Bridge Identification:

Structural File Number: 4800303 **County-Route-SLM:** LUC-002-1862 **ODOT District:** 02

Year Built: 1931 **Most Recent Fracture Critical Inspection:** 2008

Access: Various methods were used to access the numerous fracture critical members on this bridge, including industrial rope access techniques (SPRAT) climbing techniques, 120' aerial manlift, 60' aerial manlift, and ladders.

Traffic on Structure: ADT (2015): 21,253 Truck Traffic (K): 7%

Fatigue Life Study: Remaining Fatigue Life: N/A Year of Study: N/A

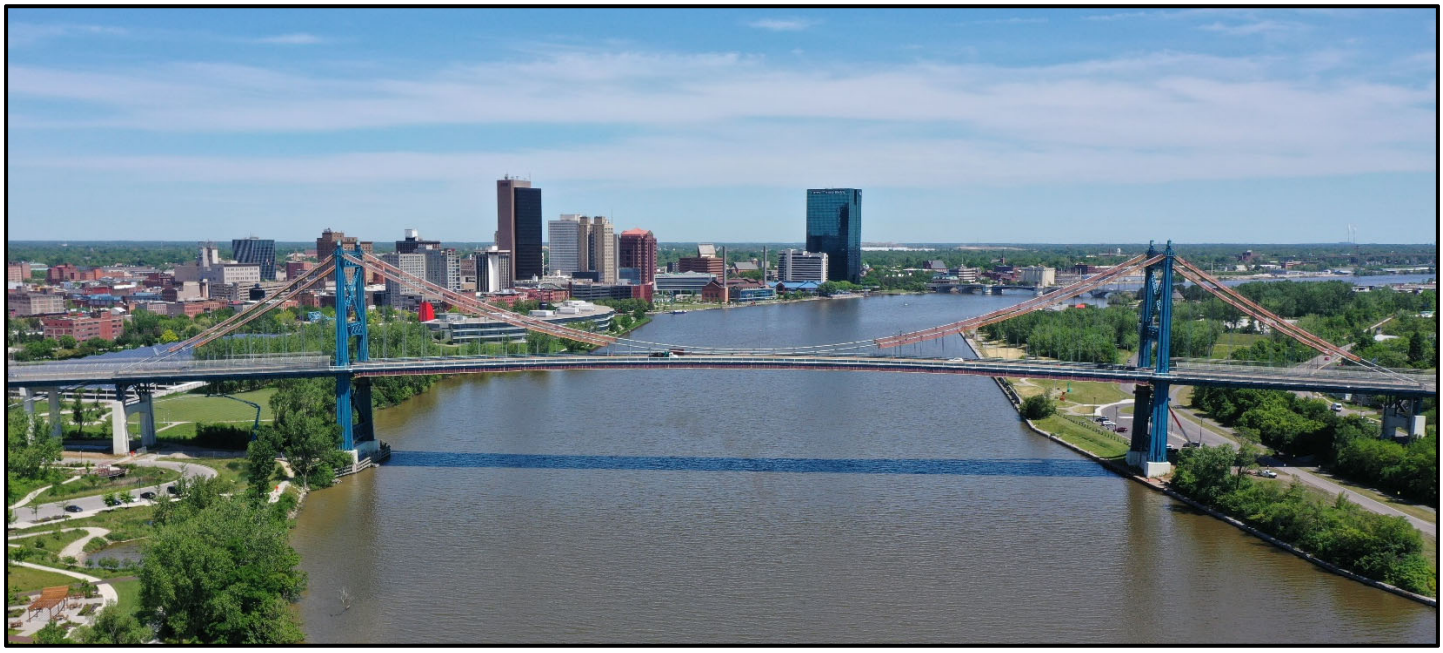

Photo 1 - Elevation View, Looking North

Structure Location:

The Anthony Wayne Bridge is in Toledo, Ohio and carries Clayton Street on the west side of the bridge to Woodville Road on the east side, over Morris Street, the Maumee River, Boers-Boyer Way, Miami Street, Yondota Street, and Utah Street. State Routes on the bridge are SR-2, 51 & 65.

Figure 1 - Location Map

Fracture Critical Inspection Requirements:

The inspection will consist of an In-Depth "Arms-Reach" inspection, performed in accordance with the guidelines of the current FHWA National Bridge Inspection Standards for Fracture Critical Members.

To perform an effective Fracture Critical Inspection, the following tasks must be performed. The 6 requirements are listed as follows:

1. Determine Resource Requirements.
   (Identify qualified inspection staff, use appropriate inspection access and inspection equipment).
2. Identify the Fracture Critical Members.
3. Develop the Inspection Procedure.
4. Prepare Follow-up Procedure.
5. Provide Quality Control/Quality Assurance for the inspection and report.
6. Develop a Periodic Inspection Plan.

Fracture Critical Inspection Plan:

Gannett Fleming performed an in-depth, element level inspection of this structure on March 11 and from June 8 through June 12, 2020. The March inspection utilized American Bridge's Safe Span rigging to access the exterior girders of the main suspension span. June's inspection included the remaining portions of the structure and incorporated personnel from Modjeski & Masters, who inspected all suspension span components. Gannett Fleming personnel included Dan Kent PE, Eric Dues PE, Cole Marburger PE, Vincent Traini PE, Ali Hashemi PE, Ruby Ng EIT, and Rob Parker. Prior to the start of the inspection, the inspection team met to review the details of this inspection plan. The inspection team also met to discuss findings at the end of each inspection day.

Inspection nomenclature and orientation:

The bridge is oriented west to east. Nomenclature included in this inspection plan and subsequent inspection report shall follow the following conventions to provide consistency with the design plans for the bridge while allowing the use of cardinal directions in field notes:

- Span nomenclature from west to east: Span 8W through 1W, Span RW-2, Span RW-1, West Suspension Span, Main Suspension Span, East Suspension Span, Span RE-1, Span RE-2, Span 1E through 15E
- Girders and stringers are numbered from north to south
- Approach Span floor beams are numbered from west to east, beginning at FB0, for each span.
- Suspension Span floor beams are numbered from west to east, beginning at FB0, at Pier B, and ending at FB65, at Pier E.

Additionally, left and right may be used to describe detailed locations. To ensure consistency, left and right directions will always be used in reference to an east facing orientation.

Superstructure and FCM Description:

The structure consists of three unique superstructure types: three continuous suspension spans, fourteen two-girder approach spans, and thirteen multi-beam/girder approach spans. The suspension span and two-girder superstructure types both contain Fracture Critical Members, identified with red arrows in the Figures below.

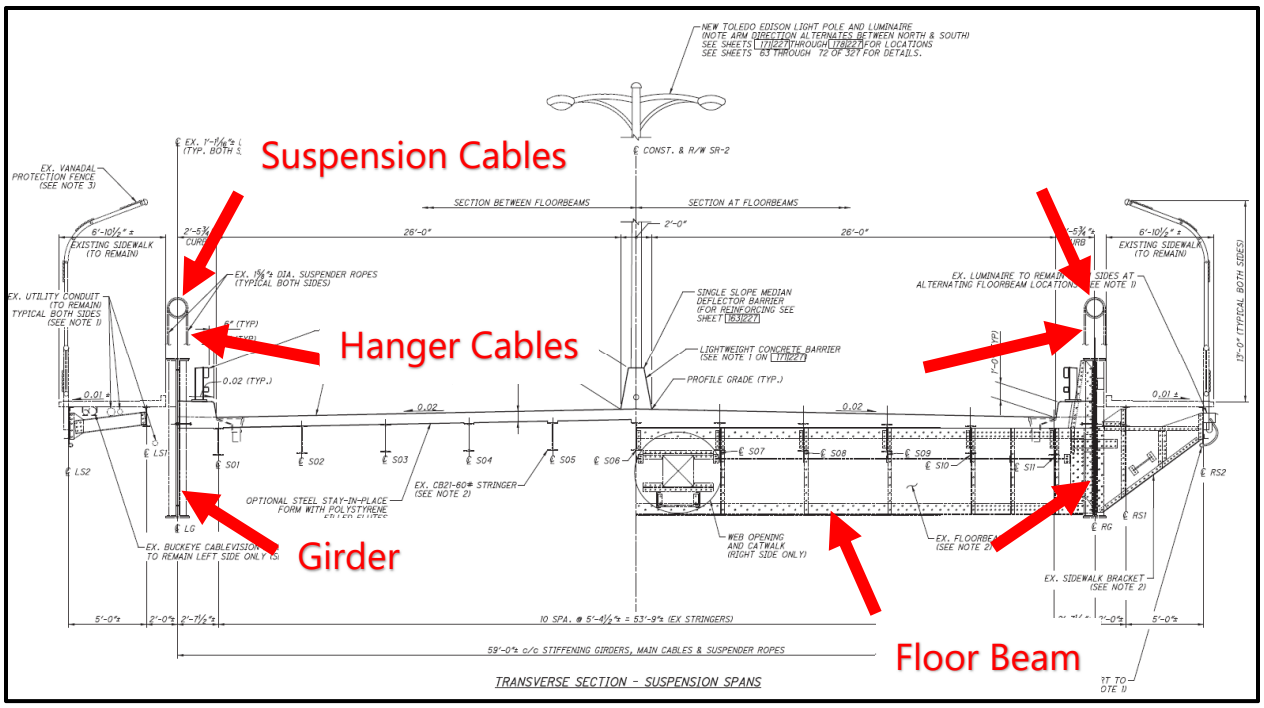

Figure 2 - Suspension Span Typical Section

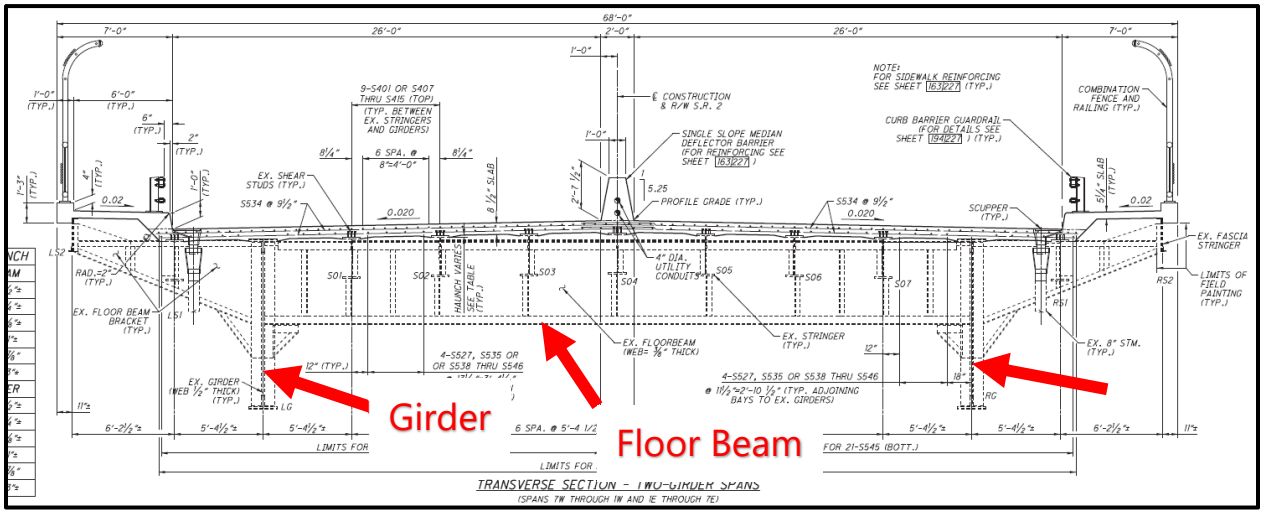

Figure 3 - Two-Girder Span Typical Section

Fracture Critical Member	Load Path Redundant	Structurally Redundant	Internally Redundant
Main Suspension Cables	No	Yes, composed of multiple strands	No
Secondary Hanger Cables	No	Yes, composed of multiple strands	Yes, 2 cables per group
Girders (in 2-Girder Systems)	No	No	Yes, built-up revited member
Floor Beams	No	No	Yes, built-up revited member
Pins/Hangers at Towers	No	No	No
Steel Frame at Pier B and Pier E	No	No	No

Table 1 - FCM Identification Table

Main Suspension Cables: The main cables of the Anthony Wayne Bridge are made up of 19 strands of 186 galvanized steel wires each. The tension cables run from the anchorage houses at each end through the backstays, side spans, and the main suspension span.

Photo 2 - Main Suspension Cables near Midspan

Secondary Hanger Cables: The suspenders consist of two wire ropes, or suspender cables, looped over the main cables, providing four components to carry each panel load. Special attention should be given to the hanger-girder connection to ensure load transfer.

Photo 3 - Hanger Cable - Suspension Girder Connection

2-Girder System Girders – Suspension Span: Located in all 3 Suspension Spans, the riveted, built-up girders support a floor beam/stringer floor system. Special attention should be given to the bottom flange tension zones and hanger-top flange connections.

Photo 4 - Suspension Span Girders

2-Girder System Girders – Approach Spans: Located in Spans 7W through 1W and Spans 1E through 7E, the single-span riveted, built-up girders support a floor beam/stringer floor system. Special attention should be given to the bottom flange tension zones near midspan.

Photo 5 - Approach Span Girder

Floor Beams: The riveted, built-up girders frame into the girder webs and cantilever beyond the girders to support the sidewalks. Tension zones include the bottom flange between girders and the top flange cantilever supporting the sidewalks.

Photo 6 - Floor Beams in 2-Girder Approach Span

Photo 7 - Floor Beam Cantilever Supporting the Sidewalk

Pins/Hangers at Towers: Located at Towers C and D, the link pins and hangers prevent uplift of the stiffening girders.

Photo 8 - Link Pins and Hangers at Tower C (Tower D similar)

Steel Frames: Located at Piers B and E, these frames were installed during the recent rehabilitation to support the new replacement spans. Special attention should be given to the fracture critical cap and the pin bearings, which control span movement.

Photo 9 - Steel Frame Supporting New Replacement Span at Pier E (Frame at Pier B similar)

Inspection Methods:

Visual Inspection: Visual inspection shall be conducted in accordance with the National Bridge Inspection Standards as defined on the Code of Federal Regulations (23CFR650), the inspection procedures defined in the American Association of State Highway and Transportation Officials (AASHTO) Manual for Bridge Evaluation, and the Federal Highway Administration report (FHWA IP-86-26) covering the "Inspection of Fracture Critical Bridge Members". The inspection shall be hands on and conducted within arm's length of the inspected components. Additional lighting, mirrors, and/or magnification will be used as necessary.

Liquid Penetrant Testing: Non-destructive testing method liquid penetrant testing will be used in accordance with accepted practice as defined by the following procedure:

1. Clean the surface of the component free of dust and dirt with a piece of cloth. Brush the surface of the component to remove scale, rust, paint etc., by a soft wire brush.
2. Spray the cleaner to remove oil, grease, etc.
3. Apply the dye penetrant (by spraying) adequately to cover the area to be tested. Allow 3 to 5 minutes or more for dye to penetrate the cracks.
4. Wipe off the excess penetrant on the surface with a rag.
5. Again, spray the surface with the cleaner to remove the remnants of the red dye.
6. Spray the developer evenly on the surface to give a thin even layer. This layer absorbs the penetrant from the cracks and red spots or lines appear on the surface to give a visible indication of the flaws.
7. If present, the crack will be indicated with the red dye absorbed by the white absorbent.

Follow-up procedures for inspection findings:

Fracture critical inspection findings shall be documented in the final inspection report. Any critical findings shall be reported to the Ohio Department of Transportation immediately. All findings (critical and typical) shall also be documented in the final fracture critical inspection report along with a copy of this inspection plan and an overall condition assessment.

Quality Control/Quality Assurance

Gannett Fleming is ISO 9001:2015 Certified and standard operating procedures for checking and reviewing work products will be utilized throughout the inspection process. The inspection team was chosen to ensure that inspector qualifications are met, with the Team Leader and several other inspectors having completed the course FHWA-NHI-130078, "Fracture Critical Inspection Techniques for Steel Bridges". The inspection team leader will perform quality control checks of support staff, as well as monitoring of any defects that are found.

Future Inspections

Future inspections of fracture critical elements on this structure are recommended every 24 months. If critical findings indicate the need for more frequent inspection cycles, this will be addressed in the final fracture critical inspection report and discussed with district personnel.