**Larson Engineering, Inc.**
118 S. Clinton Street, Suite 250
Chicago, IL 60661-5775
312.345.0540 Fax: 312.332.1484
www.larsonengr.com

Larson

May 17, 2016

Mr. Fred Preuss
Oak Park River Forest High School
201 North Scoville Avenue
Oak Park, IL 60302

Re: Parking Garage Visual Observation Report
Oak Park & River Forest High School
Oak Park, IL
LEI Project No: 21160231.000

Dear Mr. Preuss:

Pursuant to your request, Larson Engineering, Inc. (LEI) performed a limited visual observation of the parking garage structure at the address listed above on May 4, 2016. The purpose of our visit was to provide an opinion regarding the structural condition of the concrete parking garage structure. The parking garage has three levels; one garage level is at grade, one level is below grade, and one level is elevated above grade. The garage is also split into two halves, a north half and south half. The main entrance is at street level at the east end of the garage. The north half of the garage consists of two inclined ramps. One north-side ramp begins at grade at the east end of the ramp and terminates one story above grade at the west end; the other north-side ramp begins at grade at the west end of the ramp and terminates one story below grade at the east end. The south half of the ramp consists of two non-inclined parking surfaces; one surface is located at grade and the other is located one story above grade. The east and west ends of the ramps are not inclined and serve to link the ramps on the north half of the ramp with the flat surfaces on the south half. Please see attached for a reference plan of the parking garage.

## Observations

1. Deteriorated and/or damaged sealant was observed at the underside of the precast double-T beams along the joints between sections (photo 01). This observation was typical through the structure. In multiple locations open joints between sections were observed. Adjacent to the areas of damaged sealant, water damage and peeled paint were typically observed (photo 02). At multiple areas throughout the structure chipped and peeling paint was observed on the concrete structure in what appeared to be water damage.

2. Spalled and cracked concrete was observed at multiple corbels throughout the structure. We also observed corrosion at the steel embed plate supporting the precast double-T beams at the corbels (photo 03). At multiple corbels on the north side of the parking garage, the double-T section was only partially bearing on the corbel (photo 04).
3. At four (4) locations on the north side of the parking garage, steel saddles were used to anchor the double-T sections to the precast walls in lieu of the concrete corbels provided elsewhere. All of the steel saddles were corroded (photo 05).

4. Spalled and cracked concrete was observed at a perimeter beam support on the lower level of the north side of the parking garage. The spalled and cracked concrete was observed directly adjacent to anchor bolts connecting the beam to a steel angle (photo 06). We also observed spalled concrete at the underside of multiple perimeter beams (photo 07).

5. Corroded steel connector plates were observed at the precast double-T beam joints as well as at the expansion joints (photo 09). This observation was typical throughout the structure with the steel plates displaying varying levels of corrosion. The steel connector plates were generally only visible when the joint sealant was deteriorated or missing. In some locations we observed local areas of spalled concrete in the precast beam flange adjacent to the corroded steel plates. Exposed and corroded rebar were also observed at multiple areas of spalled concrete in the double-T beam flanges (photo 08).

6. Corroded steel angles were observed at the ends of multiple perimeter concrete beams throughout the parking garage (photo 10). Corroded steel shelf angles were also observed at multiple spandrel beams (photo 11). At one end of a perimeter concrete beam on the lower level of the north side of the parking garage, we observed missing anchor bolts at the steel angle that anchors the beam to a concrete column (photo 12).

7. Corroded stair treads and handrails were observed at the stairway connecting the lower level on the north side of the garage to the ground level segment on the south side of the garage (photo 13). Corroded stair treads, landings, stringers and guardrails were also observed at the stair towers; however, the corrosion at these locations was not as severe (photo 14).

8. Forty-five degree shear cracks were observed at the ends of the precast spandrel panels on the north wall at the upper garage level. Some of the cracks appear to have been sealed or repaired at some point in the past (photo 15). Similar cracks were also observed at a spandrel beam on the north wall at the lower garage level.

9. Local areas of exposed and corroded rebar were observed at multiple locations on both the interior and perimeter concrete walls (photo 16). We also observed local areas of exposed and corroded rebar in the precast double-T beam flanges when viewing the flanges from the end of the member (photo 17).

10. A crack in the west interior precast wall at the upper level of the garage was observed. Shrinkage cracks at the top of the foundation wall were observed at multiple locations along the center walls of the garage. Cracks in the foundation walls were also observed in multiple locations (photo 18).

11. We observed minor chips and spalls at various locations on top of the concrete deck and at the concrete coping. Local areas of spalled concrete were also observed at several columns and interior walls; each area of spalled concrete was smaller than 3 square feet, and rebar generally was not exposed (photo 19).

12. Damaged or deteriorated sealant and open sealant joints were observed at multiple locations at the concrete coping panels (photo 19). Open sealant joints were also observed

at multiple wall-to-column and deck-to-column interface locations throughout the garage, as well as at multiple locations at the brick façade on the south face of the parking garage.

13. Several areas of deteriorated mortar were observed at the brick façade on the southwest sign tower. Step cracks were observed at the brick façade on the south and west faces of the parking garage (photo 20).

14. Varying levels of corrosion were observed at the guardrails that run along the centerline of the parking garage on both the upper and lower levels, as well as at the guardrail that runs along the lower north garage wall. At one location on the upper level of the garage, a guardrail was damaged and was partially detached from the garage structure (photo 21).

15. Anchor bolts were corroded at multiple locations at the northeast section of the upper garage level, as well as at one location at the ground level south garage wall (photo 22).

16. Three (3) corroded bollards were observed at various locations within the parking garage (photo 23).

17. The door and elevator frames at the northeast and southeast stair towers were corroded (photo 24). The door frames at the northwest and southeast mechanical room entrances were also corroded. We also observed deteriorated sealant at the door frame on the upper level northwest stair tower. The paint on the steel canopy at the northeast stair tower on the upper level was peeling and chipping (photo 25).

18. In two (2) locations a corroded steel plate was observed at the underside of a drain location (photo 26). Corroded mechanical and electrical conduits were also observed at the west end of the lower garage level (photo 27).

19. Areas of efflorescence were observed at the brick façade at the interior face of the southeast utility room as well as at the interior face of the southwest sign tower (photo 28).

20. Where the precast double-T beams penetrated the façade of the northeast and northwest stair towers, flashing was observed around the perimeter of the T-beam penetration; however, no sealant was observed at the flashing (photo 29).

**Recommendations and Estimated Probable Construction Repair Quantities**

1. Sealant at precast double-T beams should be replaced. Damaged or deteriorated sealant at coping panels as well as at deck-to-column interface locations and wall-to-column interface locations should be replaced. The damaged and deteriorated sealant appears to be causing paint to peel and chip at the precast double-T sections and spandrel beams at the underside of the deck. The peeled and chipped paint at concrete beams did not appear to be indicative of any structural deficiencies. If required for aesthetic purposes, areas of damaged paint can be scraped and repainted.
   **Estimated Length of Sealant Repair: 7800 LF**

2. Spalled and cracked concrete corbels should be patched and repaired with an approved patching compound. Remove all loose concrete including chipping at reinforcement,

clean and remove any corrosion, prime and paint any exposed or corroded rebar or corroded embed plates with a rust-inhibitive paint prior to patching the adjacent concrete. If significant section loss occurs at rebar or embed plate, or if delamination is observed, the rebar section or embed plate should be replaced.
**Estimated Area of Concrete Patching: 100 SF**
**Estimated Quantity of Corbel Rebuilds: 15 EA.**

At corbel locations where the bearing width of the double-T section is less than 2/3 of the width of the double-T web, rebuild the corbel and reinforce with a steel saddle.
**Estimated Quantity of Corbel Replacements: 2 EA.**

3. Corroded steel saddles should be cleaned and removed of any corrosion. Saddles should then be primed and painted with a rust-inhibitive paint. If significant section loss occurs, or if delamination is observed, the steel saddle should be replaced.
**Estimated Quantity of Steel Saddle Replacements: 1**
**Estimated Area of Scrape/Prime/Paint: 20 SF**

4. The damaged end of the concrete girder at the lower level of the north side of the parking garage should be repaired. Concrete should be chipped away in the girder section adjacent to the damaged section to determine the extent of the damage and to identify any areas of rebar corrosion. The full scope of repairs can be assessed once this is complete.
**Partial Girder Reconstruction Quantity: 1**

   Local areas of spalled concrete at the perimeter beams where rebar is exposed should be patched and repaired with an approved patching compound. Loose concrete should be removed. Exposed and corroded rebar should be cleaned and any corrosion should be removed. Exposed rebar should then be primed and painted with a rust-inhibitive paint prior to patching the surrounding concrete.
**Estimated Area of Concrete Beam Patching: 20 SF**

5. Corroded steel connector plates at expansion joints should be cleaned and any corrosion removed, plates should then be primed and painted with a rust-inhibitive paint. If significant section loss occurs, or if delamination is observed, the plate should be replaced. Areas of light corrosion observed at double-T joint connector plates and spandrel beam shelf angles should be cleaned and painted with a rust-inhibitive paint where needed. The areas of corrosion at the double-T joint connector plates in some locations appear to be resulting in local areas of concrete spalling at the precast double-T flanges and should therefore be addressed to prevent further damage to the concrete.
**Estimated Expansion Joint Plate Replacement: 6 EA.**

   Spalled concrete at precast double-T beam flanges should be patched and repaired with an approved patching compound. Loose concrete should be removed. Any exposed rebar should be cleaned and any corrosion removed, exposed rebar should then be primed and painted with a rust-inhibitive paint prior to patching the surrounding concrete. Areas of minor spalling where rebar is not exposed may not require patching.
**Estimated Area of Precast Double-T Beam Patching: 65 SF**

6. Corroded steel end angles anchoring concrete spandrel beams to concrete columns should be cleaned and any corrosion removed, angles should then be primed and painted with a

rust-inhibitive paint. If significant section loss of the angle occurs, or if delamination is observed, the angle should be replaced.
**Estimated Area of Scrape/Prime/Paint: 20 SF**
**Estimated Quantity of L6x6x3/8x0'-6" Replacement: 4 EA.**

Corroded or missing anchor bolts should be replaced.
**Estimated Quantity of Anchor Bolt Replacement: 6**

7. Corroded stair treads and stair stringers at stairway connecting ground-level and lower-level of parking garage should be replaced due to observed delamination of the steel. Steel delamination is indicative of significant section loss and warrants replacement.
**Estimated Area of Steel Tread Replacement: 100 SF**
**Estimated Length of 12" Steel Stringer Replacement: 50 LF**

   Stair treads and stringers at the stair towers were lightly corroded; however, it is LEI's opinion that no structural repairs are required at these locations at this time. LEI recommends that the stair treads and stringers be cleaned and painted with a rust-inhibitive paint.

8. Diagonal shear cracks at spandrel panels should be epoxy injected with an approved epoxy-injection repair compound to prevent water infiltration. It is LEI's opinion that the cracks are not indicative of a structural deficiency; however, the cracks should be sealed to prevent water infiltration and further widening of the cracks which could result in structural damage over time.
**Estimated Length of Epoxy-Injection Repair: 650 LF**

9. Local areas of exposed, corroded rebar at concrete walls and at double-T beam flange ends should have all loose concrete elements removed and rebar should be cleaned and any corrosion removed. Exposed rebar should then be primed and painted with a rust-inhibitive paint. The concrete should then be sealed or patched with an approved sealant or patching compound.
**Estimated Area of Rebar Repair: 20 SF**

10. Cracks in the foundation walls should be epoxy injected with an approved epoxy-injection repair compound to prevent water infiltration. It is LEI's opinion that the cracks are due to shrinkage of the concrete and are not indicative of a structural deficiency; however, the cracks should be sealed to prevent water infiltration and further widening of the cracks which could result in structural damage over time.
**Estimated Length of Epoxy-Injection Repair: 325 LF**

11. It is LEI's opinion that the minor chips and spalls observed at various locations at the top of the concrete deck, the concrete coping, and at multiple columns and interior walls where rebar are not exposed are not indicative of a structural deficiency and do not require a repair at this time.

12. See Recommendation #1 for sealant repair requirements.

13. Areas of deteriorated mortar at the brick façade on the southwest sign tower should be repointed. Repointing should be applied at all locations of cracked, loose, missing or

deteriorated mortar. Proper repointing should include the contractor grinding out existing mortar prior to pointing with new mortar that matches the existing mortar. The step-cracks observed on the south building façade and the resulting open mortar joints appear to be caused by differential deflection of the supporting spandrel relative to the adjacent column. Pointing the open joints in this area will result in wider mortar joints at the step-crack locations which may not be aesthetically acceptable. If this is the case, this section of the brick facade will need to be removed and replaced. LEI has not included the replacement of this section of the brick façade in this report.
**Estimated Area of Repointing: 20 SF**

14. Excessively corroded or damaged guardrail segments should be replaced.
    **Estimated Length of Guardrail Replacement: 40 LF**

15. See Recommendation #6 for anchor bolt repair/replacement requirements.

16. Corroded bollards should be cleaned and any corrosion should be removed. Exposed steel should be primed and painted with a rust-inhibitive paint.
    **Estimated Quantity of Bollard Replacement: 3 EA.**

17. Corroded door and elevator frames should be cleaned and any corrosion should be removed. Door and elevator frames should then primed and painted with a rust-inhibitive paint to prevent further corrosion.
    **Estimated Area of Scrape/Prime/Paint at Door Framing: 15 SF**

18. Replace corroded steel plates at drain locations.
    **Estimated Quantity of Steel Plate Replacement (Approx. 10x10x1/8" Plate): 2 EA.**

    Replace corroded conduit.
    **Estimated Length of Conduit Replacement: 30 LF**

19. Areas of efflorescence should be cleaned and removed.
    **Estimated Area of Efflorescence Removal: 130 SF**

20. Sealant should be applied around flashing at double-T beam penetrations.
    **Estimated Length of New Sealant: 15 LF**

Observation items 2 and 4 represent structural deficiencies that should be addressed to ensure the short-term integrity of the parking structure. The remaining observation items do not necessarily indicate structural deficiencies; however failure to address these items in a timely manner could result in compounding issues that could eventually have a negative impact on the structural integrity of the parking garage.

In addition to the recommendations listed above, LEI recommends that the owner or someone on behalf of the owner visually survey the parking structure for issues such as those listed above on a regular basis, at least annually. Issues that develop such as those listed above should be repaired immediately to minimize the potential of developing more extensive repair needs.

If the above repairs are implemented in a timely manner, it is LEI's opinion that the working life expectancy of the parking garage structure will be at least 10 more years. If the above repairs are

implemented in a timely manner and a regular inspection and maintenance schedule is adhered to, it is LEI's opinion that the working life expectancy of the parking garage structure will be approximately 25 years.

**Opinion of Probable Construction Cost**

| | |
|---|---|
| Sealant Repair/Replacement: | $118,000.00 |
| Concrete Epoxy-Injection Repair: | $98,000.00 |
| Concrete Patching: | $19,000.00 |
| Steel Repair/Replacement/Repainting: | $21,000.00 |
| Misc. Repair (Bollards, Brick Repair, Conduit, etc.) | $15,000.00 |
| | $271,000.00 |

Note:

The following items are not included in the above Opinion of Probable Construction Cost:

- Repainting of concrete due to water damage or chipped/peeling paint,
- Concrete girder repair at damaged girder on the lower level at the north side of the garage,
- Cleaning and repainting of lightly corroded steel elements.

In providing Opinions of Probable Construction Cost, the Client understands that Larson Engineering, Inc. has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of Probable Construction Cost provided herein are to be made on the basis of Larson Engineering, Inc.'s qualifications and experience. Larson Engineering, Inc. makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

The opinions stated in this report are based on limited visual observations only. No physical testing was performed and no calculations have been made to determine the adequacy of the structural system or its compliance with accepted building code requirements.

If you have any further questions regarding this matter, please feel free to contact our office.

Sincerely,
**Larson Engineering, Inc.**

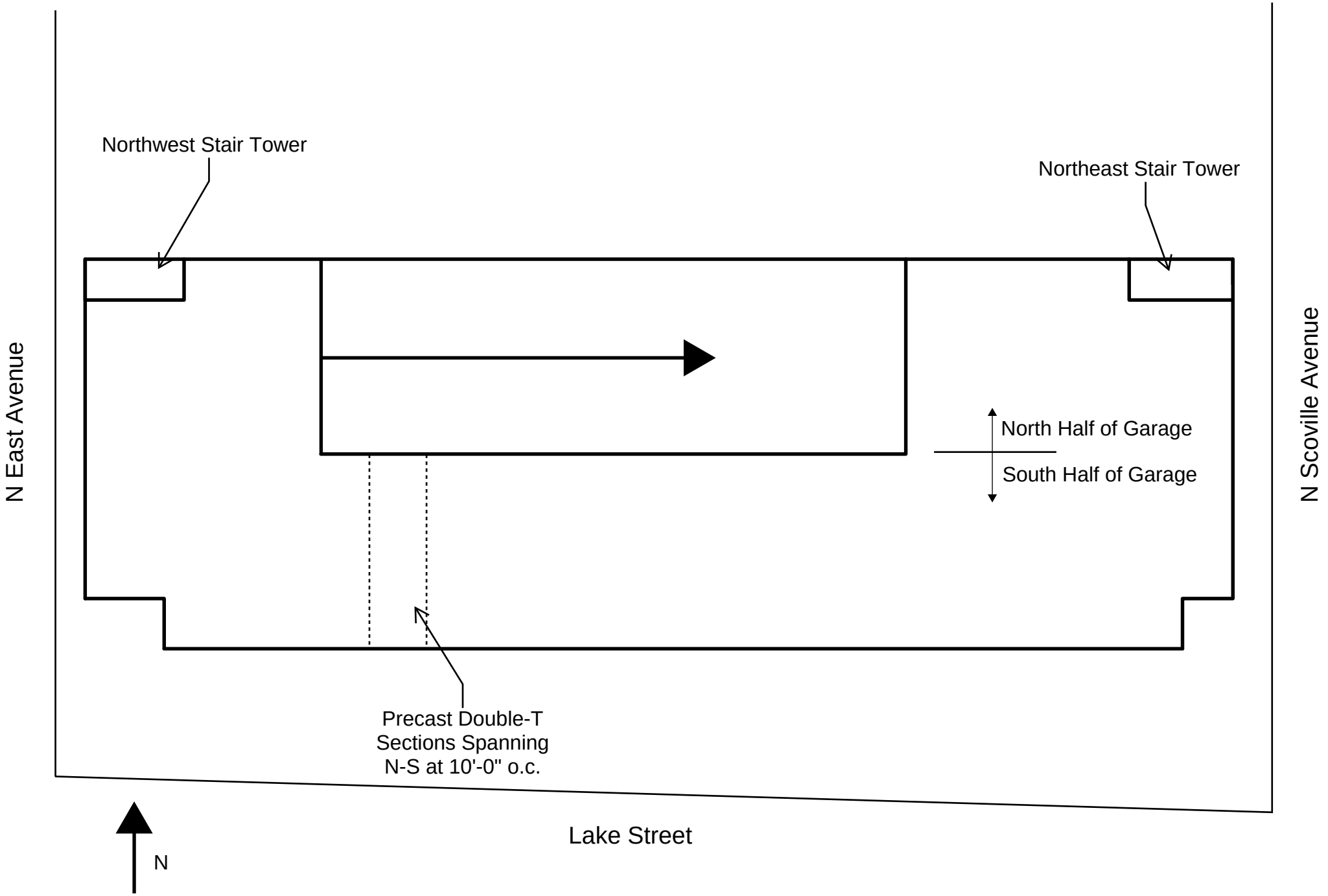
Dustin P. Witte
Engineer III – Structural
dwitte@larsonengr.com

Nancy H. Ferrini, S.E.
Senior Project Manager – Structural
nferrini@larsonengr.com

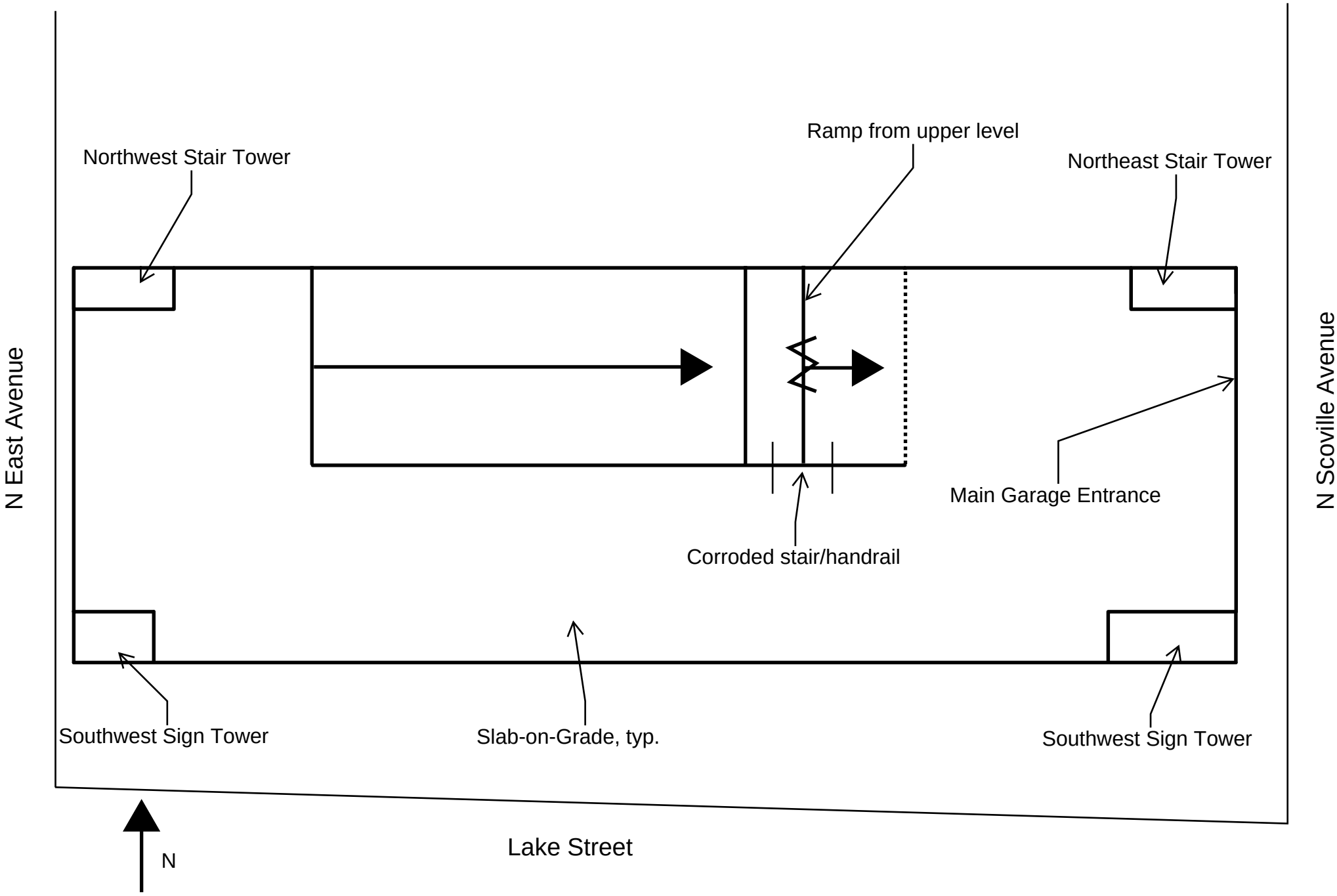

5/17/2016
Exp. 11/30/2016

DPW:slr

Attachment




Parking Garage Plan - Upper Level




Parking Garage Plan - Lower Level

01
Deteriorated sealant at double-T joint

02
Water damage and peeled paint

03
Spalled and cracked corbel with corroded embed plate

04
Double-T partial bearing at corbel

Larson Engineering

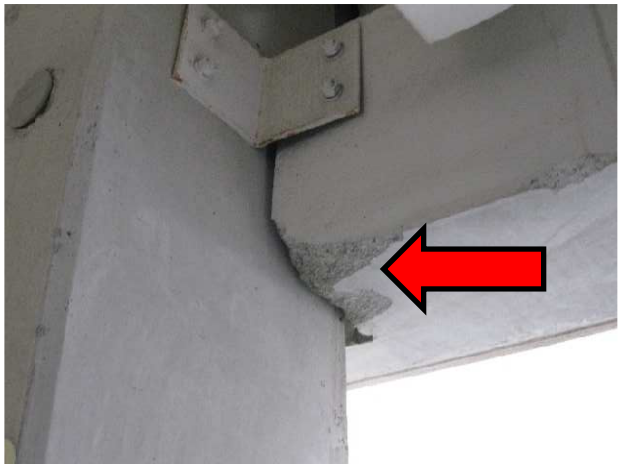
VISUAL OBSERVATION OF THE
OAK PARK & RIVER FOREST HIGH SCHOOL PARKING GARAGE
201 N SCOVILLE AVE
OAK PARK, ILLINOIS 60302

LEI PROJECT NO. 21160231.000

MAY 4, 2016

05
Corroded
steel saddle

06
Spalled and
cracked
concrete at
beam
anchor
point



07
Spalled
concrete at
underside
of beam

08
Exposed
and
corroded
rebar at
double-T
beam flange

Larson Engineering

VISUAL OBSERVATION OF THE
OAK PARK & RIVER FOREST HIGH SCHOOL PARKING GARAGE
201 N SCOVILLE AVE
OAK PARK, ILLINOIS 60302

LEI PROJECT NO. 21160231.000

MAY 4, 2016

09
Corroded connector plates at expansion joint

10
Corroded steel angles at beam-to-column connection

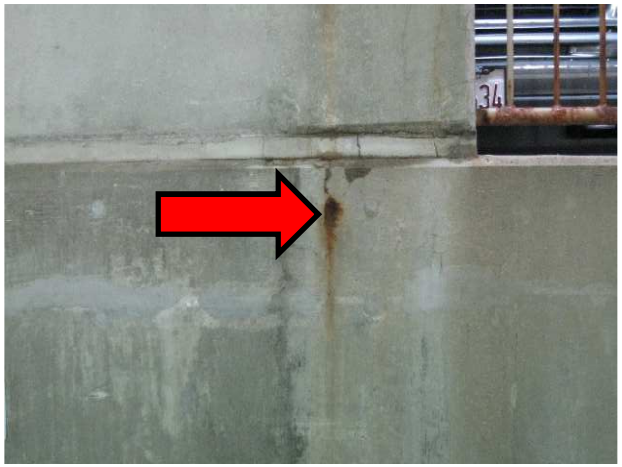
11
Corroded shelf angle

12
Corroded steel angle with missing anchor bolts

13
Corroded stair treads, stringers and guardrails

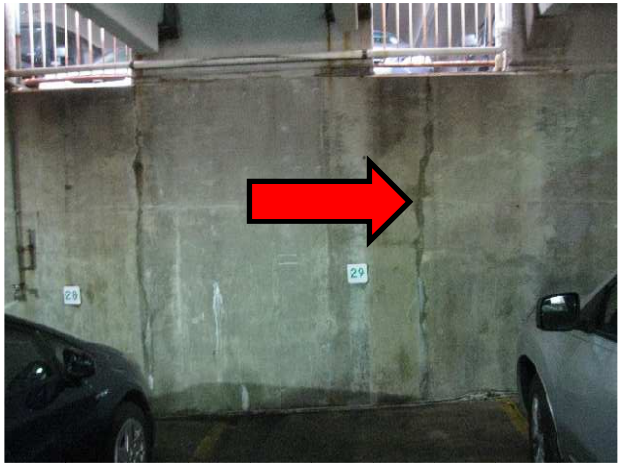
14
Corroded stair treads at stair towers


15
45-degree cracks at spandrel panel



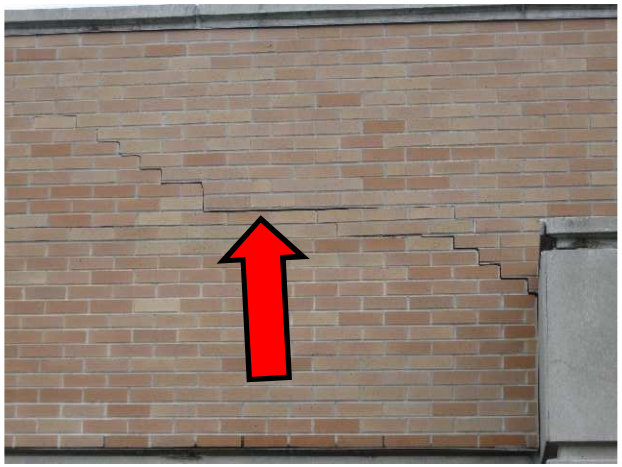
16
Exposed and corroded rebar at wall

17
Exposed corroded rebar at precast double-T beam flange



18
Cracks in foundation wall

19
Spalled concrete and open sealant joint at coping



20
Step-cracks at brick facade


21
Corroded and partially detached guardrail

22
Corroded anchor bolt


23
Corroded bollard


24
Corroded elevator frame

Larson Engineering

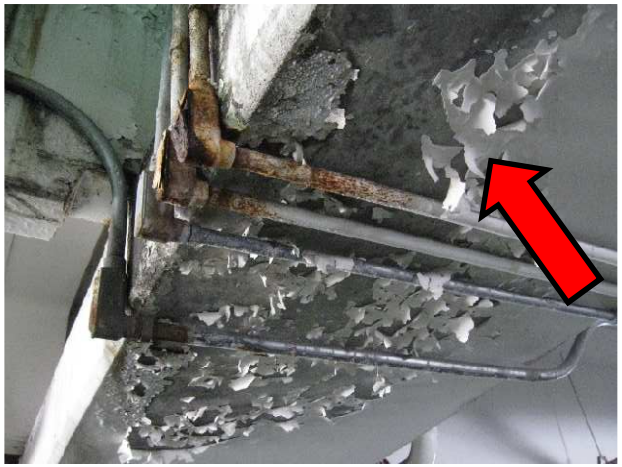
VISUAL OBSERVATION OF THE
OAK PARK & RIVER FOREST HIGH SCHOOL PARKING GARAGE
201 N SCOVILLE AVE
OAK PARK, ILLINOIS 60302

LEI PROJECT NO. 21160231.000

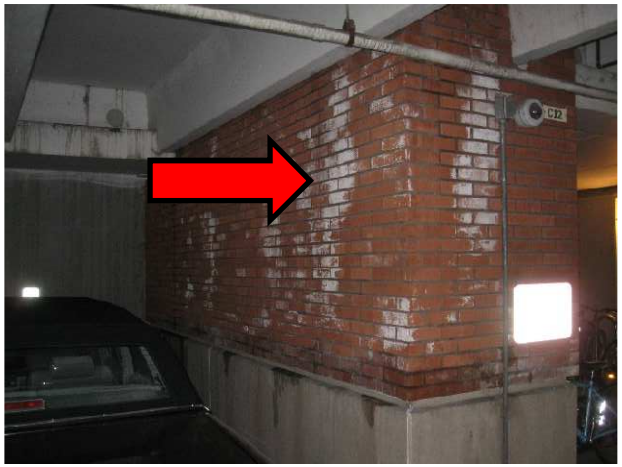
MAY 4, 2016

25
Peeled paint at canopy

26
Corroded plate at drain



27
Corroded conduit and water damage



28
Efflorescence at brick facade

Larson Engineering

VISUAL OBSERVATION OF THE
OAK PARK & RIVER FOREST HIGH SCHOOL PARKING GARAGE
201 N SCOVILLE AVE
OAK PARK, ILLINOIS 60302

LEI PROJECT NO. 21160231.000

MAY 4, 2016

29
Flashing with no sealant at beam penetration