WALKER
PARKING CONSULTANTS

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
Gateway Parking Facility
400 South Third Street
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 Gateway 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

Built in 1983, the Gateway Parking Facility is a cast-in-place, post-tensioned concrete parking structure approximately 328 feet long and 280 feet wide. There are five supported parking levels with a floor area of 393,000 square feet and a slab-on-grade with a floor area of 92,000 square feet. The structure consists of a post-tensioned concrete slab and beam system supported on conventionally reinforced concrete columns. The east and west bays of the supported levels consist of 5-1/2 inch thick slab supported by beams located on 22-foot centers. In the remaining supported area, the slab thickness is 6-1/2 inches and supported by beams on 26-foot centers. The slab-on-grade is 8 inches thick for the MTC buses. 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. A concrete sealer was applied to the slab surface upon completion of construction and again in 1987, 1994 and 2003.

Access to and from the facility is provided by express ramps along Fourth Avenue and Fifth Avenue. Traffic flow in the parking facility is one-way and 90 degree parking. Express ramps within the facility provide access to and from each level. Stair towers are located on all four corners of the facility. An elevator tower is provided at the center of the south side. The facility provides parking for approximately 1,397 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. Concrete floor delaminations at isolated locations.
2. Beam and column delaminations of limited area primarily adjacent to leaking expansion joints.
3. Ceiling delaminations of limited area primarily in express ramp.
4. Isolated expansion joint leaks and rust and water staining observed on the beam face below expansion joints throughout.
5. Wall delaminations of limited areas.
6. Leaking ceiling cracks and joints were noted on the express ramp.
7. Cracked and debonded expansion joint nosing material was noted at isolated locations.10.2
8. Isolated damaged expansion joint glands and nosings due to snowplows were noted at the top level.
9. Isolated floor cracks and construction joints were noted throughout.
10. Cove sealant failures noted.
11. At various locations, panel haunches are spalled and delaminated.
12. Vertical wall joint failure at isolated locations.
13. Light to moderate surface corrosion to precast wall panel to column connections throughout.
14. Weathered and cohesive failure of joint sealants at the exterior façade panels was noted throughout.
15. Isolated water ponds were noted.
16. Worn, debonded and damaged traffic topping.
17. Cove sealant on express ramps in missing and/or deteriorated.
18. Joint sealant failures at perimeter wall panel/slab throughout the top level

City of Minneapolis Maintenance and Repair Department is working on repairs on the speed ramps in 2005 and are scheduled to do floor slab repairs. Further, in 2005 some stair treads were replaced or deck coated in all four stair towers.

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.

Twenty-four (24) concrete powder samples were removed from eight (8) 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 the concrete as a function of depth.

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 2810 PPM to greater than 6000 PPM, averaging 4184 PPM. At the 1 to 2 inch increment, the amount of chloride ranges from 1440 PPM to 5225 PPM, averaging 2993 PPM. At the 2 to 3 inch increment, the amount of chloride ranges from 385 PPM to 3010 PPM, averaging 1306 PPM.

Review of the test results indicates high chloride ion concentrations in the top three inches of the floor slab. Values above the threshold values can support corrosion of "gray" reinforcing steel. The design drawings specify that the top mild steel have 1-1/4 inches of concrete cover. Therefore, the floor slab is chloride contaminated 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 noted on drawings and as it is detected, seal all leaking or deteriorated joints and cracks, and remaining items noted above.

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.

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

Sincerely,

WALKER PARKING CONSULTANTS

Stephen D. Disch, P.E.
Principal

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CHLORIDE ION CONTENT DETERMINATION
LABORATORY ANALYSIS RESULTS FORM

Sample No.	Sample Identification	CHLORIDE ION CONTENT -PPM- Depth Increment Tested 0" – 1"	1" – 2"	2" – 3"	Comments
CL-1	Drive Lane	5645	4500	1880	Level 2, North Bay
CL-2	Drive Lane	4695	3250	1755	Level 2, North Up Ramp
CL-4	Drive Lane	>6000	5225	3010	Level 2, South Up Ramp
CL-6	Drive Lane	3875	2680	910	Level 3, North Up Ramp
CL-9	Drive Lane	3570	1760	435	Level 4, North Bay
CL-11	Drive Lane	3350	2525	1050	Level 4, South Bay
CL-12	Drive Lane	3525	2560	1020	Level 4, South Up Ramp
CL-15	Drive Lane	2810	1440	385	Level 6, South Bay

American Information

Date Received: 9-27-05
Test Required: Acid Soluble Chloride Content
Samples Tested By: J. Skabatz

AMERICAN ENGINEERING TESTING, INC.
St. Paul, MN

Walker Information

Project Name: Gateway Ramp
Project Number: 21-3254.00
Samples Taken By: JCL
Date Sampled: 9/19/05
Number Submitted: 24
Date Submitted: 9/26/05

GATEWAY PARKING RAMP -- CHLORIDE COMPARISON

		1984 PPM VALUES			1987 PPM VALUES			1990 PPM VALUES			1992 PPM VALUES			1996 PPM VALUES			1999 PPM VALUES			2002 PPM VALUES			2005 PPM VALUES		
ID	TIER	0"-1"	1"-2"	2"-3"	0"-1"	1"-2"	2"-3"	0"-1"	1"-2"	2"-3"	0"-1"	1"-2"	2"-3"	0"-1"	1"-2"	2"-3"	0"-1"	1"-2"	2"-3"	0"-1"	1"-2"	2"-3"	0"-1"	1"-2"	2"-3"
D	2	2620	430	40	5820	2190	399	4870	1352	450	4360	2020	244	>6000	>6000	2323	>6000	4980	2430	>6000	4775	1320	5645	4500	1880
D	2	2950	450	260	4520	2170	364	3737	1472	400	3140	1456	247	>6000	>6000	1993	4150	2685	1310	4880	3345	1230	4695	3250	1755
D	2	420	160	150																					
D	2	3550	430	270	6830	3140	612	4712	1890	400	4680	2720	512	>6000	>6000	4875	>6000	5435	3660	5415	4925	2295	>6000	5225	3010
D	3	600	190	210																					
D	3	2050	390	280	4320	1640	315	3610	880	240	2552	736	272	>6000	4111	825	4060	2910	1290	4120	2045	425	3875	2680	910
D	3	540	180	160																					
D	3	470	150	180																					
D	4	1120	210	230	3510	768	239	4050	937	293	1544	580	163	>6000	3336	549	2070	420	495	3375	1435	380	3570	1760	435
D	4	690	180	160																					
D	4	1630	230	170	4180	1400	298	3665	1056	242	2888	1412	207	>6000	>6000	1358	4260	2300	805	3860	2440	480	3350	2525	1050
D	4	860	190	120	2850	762	263	2580	737	642	2772	1008	150	>6000	4689	806	2935	1460	510	3025	1855	560	3525	2560	1020
D	5	770	130	200																					
D	5	250	240	190																					
D	6	150	240	240	1020	339	247	486	394	139	652	235	179	3072	911	737				2030	430	220	2810	1440	385
D	6	260	170	210																					
RIES		16	16	16	8	8	8	8	8	8	8	8	8	8	8	8	7	7	7	8	8	8	8	8	8
UM		150	130	40	1020	339	239	486	394	139	652	235	150	3072	911	549	2070	420	495	2030	430	220	2810	1440	385
AGE		1183	248	192	4131	1551	342	3464	1090	351	2824	1271	247	5634	4631	1683	4211	2884	1500	4088	2656	864	4184	2993	1306
EV		1028	107	59	1660	870	115	1307	438	147	1242	760	108	968	1706	1346	1344	1664	1075	1223	1484	659	1071	1212	817
IUM		3550	450	280	6830	3140	612	4870	1890	642	4680	2720	512	>6000	>6000	4875	>6000	5435	3660	>6000	4925	2295	>6000	5225	3010
ase from previous year =					249%	525%	78%	-16%	-30%	3%	-18%	17%	-30%	100%	264%	582%	-25%	-38%	-11%	-3%	-8%	-42%	2%	13%	51%
ase from 1984 =					249%	525%	78%	193%	339%	83%	139%	412%	29%	376%	1766%	777%	256%	1062%	682%	246%	971%	350%	254%	1106%	580%
Average		1984 AVG=		541	1987 AVG=		2008	1990 AVG=		1635	1992 AVG=		1447	1996 AVG=		3983	1999 AVG=		2865	2002 AVG=		2536	2005 AVG=		2827