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STRUCTURAL INVESTIGATION
OF
SPARTAN STADIUM
PORTSMOUTH, OHIO

PREPARED FOR

PORTSMOUTH CITY SCHOOLS
923 FINDLAY STREET
PORTSMOUTH, OHIO 45662

PREPARED BY

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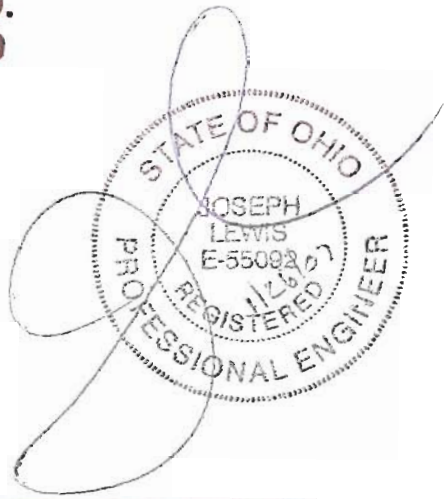

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INTRODUCTION

On December 19, 2006, I visited the Spartan Stadium complex to perform a structural investigation of the existing facilities. It Was requested that I determine the feasibility of renovating the structure. There has been considerable water leakage into the facility over the years. Additionally, there had been a past fire, where the damaged structure had been repaired. This will serve to report my findings.

DESCRIPTION OF STRUCTURE

The facilities are approximately 70 years old, and are cast-in-place concrete structures. The construction is typical for that time period. On the west side of the complex is the main stadium. There has been a great deal of water leakage into the main stadium over the years, causing areas of significant damage to the concrete. Additionally, a previous fire caused significant damage at the central entry area. This area of damage was previously repaired, and the entire stadium was newly caulked to prevent entry of water into the structure. Despite the fact that these repairs were made only 6-7 years ago, water continues to infiltrate the structure on a steady basis.

On the east side of the complex is the visitor's bleachers. These consist of cast-in-place concrete with aluminum bleacher seats spanning between concrete supports.

The analysis of existing concrete structures is complicated by the fact that it is difficult to determine the size and spacing of the rebar. In order to determine this, the structure would need to be x-rayed. Also, without taking concrete core samples, the compressive strength of the concrete can only be estimated.

FIELD INVESTIGATION

I first examined the main stadium. Water leakage has caused a great deal of cracking and spalling of the concrete throughout the entire underside of the structure. There is also significant efflorescence, which is the leaching of water-soluble calcium hydroxide from the concrete. It is characterized by the white staining of the concrete. Photos 1 and 2 on the next page offer a fair representation of the type of damage witnessed on the underside of the concrete deck. In photo #1, the bottom of the concrete steps show signs of cracking, spalling, and efflorescence. Photo #2 shows significant cracking in the concrete structural member. This corrosion is being initiated from the top surface as water leaks into the structure, and is often discovered too late. By the time the water leaches all the way to the bottom of the structure to begin corroding the rebar, significant damage has already been done to the concrete above.

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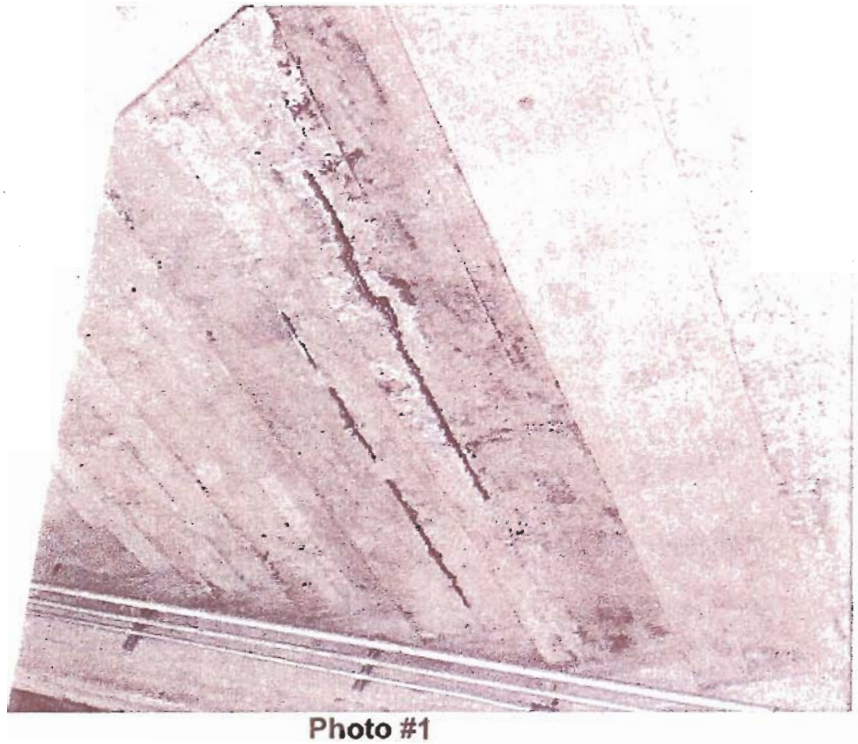

Photo #1

Photo #2

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Previous repairs were made to some of the cracks about 6-7 years ago on the underside of the structure. However, as seen in photo #3 below, the repairs are failing and the cracks are reopening. This indicates that the cracking is still active, and that water continues to leak into the structure.

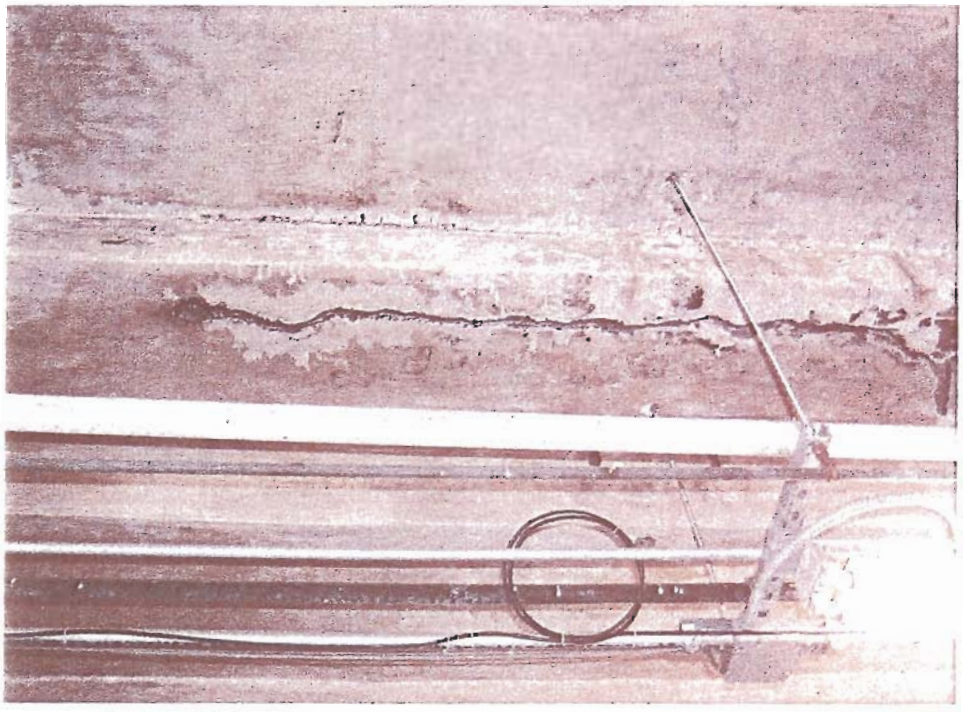

Photo #3

I examined the top of the structure to examine some of the areas where the leakage is occurring. Previous joints and cracks had been caulked in the past repairs, however in almost every case, the repaired areas had reopened allowing water to enter the structure. Photos 4 and 5 on the next page show typical examples of the how the previous caulking is deteriorating. The caulk is separating from the surrounding concrete in photo #4, allowing the entry of water. In photo #5, a crack is propagating through the caulking.

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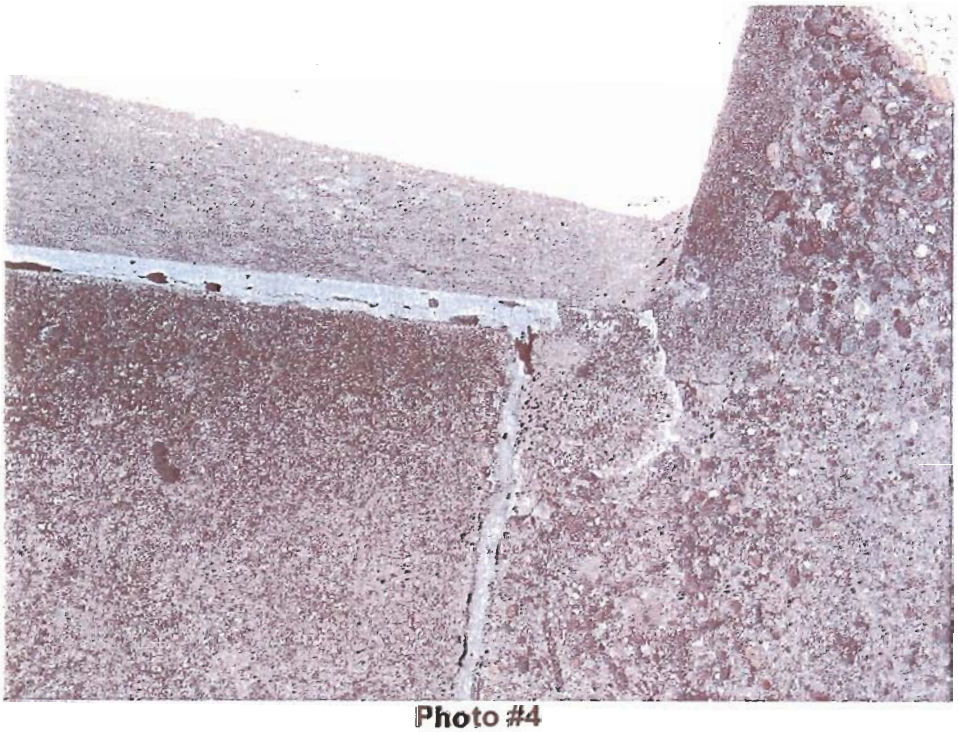

Photo #4

Photo #5

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The pilasters at the top of the stadium are also experiencing a great deal of distress, as can be seen in photo #6 below. An exterior coating had been added to the pilaster, which has severely deteriorated. The condition of the pilaster below is also questionable, as it has experienced significant water damage.

Photo #6

There are several other areas on the front facade of the main stadium where the concrete has deteriorated to the point of exposing the rusted rebar beneath. This condition is seen on photos 7 and 8 on the next page.

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Photo #7

Photo #8

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I next examined the visitors bleachers. Huge concrete failures have occurred within the structure, rendering them unsafe. The photos below, and on the next page, are indicative of the severity of the damage throughout the bleachers. There is no evidence of any maintenance ever being done to the bleachers. In photo #9 below, the concrete damage can be seen as evidenced by the cracking and spalling, as well as the exposed rusted rebar. Photo #10 shows concrete shear failure along the supporting stairs, and photo #11 shows additional damage.

Photo #9

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Photo #10

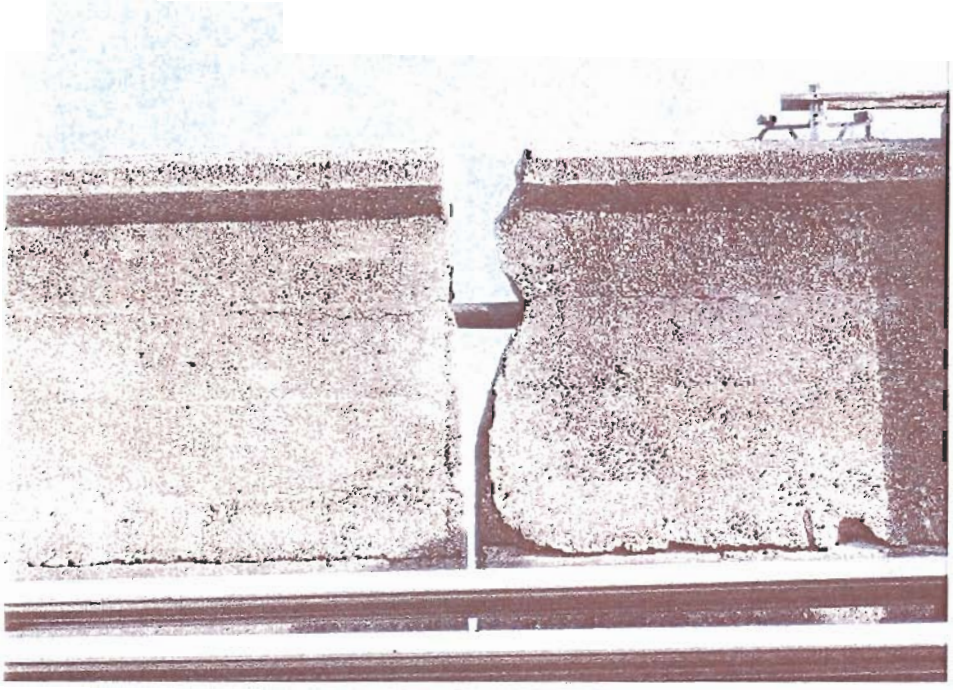

Photo #11

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The majority of the aluminum bleacher seats are no longer attached to the concrete supports. A few are still attached with steel angles, but the majority are merely resting on the concrete with no means of attachment. In photo #12 below, holes in the concrete can be seen where an angle used to be attached to the aluminum planks.

Photo #12

Finally, it is likely that there are PCBs present in the existing electrical equipment due to the era in which the equipment was installed. PCBs are included in the Federal Governments "Toxic Substances Control Act". I recommend an environmental inspection agency be obtained to further investigate the severity of the problem. The EPA maintains a listing of the laws and regulations applicable to PCBs and their cleanup.

CONCLUSIONS

The main stadium has had severe damage due to water infiltration over the years, and is in need of extensive renovations. At this time it is impossible to evaluate the structural integrity of the stadium based upon a visual inspection alone. A series of testing would have to be performed to analyze the construction materials to determine their initial quality as well as the extent of damage. First, concrete core samples would have to be taken throughout the stadium to learn the compressive strength of the concrete during construction. Then the extent of deterioration of the rebar would have to be determined using some form of non-destructive

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testing such as thermography, pulse velocity, x-ray, etc. Finally, the extent and severity of the presence of PCB's, as previously mentioned, would have to be determined. The total cost of all testing could easily be in the range of $100,000 to $200,000.

Should all of the testing come back with positive results, the repairs could then proceed. The minimum suggested repairs are as follows. First, the top and exterior surfaces of the concrete will need to be patched, caulked, and resealed. This would include the removal of all previous patching and caulking that is failing. It is also suggested that the all exterior concrete surfaces have a water sealant applied to assist in preventing the future entry of water into the structure. All of the concrete on the underside of the structure could then be repaired. This would include the chipping, cleaning, and epoxy grouting of all cracks and spalls. Due to the extent of damage, the total cost of these procedures could easily exceed $1,000,000 to $1,500,000. Once all of the repairs are made, a yearly maintenance schedule will have to be developed to maintain the integrity of the structure. Due to the age of the stadium, it is expected that leaks will continue to develop. This maintenance program can be expected to cost in the range of $50,000 to $100,000 per year.

Finally, the visitor bleachers are beyond repair. They are unsafe, and shall no longer be used. They will need to be demolished, and a new structure built in it's place. The cost of replacement will vary greatly depending on size and materials chosen, but will generally be in the neighborhood of $160 per seat.

RECOMMENDATIONS

Should the results of all of the recommended testing programs come back positive, the total estimated cost of required repairs could meet or exceed $1,500,000. This cost does not include the cost of bringing the stadium up to present day Building Code requirements for quantity of restrooms, etc. Also, the structure would still be susceptible to developing future leaks, and will require an extensive yearly maintenance schedule. It is estimated that a new grandstand can be built for an estimated $225 per seat. Therefore, the cost of a new structure seating 10,000 would be approximately $2,250,000. Based upon all of the information I have seen, it is my professional opinion that it is not economically feasible to repair the existing stadium. Due to its age, and the severity of damage, repairing the structure is not practical. Constructing a new facility will prove to be far more economical in the longrun.

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