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## **STRUCTURAL INVESTIGATION OF THE MEMORIAL STADIUM GRANDSTAND**

**DRAFT FINAL REPORT OF FINDING  
12/20/2021**

## **SCOPE:**

North Florida Professional Services, Inc. (NFPS) was tasked with performing a field inspection the grandstands of the City's Memorial Stadium. This was the result of a complaint made to the City's insurance carrier. The facility has been closed since the complaint was made.

The scope of work is to consist of three phases. Phase 1 involves a complete field inspection of the structure and a report of the findings and corrective actions needed. Phase 2 will consist of providing repair details for the corrective actions needed. Phase 3 will include the structure analysis of the grandstands once the necessary repairs are completed.

## **BACKGROUND:**

The grandstands consist of three (3) distinct sections. The main center section of the grandstands was constructed in or around 1949 by the Virginia Bridge Company. The company is no longer active under this name and original construction plans and documents are unknown. The main grandstand structure consists of ten (10) steel frames spaced approximately 15 feet on center. Each frame consisted of a wide flange steel beam running up the rake of the structure and is supported by a concrete cap block at the base and four (4) progressively taller steel H-Pile columns. The foundation supports of the columns are unable to be determined.

The north and south grandstand section were constructed sometime in the 1990's and consist of frames each. The spacing of the frames are 5 feet on center. Each frame consists of a wide flange steel beam supported by five (5) H-pile columns. The columns are supported by concrete strip footing of unknown dimensions and reinforcement. No plans for these sections of the grandstands are known to exist.

## **EXECUTIVE SUMMARY:**

While the grandstand sections need some repair and maintenance work, the overall condition of the structure does appear to support the expenditure of funds to make the necessary repairs. Most of the repairs needed are minor in scope and would most likely involve shoring up the existing columns at their bases. The entire structure does need to be sandblasted and painted. While painting does not affect the structural integrity of the facility, it does extend extent the useful life of the structure for the foreseeable future.

## MAIN GRANDSTAND SECTION:

\*For the main grandstand structure, a column does not exist at the toe of the frame lines. A concrete "cap block" (CB) supports the main floor beams.

### Frame Line 1

**Over CB1\*** - Active corrosion with insignificant pitting, less than 5%.



**Column 2** – 2 ½" H x 1" W area North flange with 25% loss of section and 100% section loss 2" x ¼" area of flange edge.

Corrective Action Required: Repair section loss at base of the column flange.



**Column 3** - Above base plate the South face of web and Southeast flange exhibit up to 10% section loss to the lower 1". The North face at this location appears similar. (Limited access due to building)

Corrective Action Required: Repair section loss at base of the column flange.



**Column 4** - The web at bearing has up to 100% section loss in a 6" wide x 3 ½" area.

Corrective Action Required: Repair section loss at base of the column flange.



**Column 5** - Top of column cover plate at I-beam (floor beam) interface active corrosion with 5% section loss above base plate. At footing, web of column up to 100% section loss in a 3" H x 6" W area.

Corrective Action Required: Repair section loss at base of the column flange.

## Frame Line 2



**Over CB 1\*** - Active corrosion with insignificant pitting, less than 5% to upper flange, 25% section loss 12" from bearing 18" length x 1" width.

Corrective Action Required: Repair section loss at base of the column flange.

**Column 2** - Insignificant pitting, less than 5% and up to 10% to lower North face of web and Northwest flange. South face limited access.

**Column 3** - East face, East flange only exposed. Lower 1" Insignificant pitting, less than 5% section loss.

**Column 4** - Limited access, concrete encased.



**Column 5** - North face of web less than 10% section loss in lower 1 ½" at base.

Corrective Action Required: Repair section loss at base of the column flange.

### Frame Line 3



**Over CB 1\*** - Top and bottom flange, 2" from bearing up to 40% section loss to flange edges of the floor beam 1" H x 18" long.

Corrective Action Required: Repair section loss at base of the column flange.

**Column 2** - Insignificant, less than 5%, pitting to lower 10" at base.

**Column 3** - South face of web at base less than 5% section loss in 1" wide area.

**Column 4** - Access limited, concrete encased.



**Column 5** - Up to 100% section loss to web in a 6"x 4" area at base.

Corrective Action Required: Repair section loss at base of the column flange.

## Frame Line 4

**Over CB 1\*** - Active corrosion with insignificant pitting, less than 5% section loss.

**Column 2** - No significant deficiencies



**Column 3** - Up to 20% section loss at base predominately in web 2" high.

Corrective Action Required: Repair section loss at base of the column flange.

**Column 4** - No significant deficiencies on exposed member, South face encased in concrete.



**Column 5** - At base, up to 15% section loss to web 1 ½" high of South face and North face of flange edges.

Corrective Action Required: Repair section loss at base of the column flange.

## Frame Line 5



**Over CB 1\*** - 100% section loss to web at bearing 2" x 2" area. Deep pitting, 25% section loss to lower web in a 10" long x up to a 2" wide area, South face. North angle in clip anchoring the floor beam to cap block is 40% due to corrosion.

Corrective Action Required: Repair section loss at base of the column flange.



**Column 2** - 50-80% overall section loss with areas of 100% section loss within the web and flange at base 3-4" in height.

Corrective Action Required: Repair section loss at base of the column flange.



**Column 3** - 50-70% section loss to web with a  $\frac{1}{4}$ " hole to lower  $2\frac{1}{2}$ ".

Corrective Action Required: Repair section loss at base of the column flange.



**Column 4** - At base up to 100% section loss to lower 3" of web and Southwest flange. Also, a 2 1/2" x 2 1/4" hole and 3/4" x 1/2" hole. Remainder of web 70% section loss.

Corrective Action Required: Repair section loss at base of the column flange.



**Column 5** - Repair plates removed for web access. Up to 100% section loss to original web at base.

Corrective Action Required: Repair section loss at base of the column flange.

## Frame Line 6



**Over CB 1\*** - Adjacent to anchor clip the web of the floor beam exhibits up to 20% section loss in a 2" x 1 ½" area on south face. The upper flange 2" from bearing South flange 25% section loss 12" in length.

Corrective Action Required: Repair section loss at base of the column flange.



**Column 2** - up to 70% section loss to North face of web and North flanges. Limited access to South face. Concrete encased.

Corrective Action Required: Repair section loss at base of the column flange.



**Column 3** - 100% section loss to entire web 1 ¼" high. Flanges exhibit 50-60% overall section loss.

Corrective Action Required: Repair section loss at base of the column flange.

**Column 4** - 10-20% section loss to web at base 1 ¼" South face. North face encased in concrete.



**Column 5** - Repair plates removed for access. Up to 100% section loss to original web at base.

Corrective Action Required: Repair section loss at base of the column flange.

## Frame Line 7



**Over CB 1\*** - Anchor bolt nut missing at bearing. Insignificant pitting, less than 5% bottom flange 2' in length, upper flange 2' from bearing 20% section loss in a 2" x 2" area around  $\frac{3}{4}$ " drilled hole.

**Column 2** - Base of the column is encased in concrete. Surface rust with no apparent section loss.



**Column 3** - Limited access; Concrete block construction. East face, East flange up to 20% section loss, West face, West flange up to 20% section loss.

Corrective Action Required: Repair section loss at base of the column flange.

**Column 4** - up to 15% section loss to lower 1  $\frac{1}{2}$ " to North web and West flange.



**Column 5** - Repair plates removed for access. Up to 100% section loss to original web at base.

Corrective Action Required: Repair section loss at base of the column flange.

### **Frame Line 8**



**Over CB 1\*** – pitting section loss up to 25% to top and bottom flange of floor beam up to 3' in length. 10% section loss to lower web 1" wide up to 20" long south face. Anchor bolt nuts missing.

**Column 2** - Insignificant pitting, less than 5%.

**Column 3** - Up to 20% section loss East face, East flange and West face, west flange. No access to web and inside flange faces.

**Column 4** - Up to 10% section loss West face, West Flange. (Only exposed face)

**Column 5** - 10-15% section loss to lower 3", flanges and web.

**Frame Line 9**



**Over CB 1\*** - 34" from the bearing of the floor beam has been spliced by butt welding floor beam and augmented with 2 full height of web x 10" long steel plates welded around full perimeter.

**Column 2** - Surface corrosion with no apparent section loss at base.

**Column 3** - completely encased in concrete and block structure. The connection to I-beam (bent cap) is exposed and in good condition.



**Column 4** - South Face inaccessible (block wall) North face, North web 40-50% section loss with 100% section loss in a  $\frac{3}{4}$ " area lower 3" at base. Inside Face of East and West flanges up to 50 % section loss.

Corrective Action Required: Repair section loss at base of the column flange.



**Column 5** - Up to 100 % section loss in a 1" x  $\frac{3}{4}$ " area in web at base. Up to 25% overall section loss to lower 1  $\frac{1}{2}$ " at base. Up to 30 % section loss Inside face Northeast flange.

Corrective Action Required: Repair section loss at base of the column flange.

## Frame Line 10



**Over CB 1\*** - Surface corrosion, no section loss, no functioning anchor bolt.

**Column 2** - 25% section loss to West and East faces of the South flange edges.

**Column 3** – 10% overall section loss to North Face of web and East face of East flange.



**Column 4** - 50% section loss overall in web with a 2" x 1" area up to 100% (pin hole).

Corrective Action Required: Repair section loss at base of the column flange.

**Column 5** - 10-15% section loss to South face of web  $\frac{3}{4}$ " high at base plate. East face of East flange concrete encased above base plate.

## Opening of grandstands to field Bay 5



The channel, parallel and approximately 3' North of Frame Line Cap 5 extends from Cap Block 5A and runs 2' beyond Column 2 at Frame Line 5.



Single anchor bolt at Cap Block 5A is 25% deteriorated.



The channel, parallel and approximately 3' South of Frame Line Cap 6 extends from Cap Block 5B and runs 2' beyond Column 2 at Frame Line 6.



No functioning anchor bolt, A 4" x 5" x 1/4" plate is welded atop.



The South to North 4" angle between Bent 5 and 6, 36" East of Column 2 is welded to the decking only. The decking and portions of the 4" angle exhibit 100% section loss along the welded seam 27" x up to 1" wide (adjacent to Bent 5).

## **GRANDSTAND DECKING**



Located 4' South of Frame Line 4, top row of seats a 14" x 6" depression/ low spot exhibits significant deterioration with 6 holes from 1/2" to 3/4" in diameter.

## **ALL DECKING (additions included)**



Throughout the decking areas exist with cracked and blistered paint, active corrosion, and minor section loss.



Typically, throughout, the angle clips securing the aluminum bench seating to the steel decking at the welded connection to steel decking, exhibit active corrosion, rust bleed out, and varying amounts of section loss up to 20%, isolated in the welded connection.



Additionally, the steel decking joints along the longitudinal/horizontal welded seams exhibit cracked paint, active corrosion, rust bleed out. Section loss is less than 10% in areas chipped out.



Throughout, the steps/stairs have a 1" angle stitch welded to the 90-degree bend at the riser/tread. Typically, these locations exhibit active corrosion and rust bleed out between the decking and angles.



Over/near Frame Line 5. Of the grandstand, column 2 inside corner of deck and stair riser 100% section loss in an 18" x 1" area.

Corrective Action Required: Repair holes in deck pans, repair or replace seat brackets as needed. Sandblast and paint.



The pipe frames, for the chain link fencing at the stadium top, exhibits 100% section loss at the welded connection to the 6" channel predominately in the pipe, up to half the circumference x 4" high. The 6" channel at this location is heavily deteriorated along the entire length of the main bleachers. The decking is welded at the top. Pack rust has pried apart up to 1 ¼". Top flange of channel has up to 100% section loss to the outer flange edge up to 1" in width.

Corrective action required: Reinforce top flange as needed. Replace pipe frames and attachments as needed.



A 4' section of top rail is missing located adjacent to the NE corner of the press box.

Corrective Action Required: Repair top rail pipe frame and secure fencing.

**SWAY BRACING** (between Main Grandstand and both bleacher additions South and North)

#### **South Bleacher Addition**

Frame Line 4, Column 3 to main grandstand Frame Line 1, Column 2: minor corrosion with insignificant section loss at the lower edge of the mitered channel.

Frame Line 6, Column 4 to main grandstand Frame Line 1, Column 3: No significant deficiencies.

#### **North Bleacher Addition**

Main grandstand Frame Line 10, Column 2 to North Addition Frame Line 1, Column 3: paint loss with active corrosion at mitered connections.

Main grandstand Frame Line 10, Column 3 to, North Addition Frame Line 1 Column 5: Lower connection, Frame Line 10 Column 3 exhibits active corrosion with pitting, less than 5% along vertical weld seam and where the channels cross.

**NORTH ADDITION:  
Frame 1**



**Column 1** - (6" channel) Active corrosion, pitting with 10% loss of section isolated in lower web only.



**Column 2** - (H-pile) Overall section loss less than 5% in lower 2". The Northwest flange has been removed (flame cut).

**Column 3** - No significant deficiencies.

**Column 4** - Insignificant pitting less than 5% at base.

**Column 5** - No significant deficiencies.

**Frame 2**

**Column 1** - (6" channel) Section loss less than 10% to the lower 2" of the web. The channel and base plate are floating above the footer with no bearing.



**Column 2** - less than a 5% section loss to the lower 1" of web Southwest flange removed (flame cut)

**Column 3** - Less than 10% overall section loss above base.

**Column 4** - Insignificant pitting above base, less than 5%.

**Column 5** - No significant deficiencies.

### Frame 3



**Column1** - (6" channel) Section loss up to 10% in the lower 2" of the web. The channel and base plate are floating above the footer with no bearing.



**Column 2** - 25% overall section loss within the lower 2" with a 1 ¼" x 1" area of 100% section loss, bottom of web.

**Column 3** - Active corrosion with insignificant pitting less than 5%.

**Column 4** - Active corrosion with insignificant pitting less than 5%.

**Column 5** - No significant pitting

#### Frame 4



**Column 1** - (6" channel) 15% section loss to lower 2" of web. The channel and base plate are floating with no bearing.

**Column 2** - less than 10% section loss within the lower 3".

**Column 3** - No significant deficiencies.

**Column 4** - Insignificant pitting at base, less than 5%.

**Column 5** - No significant deficiencies.

## Frame 5

**Column 1** - (6" channel) No significant deficiencies.

**Column 2** - (H-pile) Less than 10% overall section loss to lower 3".

**Column 3** - No significant deficiencies.

**Column 4** - Insignificant pitting less than 5% in the lower 3" at base.

**Column 5** - No significant deficiencies.

## Frame 6

**Column 1** - (6" channel) No significant deficiencies.

**Column 2** - (H pile) Insignificant pitting less than 5% lower 2" at base.

**Column 3** - No significant deficiencies.

**Column 4** - Surface corrosion, no section loss.

**Column 5** - No significant deficiencies.

## General Note



Randomly throughout the North bleacher addition areas exist where paint failure has revealed active corrosion and insignificant section loss

## SWAY BRACING



Frame 5 between Columns 4 and 5 the South leg is bent to the South up to 3”.

All sway bracing has been cut and butt welded in Bay 3 between Columns 3, 4, and 5.

**SOUTH ADDITION:  
Frame 1**



**Column 1** (6" channel) The built-up welded connection to column 1 exhibits heavy active corrosion with section loss up to 80% within the weld.



**Column 2** (H-pile) Approximately 20% overall section loss at interface of concrete footing.

**Column 3** No significant deficiencies.

**Column 4** Minor pitting at ground line; less than 10%.

**Column 5** No significant deficiencies.

### Frame 2 (H-pile)

**Column 1** (6" channel) Minor pitting, less than 10% at interface with concrete footing.

**Column 2** (H-pile) No significant deficiencies.



**Column 3** Southeast Flange 100% section loss in a 1" H x  $\frac{3}{4}$ " W.

**Column 4** Approximately 10% section loss at footing.

**Column 5** No significant deficiencies.

### Frame 3

**Column 1** (6" channel) Minimal section loss, less than 5% at base

**Column 2** (H-pile) No significant deficiencies.

**Column 3** Minimal section loss, less than 5% at base.

**Column 4** No significant deficiencies.

**Column 5** No significant deficiencies.

### Frame 4

**Column 1** (6" channel) minor pitting at base, less than 10%.

**Column 2** (H-pile) No significant deficiencies.

**Column 3** No significant deficiencies.

**Column 4** No significant deficiencies.

**Column 5** No significant deficiencies.

**Frame 5**

**Column 1** (6" channel) Corrosion with less than 10% section loss at base.

**Column 2** (H-pile) No significant deficiencies.

**Column 3** Minor pitting at base, less than 10%.

**Column 4** No significant deficiencies.

**Column 5** No significant deficiencies.

**Frame 6**

**Column 1** (6" channel) Minor pitting at base, less than 10%.



**Column 2** (H-pile) 10" above groundline, Southwest flange bent in a 4" area up to  $\frac{3}{4}$ ".

**Column 3** North web and Northwest flange up to 10% loss of section.



**Column 4** Overall section loss less than 10% at base, Southwest flange bent in 2 locations up to  $\frac{1}{2}$ " in a 16" area.

**Column 5** Southwest flange bent  $\frac{1}{4}$ " out of plane in 10" area.

#### **General comment**



Randomly throughout the South bleacher addition areas exist where paint failure has revealed corrosion with insignificant section loss.

## SWAY Bracing



Between Frame 3, Column 3 and Frame 4, Column 4, The upper North channel leg has been removed.



Between Frame 3 and Frame 4 at columns 4 and 5 (2 locations) The Sway Brace legs have been spliced together with butt weld.