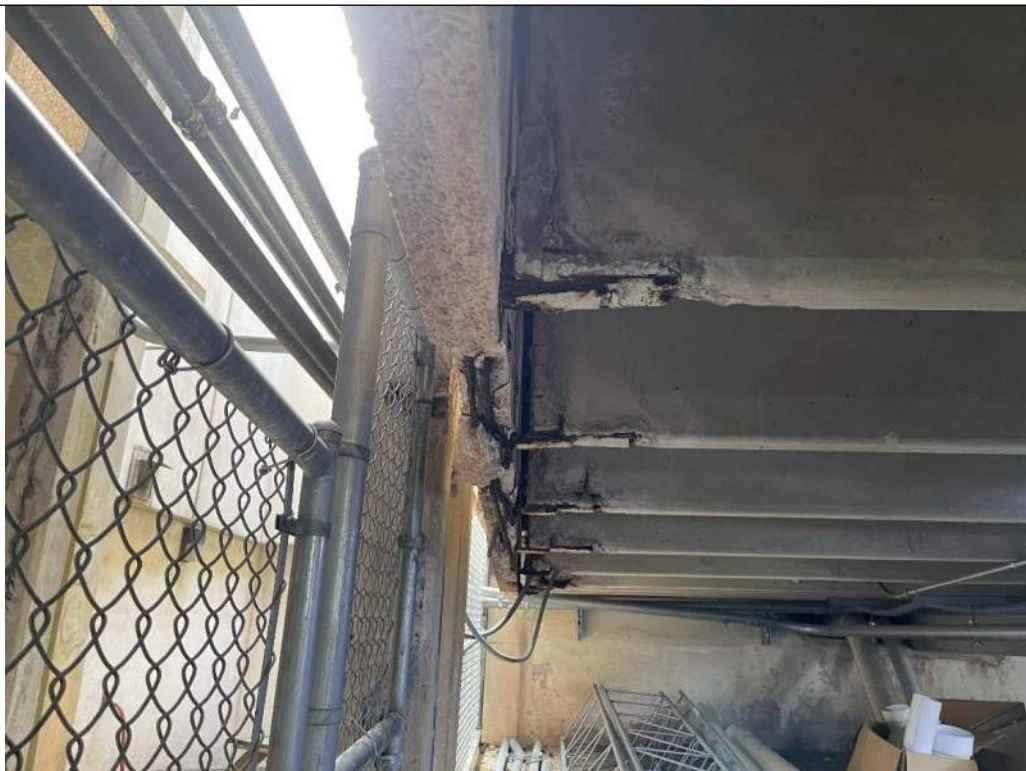


Photo No. 26: Spalling concrete and corroded reinforcing steel at underside of Level 1A along west edge of structure



## SITE PHOTOGRAPHS



Photo No. 27: Enlarged view of area shown in Photo 26 above



Photo No. 28: Spalled concrete on west face of concrete column at gridline 1-E below Level 1A

## SITE PHOTOGRAPHS



Photo No. 29: Gap at recently grouted steel bracket



Photo No. 30: Aluminum guardrail along west edge of Level 3B

## SITE PHOTOGRAPHS



Photo No. 31: Spalled/failing concrete at guardrail post