

FIELD REPORT



PROJECT: Summerville Parking Garage Spalling Assessment and Repair

OWNER: Town of Summerville, SC **CEMS PROJECT NO:** 21-009

MEETING: Field Observation **OBSERVATION DATES:** 20 & 22 SEPT 2021

LOCATION: Summerville Parking Garage **ATTENDEES:** Eric Wieters, PE
109 Central Avenue Bradley Minor, PE,
Summerville, SC 29483 MLSE

cc: Russell Cornette

WEATHER: 20 SEPT 2021 Rain showers, mid 80 degrees, 22 SEPT 2021 Clear, low 80 degrees

NO. OF PAGES: 17

FIELD NOTES

A site visit was held on the dates listed above to investigate the overall condition of the structure including concrete spalling in the stairwells.

GENERAL OBSERVATIONS:

1. CEMS representatives observed the existing condition of the parking structure including both stairwells.
2. The structure consists of concrete topped, precast concrete double-tee floor members supported by precast concrete L-beams and precast concrete wall panels. Precast stair flights are also supported by precast concrete L-beams and precast concrete wall panels.
3. The structure is in generally good condition, except as subsequently described herein.
4. Rain showers persisted during most of the first day of field observation. Paths of rainwater runoff from the top levels to the ground were observed.
5. The second day of observations were needed to better view the exterior walls of the structure without interference from rain showers.
6. Access for observations was limited in some areas by vegetation and secured enclosures.

MAIN PARKING STRUCTURE:

1. A significant amount of rainwater is running off the highest deck levels down through the voids in the walls between adjacent staggered deck levels. Water is also migrating vertically through the joints between horizontal and vertical members.
2. In general, the caulking of the precast wall panel-to-panel joints is in good condition, however, there are isolated locations where caulking is deteriorated, especially adjacent to areas of concrete panel spalling.
3. The exterior of the structure is in generally good condition.
 - a) The south exterior of the structure has vegetation from trees and other plants growing against the exterior walls of the structure. There are several vines attached to wall.
 - b) Exterior cast stone pieces have signs of moisture saturation and resultant organic growth. on their surfaces.



PHOTO 1: VEGETATION AGAINST THE SOUTH EXTERIOR WALL



PHOTO 2: VINES ATTACHED TO SOUTH EXTERIOR WALL



PHOTO 3: MOISTURE AND ORGANIC GROWTH ON CAST STONE PIECES



PHOTO 4: MOISTURE AND ORGANIC GROWTH ON CAST STONE PIECES

4. The concrete topping of the main parking structure is in generally good condition with minimal cracking or damage.
 - a) The joints in the concrete topping above the double-tee joints are in generally good condition.
 - b) Sealants are in generally good condition except in isolated locations where rainwater is migrating through the highest levels exposed to rain.
 - c) Minor damage was observed at the southwest corner of the west ramp at the upper level.



PHOTO 5: OVERVIEW OF UPPER LEVEL DECK

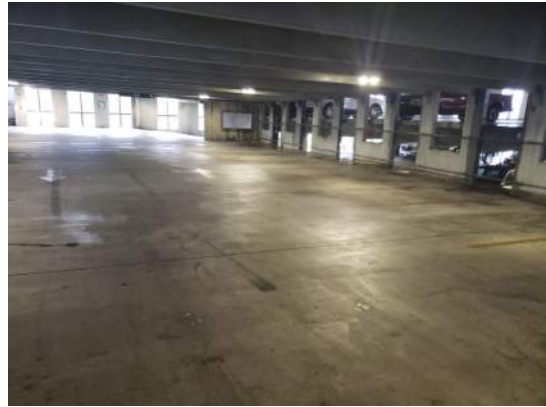


PHOTO 6: OVERVIEW OF INTERMEDIATE LEVEL DECK



PHOTO 7: TOPPING SLAB JOINT AT UPPER LEVEL DECK



PHOTO 8: TOPPING SLAB JOINT AT UPPER LEVEL DECK



PHOTO 9: CONCRETE TOPPING DAMAGE AT UPPER LEVEL



PHOTO 10: CLOSE UP OF CONCRETE TOPPING DAMAGE AT UPPER LEVEL

5. Grout packing over concealed wall panel-to-panel connections is consistently failing.
 - a) Connections along the vertical panel to panel edge connections are degraded.
 - i) At the highest levels which are exposed to the elements, the grout is very soft, loose, and spalling. The conditions improve but are still failing in the intermediate levels protected from rain. At the lower levels, the grout is performing better. The grout has a darker grey color at the lower levels, possibly indicating a different type of grout mix.



PHOTO 11: SPALLED UPPER LEVEL PANEL CONNECTION



PHOTO 12: SPALLED UPPER LEVEL PANEL CONNECTION



PHOTO 13: SPALLED INTERMEDIATE LEVEL PANEL CONNECTION



PHOTO 14: LOWER LEVEL PANEL CONNECTIONS (NOTE DARKER GROUT)

- ii) Grout packing over concealed wall panel-to-panel connections along the base of 8" thick wall panels bearing on 12" thick panels is consistently failing. The grout appears to be expanded, loose, and spalling. The outer portion of the cover was dislodged with minor probing.

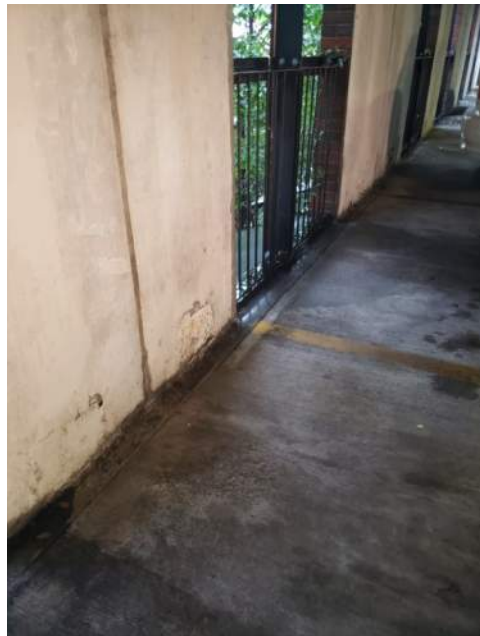


PHOTO 15: EXPANSIVE SPALLING GROUT AT WALL PANEL BASE CONNECTION



PHOTO 16: DISLODGED GROUT AT WALL PANEL BASE CONNECTION

6. At each level near the southeast end of the structure, the second and third double tee members from the east end appear to have been installed slightly out of alignment. The longitudinal joint between adjacent double tee edges tapers from approximately 4" at the north end to the typical joint width of approximately $\frac{3}{4}$ " at the south end. This appears to be an intentional decision as it is repeated at each level. The concrete topping slab bridges over the joint and has a typical, constant width joint at all locations. This condition does not appear to be negatively affecting the performance of the structure nor of the joints.



PHOTO 17: TAPERED JOINT BETWEEN PRECAST DOUBLE-TEE MEMBERS



PHOTO 18: NORTH END OF TAPERED JOINT BETWEEN PRECAST DOUBLE-TEE MEMBERS

7. At the east end of the upper level, the east end bearing of the precast L-beam over the drive ramp has a moderately corroded bearing plate.



PHOTO 19: CORRODED BEAM BEARING PLATE



PHOTO 20: LOOSE PIECE FROM CORRODED BEAM BEARING PLATE

8. Isolated concrete spalling was observed on the east exterior wall panel.



PHOTO 20: ISOLATED SPALLING ON EAST WALL



PHOTO 21: ISOLATED SPALLING ON EAST WALL (FROM ABOVE)

STAIR A:

1. A significant amount of rainwater runoff was observed at all levels of the stairs. Most significant runoff was down the gap between the parallel flights of stairs and through the landing penetrations for the standpipe. Water is ponding on the landing slabs in some areas.



PHOTO 22: RAINWATER RUNOFF BETWEEN STAIR FLIGHTS



PHOTO 23: RAINWATER RUNOFF BETWEEN STAIR FLIGHTS



PHOTO 24: RAINWATER RUNOFF THROUGH STANDPIPE OPENING



PHOTO 25: RAINWATER PONDING ON STAIR LANDING

2. Deteriorated and missing caulking was observed at the exterior stair wall panel joints.



PHOTO 26: DETERIORATED CAULK IN WALL PANEL JOINTS

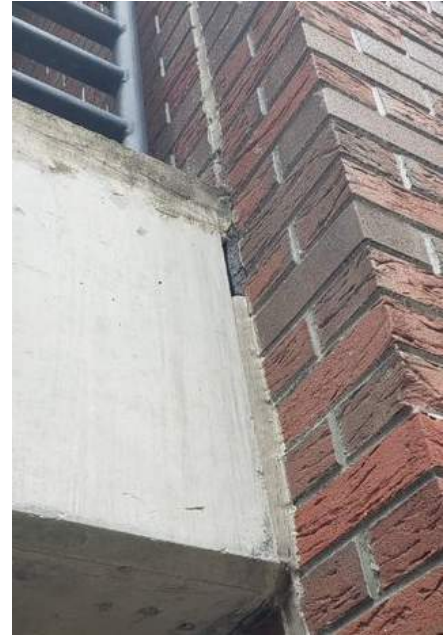


PHOTO 27: MISSING CAULK AT THE WALL PANEL AND BEAM JOINT

3. Minor damage to exterior brick veneer was observed at the exterior lower levels of the north exterior wall, adjacent to Stair A.



PHOTO 28: DAMAGED BRICK VENEER



PHOTO 29: CLOSEUP OF DAMAGED BRICK VENEER

4. Minor corrosion was observed on the underside of connections between the stair flight pieces and the supporting landing slabs.



PHOTO 30: CORROSION AT STAIR FLIGHT CONNECTIONS TO LANDING BEAM

PHOTO 31: CORROSION AT STAIR FLIGHT CONNECTIONS TO LANDING BEAM

5. Concrete beam cracking and spalling were observed at the end connections of each intermediate landing beam at the east end of the stairs.
 - a) Minor cracking was observed at the north end connections of the landing beam over ground level stair entrance.



PHOTO 32: STAIR LANDING BEAM ABOVE ENTRANCE AT EAST END OF STAIRS

PHOTO 33: MINOR CRACKING AT NORTH END CONNECTION OF LANDING BEAM

- b) Significant cracking and spalling were observed at every level at the south end connections of these landing beams.
 - i) Bottom reinforcing bars with noticeable corrosion were exposed in at least one location.
 - ii) The rainwater runoff through the landing slab standpipe penetrations onto this end of these landing beams may be contributing to the more severe damage at the south end connections.



PHOTO 34: CRACKING AND SPALLING AT SOUTH END OF LANDING BEAM



PHOTO 35: CRACKING AND SPALLING AT SOUTH END OF LANDING BEAM



PHOTO 36: CRACKING AND SPALLING AT SOUTH END OF LANDING BEAM



PHOTO 37: LOOSE PIECE OF CONCRETE AT SOUTH END OF LANDING BEAM

STAIR B:

1. Rainwater runoff was observed at all levels of the stairs, but was not as significant as observed at Stair A.
2. Concrete cover over several panel-to-panel connections near the top of the west wall is spalled. The underlying steel connections have some degree of corrosion.



PHOTO 38: SPALLED CONCRETE COVER OVER PANEL JOINT



PHOTO 39: CLOSE UP OF SPALLED CONCRETE AND CORRODED REINFORCING



PHOTO 40: SPALLED CONCRETE COVER OVER PANEL JOINT



PHOTO 41: SPALLED CONCRETE COVER OVER PANEL JOINT BELOW UPPER LANDING

3. At several levels, the stair landing slab connections to the east wall bearing corbels were spalled and corroded.



PHOTO 42: SPALLED AND CORRODED LANDING SLAB CONNECTION TO CORBEL

PHOTO 43: SPALLED AND CORRODED LANDING SLAB CONNECTION TO CORBEL

4. Concrete beam cracking and spalling were observed at the end connections of beams supporting the east end of the stair landing at each floor level.
 - a) Cracking was observed at the south end connections of these beams on several levels.



PHOTO 44: CRACKED AND SPALLED CONNECTION AT SOUTH END OF LANDING BEAM

PHOTO 45: CRACKED AND SPALLED CONNECTION AT SOUTH END OF LANDING BEAM

- b) More significant cracking and spalling were observed at the north end connections of these beams.



PHOTO 46: CRACKED AND SPALLED CONNECTION AT NORTH END OF LANDING BEAM

PHOTO 47: CRACKED AND SPALLED CONNECTION AT NORTH END OF LANDING BEAM

- 5. Beam cracking and spalling were observed in the beams along the same line adjacent to and to the north of the stairs.
 - a) Cracks were observed at each end.
 - b) Spalled and corroded connections were observed at interior supporting columns.



PHOTO 48: BEAM LINE ADJACENT TO STAIRS



PHOTO 49: CRACKING AT SOUTH END OF BEAM ADJACENT TO STAIRS



PHOTO 50: CRACKING AT NORTH END OF BEAM ADJACENT TO STAIRS



PHOTO 51: SPALLED CONNECTION AT INT. SUPPORT OF BEAM ADJACENT TO STAIRS



PHOTO 52: SPALLED CONNECTION AT INT. SUPPORT OF BEAM ADJACENT TO STAIRS

- c) Cracking was observed at the ends of the beam over the main garage entrance.
 - i) On the south end, there is a minor crack through the exterior thin-brick veneer.
 - ii) It appears cracks along the top of the beam were sealed at some point.

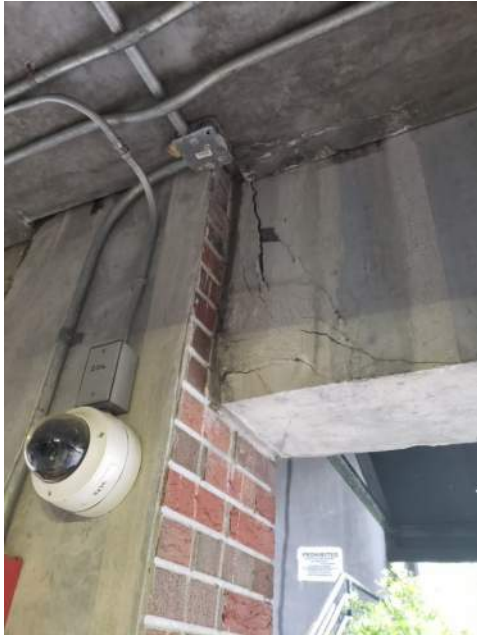


PHOTO 53: CRACKING AT SOUTH END OF BEAM OVER MAIN GARAGE ENTRANCE



PHOTO 54: CRACK THROUGH EXTERIOR BRICK VENEER

- 6. Isolated foundation cracking and spalling were observed adjacent to the stairs at the southeast corner of the building.



PHOTO 55: CRACK THROUGH EXTERIOR BRICK VENEER

SUMMARY:

1. The concrete spalling conditions observed at Stair A will need to be addressed however, CEMS personnel did not observe structural conditions which pose an obvious and immediately imminent life-safety issue.
2. All items including the existing conditions at Stair A will be evaluated further and addressed as needed in the subsequent Assessment Report.

END OF FIELD NOTES

If there are any questions or corrections regarding the above, please notify our office within 5 working days. Otherwise, the information herein will be assumed as correct and accurate.