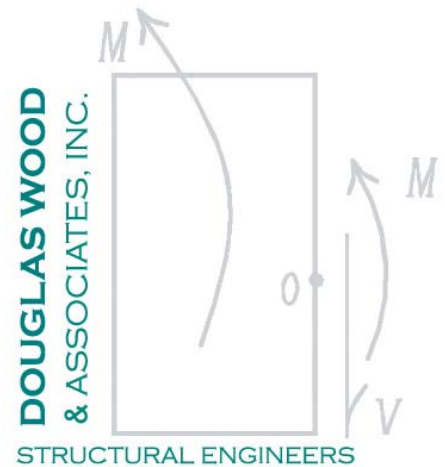


**MIAMI MARINE STADIUM  
VIRGINIA KEY  
MIAMI, FLORIDA**

**LIMITED EVALUATIONS OF EXISTING  
STRUCTURAL SYSTEMS**



**August 25, 2008**

**INTRODUCTION**

**General**

As requested by the Friends of Marine Stadium, representatives of **Douglas Wood & Associates, Inc.** have conducted a limited investigation and evaluation of the present condition of the existing structural systems at the Miami Marine Stadium.

**Scope of Investigation**

**Douglas Wood & Associates, Inc.** has provided the services for this investigation pro bono to the Friends of Marine Stadium. Our investigation addressed the present condition of the existing structural systems, which included consideration of the extent of deterioration, the likely causes of the deterioration and general concepts for repair. The need for immediate safety measures such as temporary shoring and/or bracing in some areas was also reviewed.

Primary structural systems do not include roofing or other waterproofing systems, doors, windows, non-bearing partitions, decorative elements, fixtures, cabinetry, railings and architectural finishes.

**METHODOLOGY AND LIMITATIONS**

This investigation was conducted using the following methods:

**Visual Observation**

Most information was gathered by visual observation. In most areas, at least one surface of the existing structural members is exposed for direct observation. Of course, foundation elements below ground were not directly observed, and elements such as slabs-on-ground and retaining walls could only be observed on one side. Also, of course, reinforcement and connection devices embedded in concrete could not be observed.

As of this writing, the time allotted to us to conduct our on-site observations was limited by City staff to approximately six hours. This time constraint limited the extent to which we could investigate individual areas of concern.

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### **Review of Existing Documents**

In cooperation with the City of Miami staff and the Friends of Marine Stadium, a number of documents relevant to this investigation were made available for use by **Douglas Wood & Associates, Inc.**

These documents consisted of the following:

#### **Reports**

1. "City of Miami Marine Stadium at Virginia Key, Existing Building Condition Assessment," prepared by L.D. Astorino Architects, Inc. and dated July 21, 2008
2. "Structural Condition Assessment of the Miami Marine Stadium, Miami, Florida," prepared by Bliss & Nyitray, Inc., dated July 18, 2008
3. "Condition Appraisal and Structural Review, Miami Marine Stadium Roof Structure, Miami, Florida, Volume I – Report," prepared by Simpson Gumertz & Heger, Inc. for The Hartford Steam Boiler Inspection and Insurance Co., dated May 1993. Volumes II and III of this report, which apparently consist of illustrations, appendices and calculations, do not appear to be available, at this time.

#### **Construction Drawings**

A partial set of structural drawings for the original construction of the stadium consisting of:

- S-1, Foundation Plan and General Notes;
- S-2, Ground Floor Framing Plan;
- S-3, Mezzanine Framing Plan;
- S-5, Roof Framing Plan;
- S-8, Structural Section – Col. Line 6;
- S-9, Structural Section – Col. Line 7;
- S-14, Structural Sections, Roof;
- S-16, Girder Reinforcing Details;
- S-17, Miscellaneous Structural Details; and
- S-18, Typical Structural Details.

### **Sampling and Testing**

Sampling and testing of existing structural materials was not within the scope of this investigation at this time.

### **Limitations**

The following limitations to this investigation should be noted. As previously noted, some structural members are only partially visible and all concrete-encased reinforcement and other embeddings and buried foundations and soils conditions cannot be directly observed. We were not authorized to

remove any existing finishes or other construction, nor did we perform excavations to gain visual access to existing concealed structural members. Where structural elements could not be directly observed, observations were directed at secondary signs of structural distress such as cracks, staining, efflorescence, deflections and deformations. Also, due to the constraints of time, investigations did not include exhaustive member-by-member inspection. Therefore, it must be expected that during future renovations and at other times, deteriorated or distressed structural components that were not observed or reported during this investigation, may be found.

At this time, **Douglas Wood & Associates, Inc.** has not performed structural calculations to verify the adequacy of the original design of the structural members and systems. This office assumes no responsibility for the structural design or construction of this building. The findings presented in this report do not imply any warranty on the performance or Building Code conformance of the existing structural systems.

It must be noted that this building was constructed in the early to mid-1960's. The building codes, materials, products and practices at the time of the original construction vary somewhat from those of today. Therefore, it should be remembered that there are aspects of the existing structural systems which do not conform to today's standards and codes. It is usually assumed, however, that older structures have withstood the test of time and proven to be generally adequate for their intended use. This investigation is primarily directed at determining, within the limits of visual observation and time, the presence of significant deterioration or failure.

## **EXISTING SITE CONDITIONS RELATIVE TO STRUCTURAL ISSUES**

### **Environmental Influence**

#### **Hurricanes**

The Miami area is prone to hurricanes, and the Miami Marine Stadium has, undoubtedly, been subject to hurricane-force winds on a number of occasions and has fared well in such past events. The almost exclusive use of reinforced concrete throughout the primary structural systems has, undoubtedly, contributed to its general positive performance during hurricanes.

Past performance, however, can not be considered a definitive predictor of future performance. Obviously of course, deterioration is progressive, and structural systems may weaken over time. Also, despite its age, it is unlikely that the Miami Marine Stadium has ever experienced winds associated with an upper-level category storm, such as categories 4 and 5 on the Saffir-Simpson Scale. It should be noted that in 1992 the north eye wall of

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Hurricane Andrew with its category 5 winds passed further to the south in Miami—Dade County.

The shallow waters of Biscayne Bay are also prone to hurricane storm surge and it is likely that the lower levels of the stadium structure have experienced flooding on a few occasions.

### **Salt Exposure**

With its location adjacent to and partially over Biscayne Bay, it is almost certain that chloride ions have been introduced into the existing concrete systems, through flooding, wave splash and hurricane wind-driven sea water. In sufficient concentrations, these ions can hasten electrolysis in reinforcing steel. It should be noted, however, that the investigation conducted in 1993 by Simpson, Gumpertz & Heger, Inc. included chloride ion content tests on three cores through the roof slab. Their report indicates that the chloride ion contents were within acceptable ranges throughout the depths of the test cores, except for the bottom surfaces where chloride content recommendation limits were exceeded. The report noted that the reinforcing steel is located at the roof slab mid-depth, away from the increased chloride ion concentration of the bottom surface.

## **OBSERVATIONS AND EVALUATIONS**

As previously stated, **Douglas Wood & Associates, Inc.** was provided with a copy of the report “Structural Condition Assessment of the Miami Marine Stadium, Miami, Florida,” prepared by Bliss & Nyitray, Inc., dated July 18, 2008. Due to the constraints of time at the site and due to the constraints of time based on our provision of these services pro bono to the Friends of Marine Stadium, we made use of Bliss & Nyitray, Inc.’s report (referenced above) to organize our site observations and to organize our comments on our site observations herein.

Our visual observations of the existing structure and our evaluations of those observations are in general agreement with the report prepared by Bliss & Nyitray, Inc. within the limitations of their scope, as described in their report, it is our opinion that Bliss & Nyitray, Inc.’s observations and evaluations are generally correct. We offer the following comments to certain specific items in Bliss & Nyitray, Inc.’s report.

### **Review of Report by Bliss & Nyitray, Inc.**

1. Section 3.1.4  
It should be noted that the beams along grid line E have relatively short spans and are directly loaded only by small areas of the walkway slab. Also, it should be noted that the beams “directly below the lower seating rake beams on each numbered grid line” and the “beams on grid lines 1, 17, C and D” carry no direct loads and appear to have been provided for stability bracing. In general, therefore, the stresses in these beams are relatively low.

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There are varying degrees of deterioration in these beams.

In our opinion, significant areas of these beams can be repaired in lieu of replacement.

2. Section 3.1.5

In our opinion, the “severe deterioration” of columns C-1 and C-17 pertains specifically to the lower portions of these columns and not to their entire lengths.

In our opinion, petrographic testing would be necessary to determine if there is any significant damage due to fire.

3. Section 3.1.6

In our opinion, the “severe deterioration” is limited to certain sections of the retaining wall. Most areas are in significantly better condition.

4. Section 3.2.1

In our opinion, the “severe deterioration” appears to be quite limited, with most of it occurring immediately adjacent to the hanger connections. Most areas of this slab appear to be in serviceable condition and/or require modest repair.

In our opinion, the slab area between grid lines 2 and 3 referred to as being “severely deteriorated” is limited to an area of approximately 10 ft. x 10 ft.

5. Section 3.2.4

In our opinion, further investigation would be warranted. It may be possible to retain a significant number of the slab-rod connections and steel channel embedments within the slabs.

In our opinion, the architectural integrity of the stadium will be better served and preserved by replacing parts of the existing hanger system as required, rather than by adding columns, provided that any required fire resistance ratings do not otherwise indicate.

6. Section 3.3.2

In our opinion, most of the cracks referred to in this section are acceptably narrow and could be effectively sealed with a waterproofing coating.

7. Section 3.3.5

While there are some areas of significant deterioration in these columns, the previously repaired portions have a larger cross section than the original columns. It also appears that there may be significant redundancy in the structural framing in this area. In our opinion, additional investigation is warranted relative to the need for and extent of possible “immediate shoring” for these columns. In the absence of further

investigation, the City may want to proceed with such shoring, but engineering design would nonetheless be required.

8. Section 3.4.4  
In our opinion, the estimate of “30% replacement” is somewhat high.
9. Section 4.1  
Relative to the table, “Summary of Observed Deterioration,” please refer to our comments relative to specific sections above.
10. Section 4.2  
In our opinion, one should be using the Florida Building Code 2007 – Existing Building which is scheduled to become effective December 31<sup>st</sup> of this year. Our review of this Code for other upcoming projects, however, has not found changes which would significantly effect this evaluation.

If the proposed restoration project is determined to be an Alteration Level 2, as defined by the Florida Building Code 2007 – Existing Building, there is no specific Code requirement for an investigation or evaluation of the strength of the existing structure. Of course, however, all appropriate repairs would be necessary, and if any structural “dangerous conditions,” as defined in the Florida Building Code 2007 – Existing Building, are discovered, they would need to be appropriately enhanced.

Even if the proposed restoration were determined to be an Alteration Level 3, as defined in the Florida Building Code 2007 – Existing Building, the Code would only require that the evaluation for wind response be conducted using design wind pressures as determined by the Building Code in effect at the time the stadium was constructed if less than 30% of the existing structure were included in repair or renovation.

In our opinion, repair and restoration of this building would reasonably be classified as an Alteration Level 2.

**Review of 1993 Report by Simpson Gumpertz & Heger, Inc.**

According to the available documents, it appears that in 1992/1993, the City made an insurance claim for reported roof structure damage due to Hurricane Andrew. As a result, Simpson, Gumpertz & Heger, Inc. was hired to assess the structural issues related to this claim. According to Volume 1 of their report, they conducted a rather thorough investigation of the roof structure, including visual observations, exploratory excavations, materials sampling, laboratory testing and structural analysis.

While Simpson, Gumpertz & Heger, Inc. concentrated their investigation on the roof structure, they made general observations of the balance of the structure and reported structural deterioration quite similar to that reported by Bliss & Nyitray, Inc. in their report of July 18, 2008 and as confirmed by Douglas Wood & Associates, Inc. Simpson, Gumpertz & Heger, Inc. did not quantify the amount of deterioration,

but one would expect that additional deterioration has presented itself in the intervening fifteen years.

Simpson, Gumpertz & Heger, Inc. concluded:

“The analysis and design procedures used for the design of the Miami Marine Stadium achieved a safe design but one that was prone to cracking particularly at the thin lightly reinforced front hypar shell. The existing cracks in the Miami Marine Stadium roof are not cause for concern regarding the structural integrity of the roof; however, it is prudent to improve the concrete tensile strength by injecting epoxy into the cracks to better assure the continued ability of the concrete to resist shear.”

Simpson, Gumpertz & Heger, Inc. further concluded:

“Our work indicates that the roof structures are safe, and that, with repairs to the cracks and the waterproofing, the roof(s) structure(s) useful life can be significantly extended.”

### **Cost Estimates**

We have reviewed the cost estimate provided in Bliss & Nyitray, Inc.’s report of July 18, 2008. Bliss & Nyitray, Inc. employed the services of Structural Preservation Systems, LLC. to assist them in determining structural repair costs. Structural Preservation Systems, LLC.’s is a large and reputable structural repair contractor. In our opinion, the following issues should be noted:

- 1) Structural Preservation Systems, LLC.’s “Repair Cost Estimate” (provided on page 99 of Bliss & Nyitray, Inc.’s report of July 18, 2008) includes three line items for railings, with a total cost of over \$460,000 (including permit and bonds). The “Statement of Probable Cost of Construction” in L.D. Astorino Architects, Inc. report of July 21, 2008 also includes an item for “New Railings.” These items should be coordinated to be sure that they have not been duplicated in these estimates.
- 2) Structural Preservation Systems, LLC.’s estimate includes a line item for “Roof Membrane Waterproofing.” We do not see another line item in either Structural Preservation Systems, LLC.’s or L.D. Astorino Architects, Inc.’s estimates for additional waterproofing or coatings. In our opinion, it will be very important that the entire structure be treated with an appropriate waterproofing product. Due to the amount of graffiti and due to the amount of required concrete patching, it will be appropriate to coat all surfaces within a pigmented system which will provide a uniform color. There are several possible product systems which will provide protection to the structure and enhanced aesthetics. In our opinion, the estimates should be reviewed to assure that this cost is included.

- 3) If the costs associated with the “railings” are removed from Structural Preservation Systems, LLC.’s cost estimate, their resulting estimated cost for structural repair and reroofing is approximately \$5,062,000.
- 4) Douglas Wood & Associates, Inc. has not presently sufficiently quantified the required repairs to evaluate the quantities listed in Structural Preservation Systems, LLC.’s cost estimate, nor have we researched the appropriateness of their “Unit Price(s),” nor have we employed a professional cost estimator.
- 5) It must be noted that Structural Preservation Systems, LLC.’s cost estimate (including railings) was \$5,525,000. In section 4.4 of their report, however, Bliss & Nyitray, Inc. states:

“We have found that the actual repair areas end up between 2 to 3 times larger than the initial repair estimate. Based on our experience, our opinion is the estimated repair cost will be between \$10 million and \$15 million dollars.”

\$5 million to \$15 million is quite a wide range. It would seem that this would make it difficult for the City to plan appropriately. In our opinion, further investigation, quantification of repairs and price research is warranted.

## CONCLUSION

Based on the available information at this time, and based on our limited observations, it is our opinion that the existing structural systems can be repaired such that they will possess strengths close to their original values and that the existing structural systems can be treated such that future deterioration can be effectively retarded.

In our opinion, additional investigation is warranted to determine a meaningful construction cost estimate for structural repairs.

