BOYLE

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Mr. Sal Alvarez, Parking Manager
ACE PARKING MANAGEMENT, INC.
4680 MacArthur Court, Suite A
Newport Beach, CA 92660-1826

March 21, 2005
SP-A26-100-01

City of Santa Ana
Third and Broadway Parking Structure—Site Observation

As requested, we have conducted a site observation of structural damage that exists at the City of Santa Ana parking facility located at 201 West Third Street in the City of Santa Ana. This report includes a description of the observed damage, assessment of the damage, and recommendations for remediation.

Description

The perimeter of the structure has fascia panels that are supported by the reinforced concrete floor slabs and columns. The panels are precast concrete with brick facing on the top and exterior side. The panels are approximately 6 inches thick in plan and 6 feet in height. A panel on the second floor on the west side of the structure at the south end is bowed outward more than 2 inches from its original position. The panel is approximately 33 feet long and was supported by angle clips at quarter points along its length and at each end. The quarter point clips were bolted to the floor with wedge anchors and welded to steel plates embedded in the panel. The end clips were welded to steel plates embedded in the columns and bolted to anchor bolts cast in the panel. Apparently, when a vehicle struck the panel, the quarter point clips broke out of the floor slab concrete and the panel bent outward. The edge distance from the centerline of wedge anchors to the edge of floor slab as constructed was only 1-1/2 inches. Presently, only the end clips support the panel. However, the legs of the end clips that are in contact with the panel are bent outward in the direction of the bowed panel. Also, the concrete panel is cracked above the point of connection for the end clips at both ends of the panel. Except as described above, no damage to the parking structure itself was observed.

Assessment and Recommendations

The support of the panel is at risk. The panel should be removed and replaced with a new panel and support clips. If mechanical or epoxied-in anchors are used for support of the new panel by the floor slab, the anchors should be located at least 1 foot away from the locations of the existing clips and should have at least the minimum edge distance recommended by the anchor manufacturer. Prior to erecting the new panel, the spalled floor slab concrete should be patched at the locations of the existing quarter point clips. Placing wheel-stop curbs on the floor will reduce the vulnerability of the panel.

Please call at telephone number (949) 476-3562 if you wish to discuss this report or have any questions.

Boyle Engineering Corporation

AH Grathwol

Albert H. Grathwol, SE
Principal Structural Engineer

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Mr. Sal Alvarez, Parking Manager
ACE PARKING MANAGEMENT, INC.
4680 MacArthur Court, Suite A
Newport Beach, CA 92660-1826

April 4, 2005
EI-A26-100-02

City of Santa Ana
<u>Third and Broadway Parking Structure</u>

We propose to prepare drawings, specifications, and calculations for the removal and replacement of the damaged concrete fascia panel at the southwest corner of the structure. Drawings, specifications, and calculations will be stamped and signed by a registered structural engineer.

Work also includes the following services during construction:

1. Review of submittals by the contractor.
2. Replying to requests for information from the contractor.
3. Review of change order requests.

Work will rely upon the accuracy of record drawings of the structure provided to us by Ace Parking.

Construction inspection is not included.

Our fee will not exceed $6,500.00. The work will be performed as additional work under the terms of our Agreement for Professional Services with Ace Parking dated November 15, 2004.

Your countersignature on this letter indicates your acceptance of the terms and conditions of this additional work.

Boyle Engineering Corporation

Allen J. Randall, PE
Managing Engineer
Date: 4-4-05

Ace Parking Management, Inc.

By: Sal Alvarez
Date: ___________

Ace Parking Fascia Panel.doc

DMJM H&N | AECOM

DMJM H&N
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T 714.567.2400 F 714.567.2535 www.dmjmhn.aecom.com

September 16, 2008
60042493

Hamid Torkamanha
Senior Civil Engineer
City of Santa Ana
20 Civic Center Plaza, M-36
Santa Ana, CA 92702

Subject: City of Santa Ana Parking Structure
Retrofit report issued May 8, 2008

Dear Mr. Torkamanha:

On May 08, 2008, DMJM H&N prepared a seismic evaluation report for the city of Santa Ana Parking Structure at Broadway & Third St., Santa Ana, CA. The report included recommendations for repairs and conceptual seismic retrofit options with corresponding construction costs associated with each item. Based on the recent communication with the city of Santa Ana, it is our understanding that depending on the funding availability the city may or may not seismically upgrade the parking structure as recommended in our report. However, the City of Santa Ana requested DMJM H&N to identify repair items in our report that we feel should be implemented even though the seismic upgrade funds are not available.

Please refer to the highlighted items in our report that in our opinion are critical and should be repaired. Please note that performing these repairs will not in any way reduce the risk of seismic hazard for the main structural system but might reduce the risk of seismic hazard for the non-structural elements.

Sincerely,

Shafiq Alam, S.E.
Vice President

1. EXECUTIVE SUMMARY

DISCUSSION OF BUILDING DEFICIENCIES AND SEISMIC RETROFIT OPTIONS

An ASCE 31-03 Seismic Evaluation was conducted for the Parking Structure at Broadway and Third Street, Santa Ana, California. The building was evaluated at a "Life Safety" Performance Level for an earthquake having a 10% probability of being exceeded in 50 years (475 year mean return period). The seismic force levels were taken from the USGS website.

The building is a two-level post-tensioned concrete parking structure. The gravity load resisting system consists of post-tensioned concrete slab and beams and precast concrete columns. The lateral load resisting system consists of precast concrete shearwalls in the east-west direction and concrete moment frames in the north-south direction. The parking structure is seismically separated from the adjacent building. The seismic separation does not meet the requirements of ASCE 31-03 based on the calculated drift of these two structures. The foundation consists of cast in place spread footings at the column and shearwall locations.

This evaluation included review of structural drawings and calculations to meet the provisions of the 2007 CBC, ASCE 41-06, site visits to confirm the validity of the existing conditions, and a full "Tier 1 and Tier 2" ASCE 31-03 Screening. Existing construction drawings and calculations were used in the Tier 1 screening as needed.

The major emphasis of this study focused on the calculations, drawings and field implementation of these modifications compared with the requirements of ASCE 31-03 for a Life Safety Level of building performance. Deficient items can be summarized as "Structural" and "Non – Structural" in keeping with the ASCE 31-03 format.

Structural Deficiencies:

(From ASCE 31-03 Checklist 3.7.16)

1. Building Systems, General – Adjacent Buildings
   The clear distance between adjacent buildings is greater than 4% of the building height

2. Building Systems, Condition of Materials - Deterioration of Steel
   The stair wall connections show signs of visible rusting and corrosion.

3. Building Systems, Condition of Materials - Deterioration of Concrete
   There is exposed and rusted rebar at the stair wall joints and where there is a raised curb.

4. Building Systems, Condition of Materials – Post-tensioning Anchors
One of the PT beam location has concrete that has spalled at the bottom. The PT tendons will need to be evaluated to see if has been damaged.

5. Building Systems, Condition of Materials – Precast Concrete Walls
The shearwalls have hairline diagonal crack typical throughout

6. Building Systems, Condition of Materials – Concrete Wall Cracks
The stair concrete walls have vertical wall cracks at the joints larger than 1/8".

7. Lateral-Force-Resisting System, Precast Concrete Moment Frames – Precast Connection Check
There is not a valid positive connection at the precast frame joints.

8. Lateral-Force-Resisting System, Concrete Moment Frames – Prestressed Frame Elements
The prestress force in beams with a prestressed force greater than 336k exceeds the 700 psi at the potential hinge locations which is non-compliant with the code.

9. Lateral-Force-Resisting System, Concrete Moment Frames – No Shear Failures
The shear capacity in the frame members exceeds the moment capacity at the ends of the members.

10. Lateral-Force-Resisting System, Concrete Moment Frames – Beam Bars
The frames are offset in some locations so the reinforcing does not continue 25% beyond the supports.

11. Lateral-Force-Resisting System, Concrete Moment Frames – Beam-Bar Splices
The beam lap splices are located closer than lb/4 of the joints which is non-compliant with the code.

12. Lateral-Force-Resisting System, Concrete Moment Frames – Stirrup Spacing
The beam stirrups are spaced greater than d/4 at the plastic hinge locations which is non-compliant with the code.

13. Lateral-Force-Resisting System, Concrete Moment Frames – Joint Reinforcing
Beam-column joints have ties that are spaced greater than 8db which is non-compliant with the code.

14. Lateral-Force-Resisting System, Precast Concrete Moment Frames – Precast Connections
Drawings do not show chords, ties and collectors between precast shearwalls.

15. Lateral-Force-Resisting System, Diaphragms – Diaphragm Continuity
This requirement does not comply because diaphragms are composed of split-level floors and have expansion joints.

16. Lateral-Force-Resisting System, Diaphragms – Roof Chord Continuity
All chord elements shall be continuous – chord bars are not shown in the drawings making this item non-compliant.

Non Structural Deficiencies:

(From ASCE 31-03 Checklist 3.9.1)

1. Cladding and Glazing – Cladding Anchors
The anchors for the cladding are spaced more than 6' apart.

2. Cladding and Glazing - Cladding Isolation
The cladding connections are not currently detailed to accommodate drift associated with the concrete moment frames.

3. Cladding and Glazing – Deterioration
Approximately 20% of the cladding anchors show signs of deterioration or corrosion.

4. Cladding and Glazing - Damage
Section of the exterior cladding has chipped off and is damaged.

Structural Corrective Actions:

1. Building Systems, General – Adjacent Buildings
There are no retrofit options available to shift the building in order to satisfy this requirement.

2. Building Systems, Condition of Materials - Deterioration of Steel
The steel connections in the stair areas will need to be replaced.

3. Building Systems, Condition of Materials - Deterioration of Concrete
The concrete in the stair areas will be repaired using an epoxy injection system. Rusted and spalled connections will be replaced. Concrete will be patched where these connections have been removed.

4. Building Systems, Condition of Materials – Post-tensioning Anchors
The PT tendon in the spalled beam will be evaluated for make sure that water has not rusted the tendons. The concrete will be patched and repaired in this area.

5. Building Systems, Condition of Materials – Precast Concrete Walls
The hairline cracks in the shearwalls are too thin and frequently in most locations so an epoxy injection system would not be practical. DMJM recommends adding three inches of shotcrete to the surface of the existing shearwalls in the east-west direction to strengthen the walls.

6. Building Systems, Condition of Materials – Concrete Wall Cracks
As mentioned in item 2, the stairs will be repaired with a grout injection system.

7. Lateral-Force-Resisting System, Precast Concrete Moment Frames – Precast Connection Check
The concrete moment frames in the north-south direction do not satisfy the ASCE 31-03 code requirements for ductility, detailing, and required prestress force. DMJM recommends adding addition shearwalls in the north-south direction to take the seismic force of the current code, California Building Code 2007. Two options have been established for cost estimation purposes. Option 1 uses seven concrete shearwalls, 10" or 12" thick with continuous wall footing. The design of option 1 was based on stability of the footing. Option 2 will use four concrete shearwalls with cast-in-place concrete micorpiles placed at each end of the shearwall. This will help satisfy the stability requirements for the new foundations. New connection will be provided to the existing foundations, existing slab-on-grade and at the second and roof level slabs as needed for both options.

8. Lateral-Force-Resisting System, Concrete Moment Frames – Prestressed Frame Elements
See the response to item 7.

9. Lateral-Force-Resisting System, Concrete Moment Frames – No Shear Failures
See the respond to item 7.

10. Lateral-Force-Resisting System, Concrete Moment Frames – Beam Bars
See the respond to item 7.

11. Lateral-Force-Resisting System, Concrete Moment Frames – Beam-Bar Splices
See the respond to item 7.

12. Lateral-Force-Resisting System, Concrete Moment Frames – Stirrup Spacing
See the respond to item 7.

13. Lateral-Force-Resisting System, Concrete Moment Frames – Joint Reinforcing
See the respond to item 7.

14. Lateral-Force-Resisting System, Precast Concrete Moment Frames – Precast Connections
See the respond to item 7.

15. Lateral-Force-Resisting System, Diaphragms – Diaphragm Continuity
The in-plane load connections have sufficient capacity as shown in calculation #7. Therefore no retrofit is required.

16. Lateral-Force-Resisting System, Diaphragms – Roof Chord Continuity
The in-plane load connections has sufficient capacity as shown in calculation #7. Therefore no retrofit is required.

Non-Structural Corrective Actions:

1. Cladding and Glazing – Cladding Anchors
Additional anchors will be added to satisfy a six foot maximum spacing. An estimate of 2 anchors per bay will be included.

2. Cladding and Glazing - Cladding Isolation
Because the north-south direction will have new shearwalls, the cladding connections will not have to take the drift requirements after the proposed retrofit is completed.

3. Cladding and Glazing – Deterioration
Approximately 20% of the cladding anchors will be replaced.

4. Cladding and Glazing - Damage
The sections of exterior cladding that has chipped off and is damaged will be repaired or replaced.

BUILDING CONSTRUCTION COST DETAIL - OPTION 1

	ITEM			UNIT COST	TOTAL	$/SF	% TOTAL
2000	SITEWORK				99,931		4.85%
	Demolition and Removals						
	Remove concrete slab at new footings, incl sawcutting	3,528	sf	8.74	30,851		
	Miscellaneous demolition	145,466	sf	0.25	36,367		
	Protection of existing surfaces		sf	1.56	0		
	Remove existing landscaping for wall footing access	700	sf	1.87	1,312		
	Replace landscaping and irrigation	700	sf	8.12	5,684		
	Remove existing alley paving for wall footing access	700	sf	18.74	13,117		
	Replace paving	700	sf	18.00	12,600		
3000	CONCRETE				1,593,382		77.30%
	Surveying and Layout						
	Layout	145,466	sf	0.10	14,547		
	Epoxy Injection						
	Joint prep at epoxy injection	360	lf	25.00	9,000		
	Epoxy Injection at Column / Beam Interface, exterior columns only	360	lf	65.00	23,400		
	Stairwells, perpendicular wall repairs						
	Joint prep at epoxy injection	120	lf	25.00	3,000		
	Epoxy Injection at Wall Interface, stairs only	120	lf	65.00	7,800		
	Wall Footings						
	Concrete, 4,000 psi	549	cy	270.67	148,598		
	Reinforcing steel	23,250	lb	1.25	29,045		
	Excavation	719	cy	57.26	41,168		
	Backfill	170	cy	26.03	4,424		
	Spoils removal	549	cy	46.85	25,719		
	Surface preparation	576	sf	4.06	2,339		
	Epoxy dowels, 2'-0" long including drilling	288	ea	37.48	10,793		
	Epoxy dowels, 2'-4" long including drilling		ea	74.95	0		
	Grade Beams Between Existing Shear Walls						
	Concrete, 4,000 psi	16	cy	375.00	6,000		
	Formwork	240	sf	27.00	6,480		
	Reinforcing steel	1,200	lb	1.75	2,100		
	Excavation	29	cy	115.00	3,335		
	Backfill	13	cy	26.03	338		
	Spoils removal	16	cy	46.85	750		
	Surface preparation	80	sf	25.00	2,000		
	Epoxy dowels, 2'-0" long including drilling	80	ea	65.00	5,200		
	Slab On Grade						
	Grading	3,528	sf	1.87	6,611		
	Reinforcing steel	5,500	lb	1.25	6,871		
	Concrete, 4,000 psi	58	cy	270.67	15,597		
	Finish slab	3,528	sf	1.09	3,856		
	Epoxy dowels, at perimeter including drilling	552	ea	34.35	18,964		
	Cast-In-Place Concrete Interior Walls						

Prepared by: IDI

Date of Estimate: 5/8/2008

BUILDING CONSTRUCTION COST DETAIL - OPTION 1

	ITEM			UNIT COST	TOTAL	$/SF	% TOTAL
	Concrete - 4,000 psi	230	cy	324.80	74,705		
	Formwork	14,143	sf	20.82	294,468		
	Reinforcing steel	31,885	lb	1.25	39,832		
	Epoxy dowels, including drilling thru slabs for continuity	355	ea	65.59	23,283		
	X-ray for rebar through slabs	178	ea	65.59	11,674		
	X-ray for cores	84	ea	56.22	4,722		
	Coredrill for pours	84	ea	81.20	6,821		
	Shotcrete walls						
	Concrete walls, gunite	7,500	sf	35.40	265,465		
	Misc. formwork	7,500	sf	5.21	39,039		
	Rebar	17,106	lb	1.25	21,369		
	Surface preparation	7,500	sf	2.03	15,225		
	Epoxy dowels, to existing wall surface including drilling, 18" o/c	3,372	ea	32.48	109,537		
	Concrete Patch and Repair						
	Stairwells						
	Surface prep for stair well delamination repair	200	sf	90.00	18,000		
	Patch spalling with epoxy grout	50	cf	156.16	7,808		
	Stairwells						
	Perpendicular wall repairs	120	sf	90.00	10,800		
	Patch spalling with epoxy grout	30	cf	156.00	4,680		
	Post-tensioned beam spall repair, grid 8 level 2						
	Surface prep for beam repair	5	sf	90.00	450		
	Patch spalling with epoxy grout	1	cf	350.00	438		
	Superstructure						
	Water Damage Cleanup						
	Misc. water damage cleanup, allowance	145,466	sf	1.50	218,199		
	Façade to slab connections, replace 20% of connections						
	New spandrel to slab connection metals assembly and expansion bolting	41	ea	550.00	22,550		
	X-ray for rebar through slabs	41	ea	65.59	2,689		
	Façade to slab connections, 1 line connection						
	New spandrel to slab connection metals assembly and expansion bolting	6	ea	550.00	3,300		
	X-ray for rebar through slabs	6	ea	65.59	394		
5000	**METALS**				**16,293**		**0.79%**
	Miscellaneous Metals						
	Angle 6x6x3/8 shelf angle	47	ea	346.67	16,293		
6000	**WOOD & PLASTICS (includes carpentry)**				**14,547**		**0.71%**
	Rough Carpentry						
	Miscellaneous rough carpentry	145,466	sf	0.10	14,547		
7000	**THERMAL & MOISTURE PROTECTION**				**278,810**		**13.53%**
	Roofing						
	Reseal top level of parking deck, restripe	48,489	sf	5.75	278,810		

Prepared by: IDI

parking facility design . land use planning . signage & graphics . consulting

parking design group
los angeles omaha houston

April 17, 2006

Ms. Danell Mercado
Redevelopment Assistant
City of Santa Ana
Downtown Development Division
20 Civic Center Plaza M-25
P.O. Box 1988
Santa Ana, CA 92702

Regarding:
Cursory Review for the
Proposed Parking Structure at 3rd & Sycamore
Santa Ana, CA

Dear Ms. Mercado:

Thank you for meeting with me today to discuss the proposed parking structure at 3rd & Sycamore streets in the City of Santa Ana, California.

The following summarizes our discussions and our subsequent cursory design review of a proposed parking structure on the site.

Based on our discussions and the information provided, we understand the site to be 100' x 125', and located on the southwest corner of the 3rd and Sycamore Streets. You mentioned that the parking structure will provide parking for a proposed art school that may be located adjacent to the site and will probably need approximately 150 to 180 parking spaces.

This cursory review is based on the basic parking design criteria of "six turns to the top" to maintain user comfort and convenience. We also took into account the required number of accessible parking spaces per California Title 24 and the Americans with Disabilities Act (ADA). Therefore, this cursory review resulted in a parking capacity of approximately 180 spaces. The total constructed area would be approximately 84,000 s.f. for an efficiency (area/space) of approximately 470 s.f./space. This is exceptionally high due to the inefficiencies caused by the small footprint of the site. In addition, there could be an assumed loss in capacity by as much as 3% to 5% due to unknowns and structural changes that could be experienced during subsequent design phases.

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It could be anticipated that this proposed parking structure could cost approximately $20,000 to $25,000 per space. Based on a parking capacity of 180 spaces, this would equate to an estimated range in total cost of approximately $3,600,000 to $4,500,000, excluding land costs.

The overall parking capacity and estimated construction costs presented above could be verified through the completion of a conceptual design analysis. Parking Design Group remains available to provide these services upon your request.

Thank you again for meeting with me to discuss this proposed project. If you have any questions or comments regarding this cursory review please feel free to contact our office.

Sincerely,

David L. Vogel

David L. Vogel
Partner