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GEIGER ENGINEERS

Geiger Gossen Hamilton Liao Engineers P.C.

New York/Bellir

NYS PAVILION INSPECTION

17 November 1992 (Revised 15 Dec. 1992)

Queens Theater in the Park
PO Box 69
Flushing, NY 11352

Attn: Robert Forman

Re: Summary of Structural Condition
NYS Pavilion Inspection
GCHL Job #92022.00

Dear Mr. Forman

Geiger Engineers has reviewed the NYS Pavilion structure for significant deterioration and signs of potential structural instability during two investigation site visits conducted on 23 September 1992 and 01 October 1992 (see attached copies of observation reports for details). During these site visits the foundation, the one story perimeter building's walls and roof, the 16 perimeter columns and the cable roof structure were inspected. The inspection of these components of the structure was limited by the access provided. Approximately 4000 square feet of the interior of the structure are currently occupied on a temporary basis by the Queens Theatre In The Park until completion of the renovation of the adjacent theatre building scheduled for late 1993. The N.Y. S. Pavilion as a whole is currently in a state of deterioration such that repairs are required if occupancy is to be allowed.

The following items should be stabilized, repaired, or scheduled for regular inspection to assure safety to the public:

1. Pile Foundation - Pile sections above the ground water line must be sealed to terminate the ongoing decay of the piles. Only this process will insure the load capacity of the piles in the future to support the existing structure. As discussed in the site visit report of 23 Sept. 1992, our observation of a seemingly typical pile and calculations of applied load to the deteriorated pile foundations has indicated that the pile foundations are presently sufficient to support the facility but will be insufficient with additional pile deterioration. If an immediate repair of the deteriorated portion of the pile foundation is impractical, then the structure must be inspected on an every six month basis to assure that no significant settlement has occurred. A sign of settlement would indicate probable pile foundation failure. This inspection may be accomplished by surveying the position of a defined location on each of the 16 concrete

columns relative to a point of fairly stable elevation (ie. a geodesic monument). The initial survey should commence as soon as possible.

2. The CMU Walls (concrete masonry unit) composing the perimeter one story building must be repaired at areas where cracking and spalling were noted in the site observation report from 23 Sept. 1992. Following the repairs to these CMU walls of the one story perimeter building, inspection (concurrent with pile foundation inspection noted above) of the CMU walls must occur to assure continued stability of the CMU walls.
3. The Roof on the perimeter one story building must be repaired where water is leaking through the deteriorated existing roofing membrane in the areas under which the spaces will be occupied. As part of the roofing membrane repair, the metal roof deck should be painted with a cold galvanizing paint to prevent further corrosion of the metal deck. Additionally, all of the roof drains must be cleaned and maintained to prevent ponding of water on the roof. Public access is currently not allowed and must not be allowed to the roof (Promenade level) unless a more extensive investigation is undertaken.
4. The Stairways to the Promenade level must not be used because of their extreme state of deterioration. Based on our visual inspection replacement of these stairways will be required if access is required to the Promenade level. Access to the promenade level is currently closed off.
5. The Roof Cables with broken wires or severe corrosion must be replaced. Based on observations during the 01 Oct 92 inspection, the damaged cables were mainly the bottom roof cables. Our concern with regard to the roof cables is based on the potential that the lower cables will break under their current prestressing forces where significant corrosion has occurred and individual wires of the structural stand have already broken. If the structural stand breaks, the anchorage and cable may drop from the roof structure on to the ground below.

As an alternative the roof cables may all be removed (GGHL can provide a de-stressing sequence for removal of the roof cables if this course of action is chosen). If the more severely deteriorated lower cables are removed without removing the upper cables, this removal will upset the balance of the perimeter compression ring. Therefore, the removal of only the lower cables cannot be recommended without the removal of the top cables.

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CONSTRUCTION OBSERVATION REPORT

2 Executive Blvd.
Suite 410
Suffern, NY 10901
914/368-3330
Fax: 914/368-3366

110 Prospect Street
Bellingham, WA 98225
206/734-7194
Fax: 206/734-7399

JOB NAME: NEPS Pavilion Inspection

JOB NUMBER: 92022.00

REPORT NO: 1

DATE: 23 September 1992

WEATHER: Sunny 65°F

REQUESTED BY: R. FORMAN

PREPARED BY: SPE

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The following list of observed construction progress or Contractor errors and/or omissions is limited to Structural items. Construction observation is for general conformance with the contract documents only. No detail inspection has been made, and, not necessarily all problems, errors, or changes by the Contractor have been detected. The Contractor remains responsible for complying with all contract documents. No review of calculations has been made.

Item No.	Description of work done, locations, equipment used, quantity estimates; indicate location and elevations, and mark locations on plans.	Dwg No./ Spec Ref.	Action F.c. By Y/N
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Pile Review:

- One wood pile on the "A" column side of the "P" column pile group was excavated several days in advance to a depth of approximately 18 inches below the bottom of the concrete pile cap. The soil noted to be of a sandy loam consistency.
- The side of the pile was probed with the use of a blunt screw driver to approximately determine the depth of seriously deteriorated pile cross section. The surface of the pile was easily excavated to a depth of 2.5 inches.
- Visually, the pile was noted to be fully intact prior to the probing. The deteriorated wood which was excavated from the surface of the pile was damp and spongy in nature (a sample was retained).
- The pile diameter was estimated to be 12 inches. Assuming the observed pile deterioration is consistent at all the piles, the reduction in effective foundation capacity is about 14 percent. This reduction in relative pile loading capacity has been off set by reduction in dead and live loading resulting from the removal of the roofing panels. Therefore, the foundation structure is apparently satisfactory in its current condition, but with continued deterioration of the wood piles the foundation

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DISTRIBUTION: R. FORMAN - Theater in the Park
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2 Executive Blvd. 110 Prospect Street
Suite 410 Bellingham, WA 98225
Suffern, NY 10901 206/734-7194
914/356-3333 Fax: 206/734-7399
Fax: 914/356-3356

JOB NAME: NYS Pavilion Inspection

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system will become over loaded. This prediction is based on the assumption that:

- (1.) pile allowable compression stress parallel to the grain is 1200 psi (average for western and southern pine) for undeteriorated wood
- (2.) deteriorated portion of pile has no axial load capacity but can provide sufficient lateral bracing capacity to prevent the pile from buckling under axial compression load
- (3.) the seemingly undeteriorated portion of the pile has 75 percent of the full wood compression capacity.
- (4.) the initial allowable pile loading capacity, based on information from the adjacent Theater in the Park Contract Documents, was 20 tons.
- (5.) the prediction of pile deterioration uniformity is substantiated by a similar investigation completed in 1989 for the adjacent Theater in the Park (built at approximately the same period of time) which was discovered to have an identical extent of pile deterioration.

2. CMU Perimeter Walls for Supplemental Structure

- a. In general, numerous diagonal and horizontal cracks and some buckling out of plane was noted with regard to the CMU walls. Specifically,

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2 Executive Blvd. 110 Prospect Street
Suite 410 Bellingham, WA 98225
Suffern, NY 10901 206/734-7194
914/368-3330
Fax: 914/368-3366 Fax: 206/734-7399

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	<p>these problems were noted in the following locations:</p> <ol style="list-style-type: none">(1.) The interior perimeter CMU wall was severely buckled near the roof line between columns "J" and "K". Portions of the upper courses of CMU are in immediate danger of falling.(2.) Long diagonal shear cracks running from the roof level to the floor level were noted between column lines "L" and "M". Some of these cracks have opened to over an inch in width.(3.) Between column lines "H" and "J" the portions of the CMU wall above and below the long diagonal cracks have moved out of plane by 3/4 of an inch.(4.) Very long lines of diagonal cracks extend from column line "H" to as far as column line "L".(5.) A very large bulge exists in the upper half of the wall between column line "L" and "M".(6.) Differential wall settlement/footing failure has most likely caused the long horizontal cracks near the expansion joint at column line "F".(7.) Severe vertical cracking was noted at the vomitory wall and interior masonry wall intersection at column line "C".(8.) As a general note the radial walls adjoining the interior		

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2 E. 410
Suffern, NY 10901
914/368-3330
Fax: 914/368-3366

110 Prospect Street
Bellingham, WA 98225
206/734-7104
Fax: 206/734-7399

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	<p>circumferential wall have separated from the circumferential wall in some cases by as much as an inch.</p> <p>(9.) The exterior circumferential wall showed signs of "hairline" horizontal and diagonal cracks throughout.</p> <p>(10) Light could be seen through the diagonal cracks in the exterior circumferential wall between column lines "L" and "P".</p> <p>(11) Severe vertical and diagonal cracking was noted in the exterior circumferential wall between column lines "J" and "L". At this area there was also severe buckling of the CMU courses just below the roof level.</p> <p>b. The CMU walls throughout the structure may be experiencing this cracking because of footing settlement. However, the footings were not visible to ascertain whether the cracks in the CMU walls were concurrent with footing deformations.</p>		
3.	<p>Condition of the Promenade Level and Associated Stairways</p> <p>a. All of the stairs have severely corroded metal pan treads. In most cases sun light can be seen through the corroded riser portion of the pan. In some cases the steel stair nosings are</p>		

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2 Executive Blvd. 110 Prospect Street
Suite 410 Bellingham, WA 98225
Suffern, NY 10901 206/734-7194
914/313-3330 206/734-7399
Fax: 914/313-3336 F x: 206/734-7399

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	partially detached. The escalator at column line "G" is beyond repair.		
b.	The roofing membrane on the promenade has extensive spider cracking and is most likely allowing water to pass through. However, in most areas the galvanized metal form deck below does not show signs of corrosion.		
c.	Several of the roof drains are clogged and ponding of water on the roof has resulted. The ponding of water could potentially become 4 to 5 inches deep. Corrosion of the metal form deck below was noted at the areas of ponding water. The areas where water had ponded due to a clogged roof drain were between column lines "K"-"L", "I"-"J", and "B"-"C".		
d.	Peeling of the roofing membrane was noted at the expansion/control joints. The expansion/control joint was patched at the location between column line "O" and "P" and at column line "A". However, the patches have buckled and may soon begin to leak.		
e.	The fire hose cabinets have been vandalized and are no longer serviceable.		
f.	The grating between the horizontal perimeter railing members along the interior side of the promenade from column lines "B" to "D" is missing.		
4.	Perimeter Concrete Columns Supporting the Cable Structure		

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	<p>a. Horizontal cracks have been noticed at many locations on the columns. These cracks may be a result of a cold joint formation during construction. The cracks are generally long and no signs of spalling are apparent in the areas adjacent to the cracks.</p> <p>b. Pour joints or form breaks are evident every three to four feet. At these locations, honey combing of the concrete is evident.</p> <p>c. Spalling of the concrete cover and exposed rusting stirrups are evident at many of the tower concrete tie beams connecting the two semi circular concrete shells forming the 16 concrete roof support columns.</p>		

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