



WALKER
PARKING CONSULTANTS

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October 14, 2005

Mr. Buick Alavy
City of Minneapolis
Property Services
350 South 5th Street, Room 223
Minneapolis, MN 55415

Re: *Annual Observation Report
Seven Corners Parking Facility
1504 Washington Avenue South
Minneapolis, Minnesota
Walker Commission No. 21-3254.00*

Dear Mr. Alavy:

In conformance with the City of Minneapolis inspection requirements for parking ramps, the following is a summary of the structural condition of the Seven Corners Parking Facility.

Walker completed a first year field observation, chain drag and chloride ion testing of this parking facility to review the condition of the structural elements.

FACILITY DESCRIPTION

The Seven Corners Parking Facility was constructed in two phases. Phase I was built in 1983 and Phase II was built in 1984. The entire structure is a cast-in-place, post-tensioned concrete floor slab and beam system supported on conventionally reinforced columns. Phase I is approximately 236 feet long by 104 feet wide and Phase II is approximately 243 feet long by 104 feet wide. There are four supported levels with a floor area of 195,000 square feet and a slab-on-grade with a floor area of 53,000 square feet. The supported floor consists of a 5-1/2 inch to 6-inch thick concrete slab supported on post-tensioned concrete beams typically spaced at about 22 feet on center. Epoxy coated reinforcing steel was used in the top portion of the floor slab. A corrosion inhibiting admixture (DCI, by W.R. Grace Co.) was added to the concrete used in the beams and floor slabs. A dosage rate of 3.5 gallons per cubic yard of concrete was typical. In addition, a concrete sealer was applied to the slab surface upon completion of construction and again in 1989, 1994, and 2004.

Access to and from the facility is via the street level entry/exit on Washington Avenue located at the south side of the building. The parking facility is a double threaded helix design with one-way traffic and angled parking throughout. A stair tower and a stair/elevator tower are located at the south side of the facility. The facility provides parking for approximately 762 vehicles.



VISUAL OBSERVATION SUMMARY AND CONCLUSIONS

During the course of our visual observation of this facility, we did not observe any conditions, which would restrict the facility from qualifying for an operating certificate. Limited overhead concrete removals to reduce the hazard of falling concrete are recommended. However, hidden or latent conditions may exist in this facility, which have not yet revealed themselves through visual evidence and may require removal in subsequent years. The following is a summary of conditions noted:

1. Unsealed and leaking floor slab cracks are isolated throughout.
2. Spot failures and isolated leaking of expansion joints.
3. Concrete floor and column delaminations in limited areas.
4. Isolated floor spalls at the slab-on-grade.
5. Wall spall at isolated locations.
6. Beam cracks and delaminations at isolated locations.
7. Worn and damaged traffic topping throughout, primarily in drive aisles.
8. Weathered/deteriorated construction joints and cove sealants.
9. Adhesive and cohesive joint sealant failures between structure and stair towers.
10. Spot failures and isolated leaking floor slab construction joint sealants.
11. Missing cove sealant at spandrel/slab connections.
12. Isolated delaminated/debonded precast panel connections.
13. Weathered/deteriorated façade panel joint sealant.
14. Isolated concrete delaminations at east stair tower stair soffit.
15. Corrosion of window frames at the roof level of the elevator tower.
16. Expansion joint material depression at isolated locations by the elevator tower.
17. Deteriorated horizontal joints in exterior precast panels of the stair tower.

Leaking construction joints, expansion joints, or cracks can contribute to corrosion of embedded post-tensioning tendons and anchors and reinforcing steel. Corrosion of embedded post-tensioning tendons and anchors can adversely affect the structural integrity of the floor slab; therefore, all joints and slab cracks should be sealed and maintained annually.

It should be noted that Walker Parking Consultants/Engineers, Inc. has not performed a structural review to verify the structural adequacy of the original design, as this is not within the scope of work. During our review, we did not observe deterioration to be indicative of inadequate original structural design or construction.

CHLORIDE ION TESTING

Enclosed are test results from American Engineering Testing. A chloride comparison table indicates the change in chloride concentrations at selected locations in the parking facility. Chloride sampling this year was taken in close proximity to the 1984, 1987, 1990, 1992, 1996, 1999 and 2002 sites.

Twelve (12) concrete powder samples were removed from four (4) locations and tested for acid soluble chloride ion content (salt contamination). Powder samples were removed in one-inch increments at each location to establish the chloride ion content of concrete as a function of depth.



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Concentrations of chloride ions ranging from 375 to 550 parts per million (PPM), along with the presence of moisture and oxygen, are needed to support corrosion of "gray" (non-epoxy coated) mild steel reinforcement in concrete. Of particular importance is the chloride ion concentration at the level of steel reinforcement.

The amount of chloride ions in the concrete at the 0 to 1 inch increment below the surface ranges from 1730 PPM to 4580 PPM, averaging 3093 PPM. At the 1 to 2 inch increment, the amount of chloride ranges from 555 PPM to 2430 PPM, averaging 1596 PPM. At the 2 to 3 inch increment, the amount of chloride ranges from 105 PPM to 1220 PPM, averaging 549 PPM.

Review of the test results indicates high chloride ion concentrations in the top three inches of floor slab. Values above the threshold values can support corrosion of "gray" reinforcing steel. The design drawings specify that the top mild steel have 1-1/2 inches of concrete cover. Therefore, the floor slab is within the chloride contaminated area at the level of top reinforcing steel. Since the mild steel in the top of the floor slab is epoxy coated and DCI was added to the concrete, additional protection against corrosion is in place.

CERTIFICATION

The City of Minneapolis Ramp Certification Ordinance requires that the engineer state whether the structure is capable of supporting the loads for which it is used. This structure is primarily used for the parking of passenger cars and, in our opinion, presently is capable of supporting that load.

Our recommendations include the continuation of annual structural maintenance, removal of all loose concrete overhead as it is detected, schedule crack and construction joint sealant replacement for the 2006 construction season, budget for traffic topping, and remaining items noted above. We recommend that test wells be excavated at the fifth level pour strip along Grid 14 in the spring of 2006. It appears that deterioration at the pour strip area is more advanced than at other locations.

The above engineering services provided were completed by me or under my direct supervision. My field of practice is structural engineering with primary emphasis on concrete deterioration and renovation. Walker Parking Consultants/Engineers, Inc. carries the \$250,000 insurance coverage required by Section 108.80 of the City Ordinance.

If we can be of further assistance or answer any questions, please call on us.

Sincerely,

WALKER PARKING CONSULTANTS

A handwritten signature in black ink, appearing to read "Stephen D. Disch", written in a cursive style.

Stephen D. Disch, P.E.
Principal

