2020 In-Depth, Element Level Bridge Inspection Report

Submitted to:

Ohio Department of Transportation, District 2
317 E Poe Rd
Bowling Green, OH 43402

LUC-2-1862

In-Depth, Element Level Bridge Inspection Report

PID: 108045

Submitted by:

Gannett Fleming

*Excellence Delivered **As Promised***

October 2020

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SUMMARY

The Anthony Wayne Bridge over the Maumee River is in ***Satisfactory*** condition, or ***6*** on the NBIS Rating Guideline. The complete AssetWise Bridge Report is included in Appendix A.

DECK – GOOD

The deck is in good condition, with a NBIS Rating of 7. The only notable finding was the excessive efflorescence and longitudinal deck cracking at the underside of deck, at girder/deck edge interface in the suspension spans.

WEARING SURFACE – GOOD

The wearing surface is in good condition, with a NBIS Rating of 7. Abrasion is present in west bound lanes near both towers and there are minor transverse cracks scattered across the bridge.

EXPANSION JOINT – GOOD

The expansion joints are in good condition, with a NBIS Rating of 7. All the joints are full of sediment, but movement doesn't appear to be affected.

SUPERSTRUCTURE – SATISFACTORY

The superstructure is in satisfactory condition, with an NBIS Rating of 6. The Protective Coating System is in good condition with a NBIS Rating of 7. Common findings include freckled rusting, painted over section loss, and painted over distortion caused by pack rust. In addition, cracks in the top flange of the floor beam cantilevers at south sidewalk FB 10, 15, 16, 17, 18, 47, 50, 51 and north sidewalk FB 51were discovered. A calculation verified that the capacity of the compromised cantilever section was adequate for the sidewalk loading.

SUBSTRUCTURE – GOOD

The substructure is in satisfactory condition, with a NBIS Rating of 7. Overall, patches are sound with intermittent, minor unsound areas. All minor cracks are sealed.

SUSPENSION COMPONENTS – SATISFACTORY

The suspension components are in satisfactory condition. Notable deficiencies include moderate to severe corrosion of the splay saddles at the top of the anchorage pits, moderate corrosion of the main cable strands at the strand shoe interface, section loss of anchorage eyebars at the embedment concrete in the anchorage chambers, surface corrosion of the secondary steel cables, and section loss of the link plates in the cable bents of Piers B & E.

CHANNEL – GOOD

The channel is in good condition with a NBIS Rating of 7. No signs of obstructions or erosion were found.

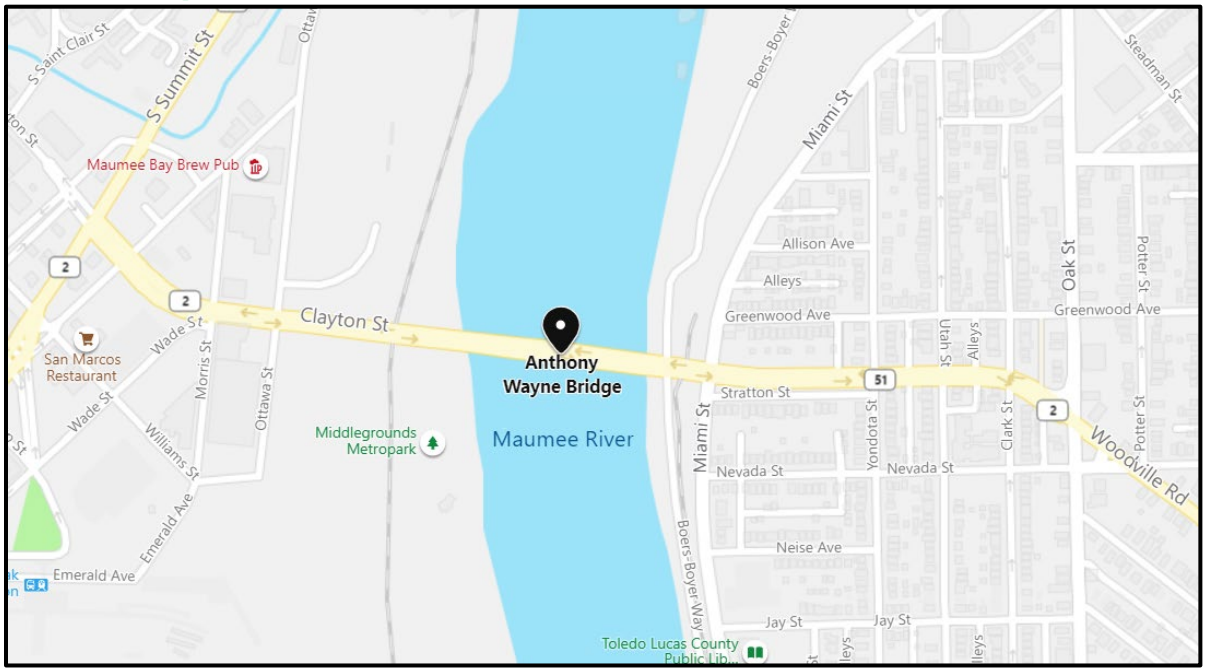
APPROACH – SATISFACTORY

The approach roadway is in satisfactory condition. All lanes on the west and east approaches exhibit map, transverse and longitudinal cracks.

INTRODUCTION

The Anthony Wayne Bridge, also named the High Level Bridge, is located 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. The historic bridge recently received extensive rehabilitation, resulting in new conditions and several unique elements. This in-depth, element level inspection is to serve as a basis for future inspection and maintenance going forward.

Location Map



General Photos

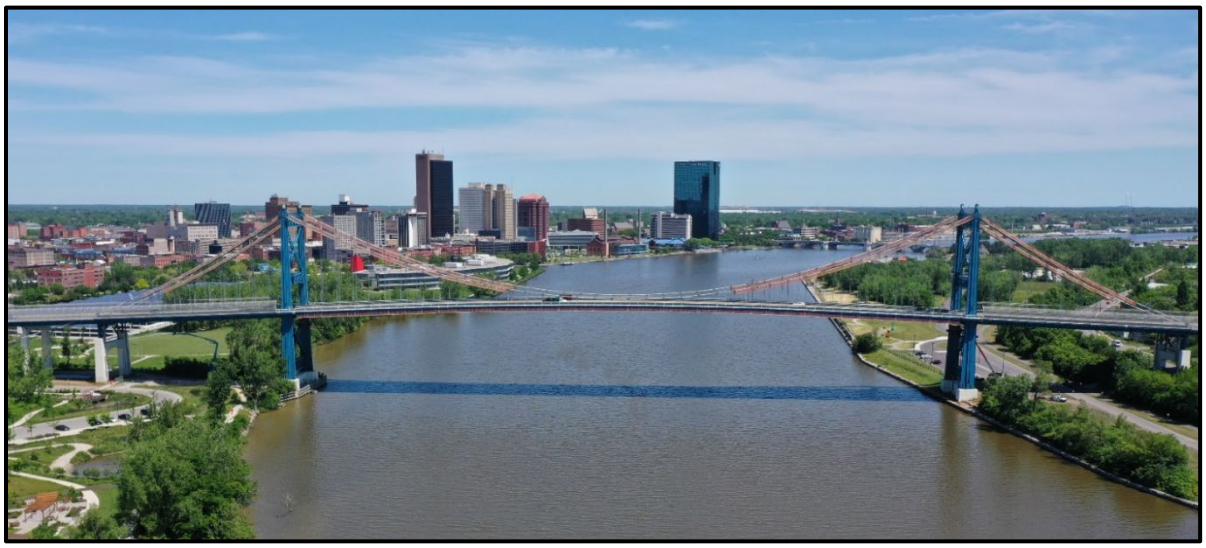


Photo 1 - Elevation View, Looking North

Photo 2 - Elevation View, Looking East

Photo 3 - West Approach Spans

Photo 4 - East Approach Spans

Photo 5 - Underside of Suspension Span, Looking East

Bridge Description

Superstructure

The overall length of the bridge is 3,215 feet taken along the centerline of the roadway. The structure consists of three unique superstructure types: three continuous suspension spans, fourteen two-girder approach spans, and thirteen multi-beam/girder approach spans. See Figures below.

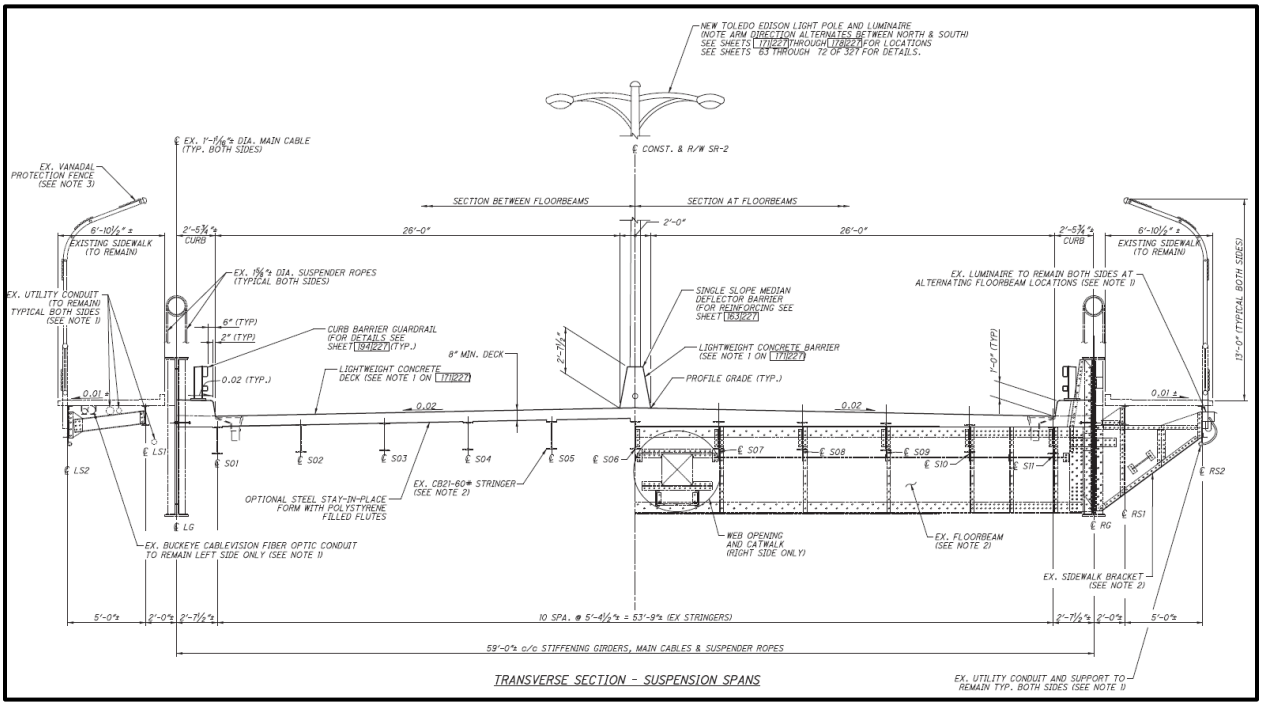


Figure 1 - Suspension Span Typical Section

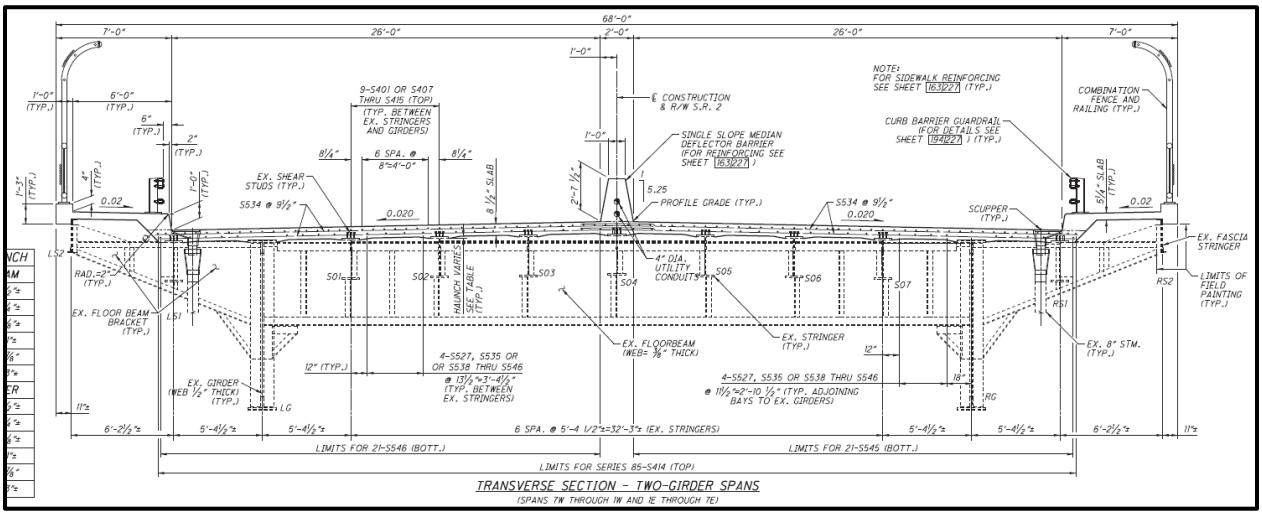


Figure 2 - Two-Girder Span Typical Section

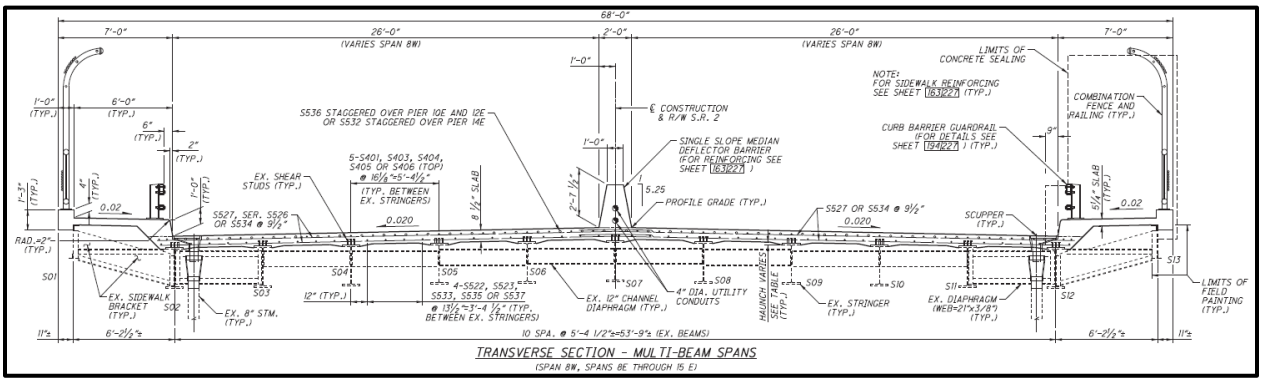


Figure 3 - Multi-Beam Span Typical Section

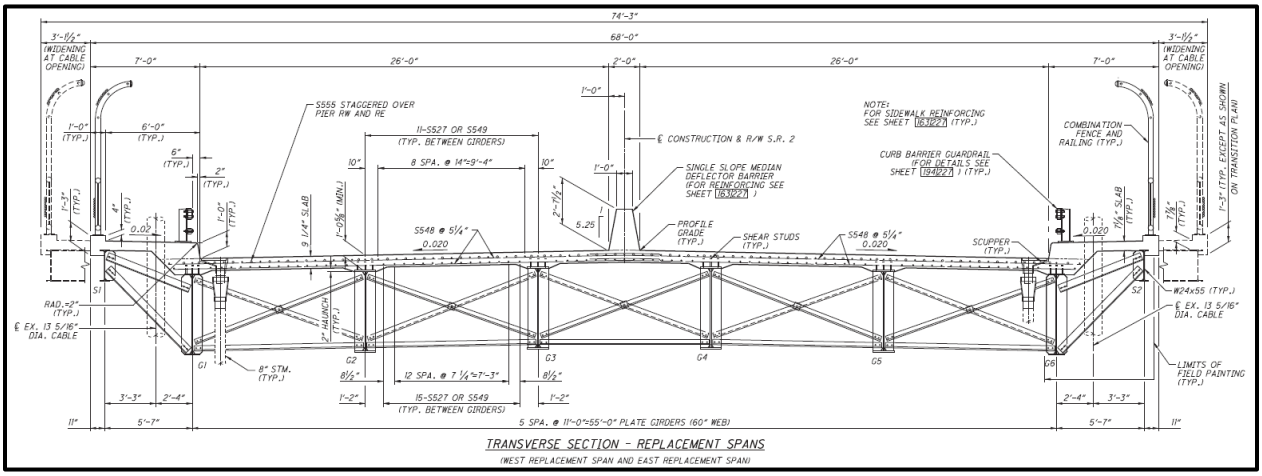


Figure 4 - Multi-Girder Replacement Span Typical Section

All sections include two 26', curbed travel ways, a single slope median barrier, and two 6' pedestrian sidewalks. The deck, curbs, median, and approach sidewalks were all replaced in 2015 and are composed of reinforced concrete. The suspension span deck and curbs are composed of lightweight concrete and house distributed galvanic anodes, which were designed to protect the main girder web. The suspension span sidewalks are precast panels, installed in 1998.

Substructure

The abutments are reinforced concrete gravity type abutments. In 2015, the east abutment was converted to semi-integral. The west abutment consists of a backwall and strip seal. Piers 7W, 6W, and 4E through 7E are reinforced concrete columns. Piers 5W through 1W, Pier B, Pier E and Piers 1E through 3E are reinforced concrete, open-webbed, two-column, capped piers. Piers RW, Tower C, Tower D, and Pier RE are reinforced concrete, two-column, capped piers. Piers A and F are reinforced concrete wall-type anchorage houses for the suspension components. Piers 8E through 14E are reinforced concrete, four-column, capped piers. All piers are founded on piles except A, C, D, and F, which are founded on spread footings.

Suspension Components

Each main cable consists of 19 strands of 186 parallel wires, for a total of 3,543 wires. Each wire is No. 6 galvanized wire with a diameter of 0.192 inches resulting in a total cable diameter of 13 5/16". The cables are wrapped outside the anchorage chambers in a heat-shrink neoprene cable wrap. The cables are anchored at each end within the anchorage chambers and pass over steel saddle castings at the top of the main towers. Inside the anchorage chambers, the main cables pass over a steel saddle casting located approximately at ground-level that directs the cable vertically downward into the anchorage pit approximately 40'-0" below ground-level. Upon exiting the cable saddle, the wire strands splay outward and wrap around the strand shoes. Each strand shoe is attached to a pair of anchorage eyebars by a pinned connection, and the eyebars are embedded in the concrete floor of the anchorage chamber. The anchorage provides a large, heavy mass to resist the pull of the main cable.

The suspender ropes consist of two 1 5/8" diameter wire ropes draped over castings clamped onto the main cables. In the main span these clamps are spaced 19'-11 1/2" apart and 19'-2 1/2" apart in the side spans. At the east and west ends of the side spans (Panel Points 0 and 65), special, larger diameter suspender ropes serve as hold-downs to resist uplift of the spans. These special suspenders are anchored at their tops to a much larger cable band and to a hold-down link and pin system at their bottom ends.

Pin and link assemblies are located at the north and south stiffening girders at the east and west sides of both towers for a total of 8 pin and link assemblies. These tower links help to maintain vertical alignment of the bridge deck while allowing longitudinal movement of the spans. Additionally, the cable bent frames at the east and west ends of the suspended side spans serve as pinned tension links to prevent uplift at the ends of the side spans.

Construction & Maintenance History

- 1931 – The Anthony Wayne Bridge, designed by Waddell and Hardesty, was opened to traffic. The McClintic Marshall Company was the contractor for the erection of the superstructure and HP Converse and the Holmes Construction Company were the substructure contractors.
- 1960-61 – Improvements to the structure included concrete deck replacement, lighting improvements, structural steel repair, expansion joint replacement, new scuppers, and downspouts.
- 1978 – Concrete barrier built on centerline.
- 1981 – Fences constructed on east approach spans.
- 1984-85 – Structural steel was painted using ODOT System A (inorganic zinc silicate primer and a vinyl finish coat).
- 1987 – Decorative lighting added in the suspension spans.
- 1988 – City of Toledo, Division of Streets, Bridges, and Harbors started to replace sidewalk in the suspension spans.
- 1989 – Plans and specifications were developed to repair the substructure concrete, rehabilitate the link bearing members, including pin replacement at the towers, install new strip seal expansion joints, drainage troughs and downspouts, pavement relief joints, and curb railing on the bridge approach spans. In addition, Physical Condition Report was prepared by SSOE, Incorporated.
- 1991 – Burgess & Niple, Limited (B&N) performed the first annual inspection of the bridge. Modjeski & Masters was hired as a sub consultant to inspect the suspension components with B&N. A night field survey was performed to provide geometric data for a structural and geometric behavior analysis of the suspension spans. Improvements included substructure concrete repair, rehabilitation of the link bearing members at the towers, new strip seal expansion joints, new drainage troughs and downspouts, and installation of curb railing on bridge approach spans.
- 1992 – B&N performed the second annual inspection of the bridge. Modjeski & Masters was hired as a consultant to inspect the suspension components with B&N.
- 1993 – B&N performed the third annual inspection of the bridge. Modjeski & Masters was hired as a sub consultant to inspect the suspension components with B&N. Commercial Diving Service, Inc. was hired as a sub consultant to perform a subaqueous inspection.
- 1995 – B&N prepared rehabilitation plans for various improvements, including a superplasticized dense concrete overlay, sidewalk replacement, finger joint replacement,

new deck joints, structural steel repairs, new suspender ropes, new cable wrap, painting the entire structure, etc.

- 1997-98 – American Bridge Company performed 1995 plan rehabilitation.
- 2003 – Gannett Fleming inspected the structure. Modjeski & Masters was hired as a sub consultant to inspect the suspension components. Mannik & Smith was hired as a sub consultant to inspect the east and west approach span components.
- 2012 - Cable opening inspection-Plasecki Steel Const. Corp.
- 2014-15 - E.S. Wagner Const. Co. performed plan rehabilitation which replaced bridge deck, made structural steel repairs, replaced approach truss spans with continuous steel girders, and patched concrete substructures. The suspension span deck was replaced with lightweight concrete. Consulting engineers were Arcadis, Gannett Fleming & Modjeski & Masters.
- 2016-17 - UCL Inc. preformed plan work to replace the bridge paint system.
- 2018-2020 - Replace cable wrap and installation of cable dehumidification system, install dynamic lighting system.
- 2020 – Gannett Fleming performed in-depth, element level and fracture critical inspection. Modjeski & Masters was hired as a sub consultant to inspect the suspension components. HRV Conformance Verification Associates performed phased array and conventional ultrasonic testing on the tower pins.

Inspection Procedure

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.

All bridge components were inspected at arm's length. 120' aerial lifts, 60' aerial lifts, SPRAT industrial rope access climbing techniques, and extension ladders were all utilized to safely access all components. Due to the recent rehabilitation and patching of the substructures, only substructure areas that appeared visually defective were hammer sounded.

Condition & Element Level Rating Guidelines

This bridge inspection was performed in accordance with the following documents:

- Manual of Bridge Inspection, Ohio Department of Transportation, 2014
- Manual for Condition Evaluation of Bridge, 2nd Edition, American Association of State Highway and Transportation Officials (AASHTO), 2011
- Bridge Inspector's Reference Manual (BIRM), U.S. Department of Transportation, revised December 2012

The figure below contains the bridge inspection rating matrix established by the Federal Highway Administration. This rating system was used for the NBIS components, General Appraisal, Deck, Superstructure, Substructure, Suspension Components, Channel, and Approach Summaries.

Condition Rating	Condition State	Description of Condition State
N	NOT APPLICABLE	
9	EXCELLENT	
8	VERY GOOD	no problems noted
7	GOOD	some minor problems
6	SATISFACTORY	structural elements show some minor deterioration
5	FAIR	all primary structural elements are sound but may have minor section loss, cracking, spalling, or scour
4	POOR	advanced section loss, deterioration, spalling, or scour present
3	SERIOUS	section loss, deterioration, spalling, or scour have seriously affected primary structural members; local failures possible; fatigue cracks in steel or shear cracks in concrete may be present
2	CRITICAL	advanced deterioration of primary structural members; fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support
1	"IMMINENT" FAILURE	major deterioration or section loss present in critical structural members or obvious vertical or horizontal movement affecting structure stability
0	FAILED	out of service; beyond corrective action

Figure 5 - NBIS Condition Rating System (FHWA)

The following Condition State definitions were taken from ODOT Manual of Bridge Inspection, 2014 and used in the field to determine defect classification:

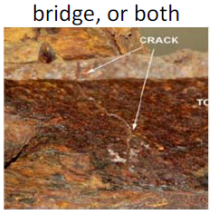
Defect	CS1	CS2	CS3	CS4
Section loss	None	Minor, surface pitting, up to 1/16" at worst	Any pitting between 1/16" and 10% deep loss of section	**Safety:** Requires **immediate action** to ensure safety of public traffic **Serviceability:** The condition is beyond the **limits established** in condition state three (3), **warrants a structural review** to determine the strength or serviceability of the element or bridge, or both **Safety:** Requires **immediate action** to ensure safety of public traffic **Serviceability:** The condition is beyond the **limits established** in condition state three (3), **warrants a structural review** to determine the strength or serviceability of the element or bridge, or both 
Corrosion, Pack Rust/ Connection	None	Freckled rust. Corrosion has initiated. Pack rust without distortion.	Missing bolt, rivet, broken weld, fasteners or pack rust with distortion but does not warrant a structural review.	
Cracking/ Fatigue	None	Repaired or arrested* cracks	Any initiated or propagated crack in the compression zone that does not warrant structural review	
Distortion	None	Exists but does not require mitigation. Distortion that has been mitigated	Distortion that requires mitigation that has not been addressed but does not warrant a structural review	
Settlement	None	within tolerable limits or arrested with no observed structural distress	Exceeds tolerable limits does not warrant a structural review.	
Scour	None	Exists within tolerable limits or has been arrested with effective countermeasures	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant a structural review.	
Damage	N/A	Has impact but repaired or minor	Has impact but does not warrant a structural review.	

Figure 6 - Steel Condition State Definitions

Defect	CS1	CS2	CS3	CS4
Delam/ Spall/ Patched Area	None	Delaminated. Spall 1 in. or less deep OR 6 in. or less in diameter. Patched area that is sound	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	**Safety:** Requires **immediate action** to ensure safety of public traffic **Serviceability:** The condition is beyond the **limits established** in condition state three (3), **warrants a structural review** to determine the strength or serviceability of the element or bridge, or both
Exposed Rebar	None	Present without measurable section loss	Present with measurable section loss, but does not warrant a structural review	
Cracking*	Any sealed OR less than 0.012 in. wide or spacing greater than 3.0 ft.	Unsealed Width 0.012-0.05 in. or spacing of 1.0-3.0 ft.	Unsealed cracks greater than 0.05 in. wide or spacing of less than 1 ft.	
Efflorescence/ Rust Staining/ Saturated	None	Surface white without build-up or leaching without rust staining. Arrested leaching or saturation	Heavy build up. Rust staining	
Abrasion/ Wear	None	Exposed coarse aggregate but the aggregate remains secure in the concrete	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear	
Distortion	None	Exists but does not require mitigation. Distortion that has been mitigated.	Distortion that requires mitigation that has not been addressed but does not warrant a structural review.	
Settlement	None	Exists within tolerable limits or arrested with no observed structural distress	Exceeds tolerable limits but does not warrant a structural review.	
Scour	None	Exists within tolerable limits or has been arrested with effective countermeasures	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant a structural review.	
Damage	N/A	Has impact but repaired or minor	Has impact but does not warrant a structural review.	

Figure 7 - Reinforced Concrete Condition State Definitions

Defect	CS1	CS2	CS3	CS4
Cracking*	Any sealed OR width less than 0.012 in. or spacing greater than 3.0 ft.	Unsealed Width 0.012-0.05 in. or spacing of 1.0-3.0 ft.	Unsealed Width greater than 0.05 in. or spacing of less than 1 ft.	**Wearing Surface is no longer effective** 
Rutting	None	Rutting less than 1" deep	Rutting more than 1"deep	
Patched Area/ Pothole	None	Patched area that is sound. Partial depth pothole	Patched area that is unsound or showing distress. Full depth pothole Traffic is slightly bouncing but not swerving due to a pothole.	
Effectiveness / Protecting Structural Elements/ Delam/ Traffic Safety	Fully effective. No evidence of leakage or further deterioration of the deck	Substantially effective: Deterioration of the deck has slowed. Delamination less than 6 in. in diameter	Limited effectiveness. Deterioration of the deck has progressed Delamination greater than 6 in. in diameter	
Damage	N/A	Impact Damage within tolerable limits	Impact damage does not warrant structural review	

Figure 8 - Wearing Surface Condition State Definitions

Defect	CS1	CS2	CS3	CS4
Grating	Intact and functioning properly	Intact and functioning, minor problems	Broken or missing grating or assembly but does NOT pose a hazard to vehicular or pedestrian traffic	Broken or missing grating or assembly may pose a hazard to vehicular or pedestrian traffic
Scuppers, Downspouts	Open, no ponding	Partially Clogged but no signs of ponding on deck or Downspout is inadequately terminated	Clogged, there are signs of ponding on deck but it does not extend into the striped or normal traffic lane	Clogged, there are signs of ponding in the striped or normal traffic lane.

Figure 9 - Deck Drainage Condition State Definitions

Defect	CS 1 -	CS 2	CS 3	CS 4
Leakage	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion	Fully Adhered.	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion.
Seal Cracking	None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Seal Damage	None.	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Debris Impaction	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched Area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched Area that makes the joint loose.	Spall, delamination, unsound patched Area or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage	None.	Freckled rust, metal has no cracks, or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning.	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Damage	Not applicable.	The element has impact damage not impeding traffic	The element has impact damage. Subtle clanking under traffic	The element has impact damage, LOUD clanking under traffic

Figure 10 - Expansion Joint Condition State Definitions

Defect	CS 1	CS 2	CS 3	CS 4
Corrosion	None.	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion but does not warrant a structural review.	
Movement	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
Alignment	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	
Bulging, Splitting or Tearing	None.	Bulging less than 15% of the thickness.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing's surfaces are not parallel. Does not warrant structural review.	
Loss of Bearing Area	None.	Less than 10%.	10% or more but does not warrant structural review.	
Damage	Not applicable.	The element has minor impact damage.	The element has impact damage but does not warrant a structural review	The element has severe impact damage.

Figure 11 - Bearing Condition State Definitions

Defect	CS 1	CS 2	CS 3	CS 4
Corrosion	None.	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, fasteners or pack rust with distortion but does not warrant a structural review.	
Movement	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
Alignment	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	
Bulging, Splitting or Tearing	None.	Bulging less than 15% of the thickness.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing's surfaces are not parallel. Does not warrant structural review.	
Loss of Bearing Area	None.	Less than 10%.	10% or more but does not warrant structural review.	
Damage	Not applicable.	The element has minor impact damage.	The element has impact damage but does not warrant a structural review	The element has severe impact damage.

Figure 12 - Pins/Hangers/Hinges

DECK

Element #12 / 805 - Reinforced Concrete Deck

DECK							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
12	Reinforced Concrete Deck	SF	187,865	186,024	530	1,311	0
805	Wearing Surface - Monolithic Concrete (ODOT)	SF	167,165	166,730	435	0	0

Overall, the deck is in good condition with a National Bridge Inventory Rating of 7. Stay-in-place forms are present in all 30 spans. The suspension spans are composed of lightweight concrete.

The only notable finding was the excessive efflorescence and longitudinal deck cracking at the underside of deck, at girder/deck edge interface in the suspension spans. The longitudinal deck cracks were quantified as CS3, while areas with efflorescence only were given CS2 status. Shortly after the inspection, samples of the efflorescence were sent to CTL Group to determine their mineral composition. CTL performed an x-ray diffraction test which identified the efflorescence as lithium carbonate. This identification was then verified with an inductive coupled plasma test. Once identified, Gannett Fleming contacted Vector Corrosion Technologies, the group responsible for the installation of the anodes in the deck. Vector was able to identify the source of the lithium, lithium hydroxide, the activator used during installation of the anodes. Vector does not believe the efflorescence will affect the well-being of the concrete deck, anodes, or adjacent steel girders. As for the longitudinal cracking, Gannett Fleming believes it is caused by the moderate differential movement of the deck and girder.

Photo 6 - Longitudinal Cracking & Efflorescence at Edge of Deck Underside (Typical, South Girder in Bay 15 shown)

There is no current OSHA Permissible Exposure Limit for lithium carbonate, however caution should be used during future inspections, as there is concern if it were to be ingested, inhaled, or came in contact with unprotected skin or eyes. PPE should include impervious gloves, eye protection that meets OSHA's eye and face protection regulations in 29 CFR 1910.133, and approved dust mask. Additionally, contaminated clothing should be changed immediately and cleaned prior to reuse.

The wearing surface is in good condition with a National Bridge Inventory Rating of 7. Abrasion is present in west bound lanes near both towers and there are minor transverse cracks scattered across the bridge.

Photo 7 - Wearing Surface Abrasion

Element #300 - Strip Seal Expansion Joint

STRIP SEAL JOINTS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
300	Strip Seal Expansion Joint	LF	1,596	0	1,596	0	0

Expansion joints are in good condition with a National Bridge Inventory Rating of 7. There were no signs of leaking observed during the inspection. Modular joints are present at the towers, elastomeric strip seals are in place everywhere else. All joints are full of sediment, but movement doesn't appear to be affected.

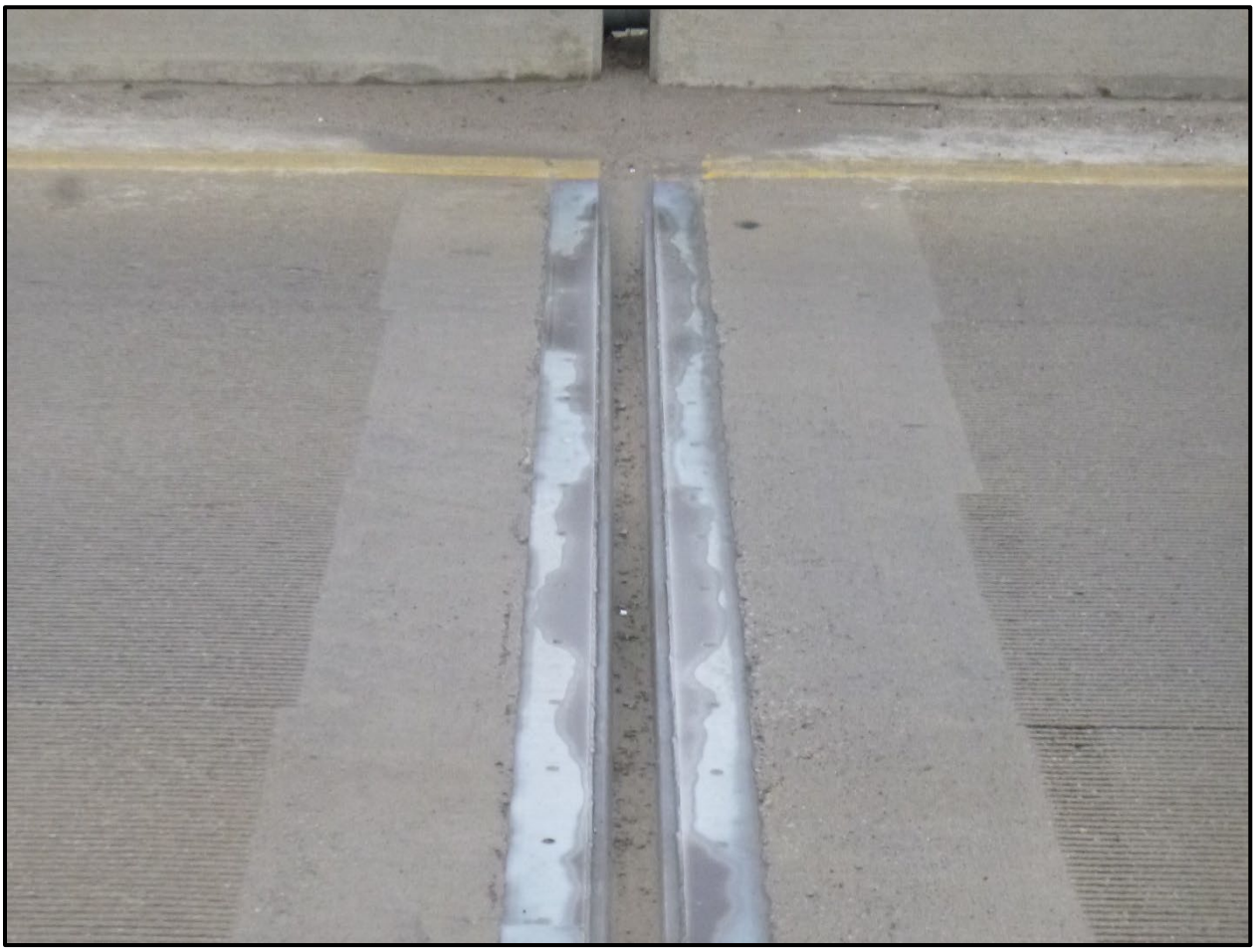


Photo 8 - Typical Strip Seal Expansion Joint Condition

Element #303 - Assembly Joint with Seal

MODULAR JOINTS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
303	Assembly Joint with Seal	LF	108	0	108	0	0

Photo 9 - Typical Modular Expansion Joint Condition

Element #330 - Metal Bridge Railing

METAL RAILING							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
330	Steel Guardrail (atop curb)	LF	6,432	6,427	1	4	0

The guardrail that protects sidewalk pedestrians is in good condition. There is a missing bolt in top rail/post connection at northeast corner of bridge, Span 15E. Additionally, there is impact damage to the lower rail at first post on southwest corner of bridge.

Photo 10 – 4 feet of Impact Damage to Guardrail at First Post on Southwest Corner of Bridge

Element #331 - Reinforced Concrete Bridge Railing

MEDIAN PARAPET							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
331	Reinforced Concrete	LF	3,215	2,297	918	0	0

The median parapet exhibits vertical cracking at approximately 3' spacing in the approach spans. Delamination and spalling are present under both light poles that are adjacent to Tower D. It was noted during construction that the light pole anchor bolts were placed in wrong sized pattern, which resulted in the bolts being bent in order to set the poles.

Photo 11 - Typical Vertical Cracks in Median Parapet

Photo 12 - Delamination and Spalling at Light Pole Adjacent to Tower D

Element #815 (ODOT) – Deck Drainage Grates & Scuppers

DRAINAGE							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
815	Deck Drainage Grates (ODOT)	EA	26	8	17	1	0

Most of the grates are partially covered in sediment/debris, but all appear to be draining. The grate along the south curb near Pier B is broken.

Photo 13 - Broken Deck Drainage Grate at South Curb near Pier B

Sidewalk (Non-Element)

The approach span sidewalks are in good condition and show no significant signs of distress. Unlike the approach sidewalks, the suspension span sidewalks were not replaced during the recent rehabilitation, and therefore are in fair condition. Many of the precast panel joints are leaking and small areas of spalling/delamination are present.

Sidewalk Railing (Non-Element)

The sidewalk railing is in good condition and shows no significant signs of distress.

Photo 14 - Sidewalk Railing (Typical Condition)

SUPERSTRUCTURE

Overall, the superstructure is in satisfactory condition with a National Bridge Inventory Rating of 6. The Protective Coating System is in good condition with a National Bridge Inventory Rating of 7. Condition State 2 findings include freckled rusting, minor pack rust without distortion, and minor impact damage. Condition State 3 findings include section loss greater than 1/16" and distortion caused by pack rust. Almost all CS2 and CS3 findings are painted over and inactive.

Element #107 / 515 - Steel Open Girder/Beam

GIRDERS/BEAMS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
107	Steel Open Girder / Beam	LF	10,852	8,564	111	2,177	0
515	Steel Protective Coating	SF	186,590	186,119	470	0	1

Arrested bottom flange section loss, freckled rusting, and distortion caused by pack rust were typical findings in the approach and suspension spans.

Photo 15 - Typical Pack Rust Induced Distortion of Suspension Span Girder Bottom Flange

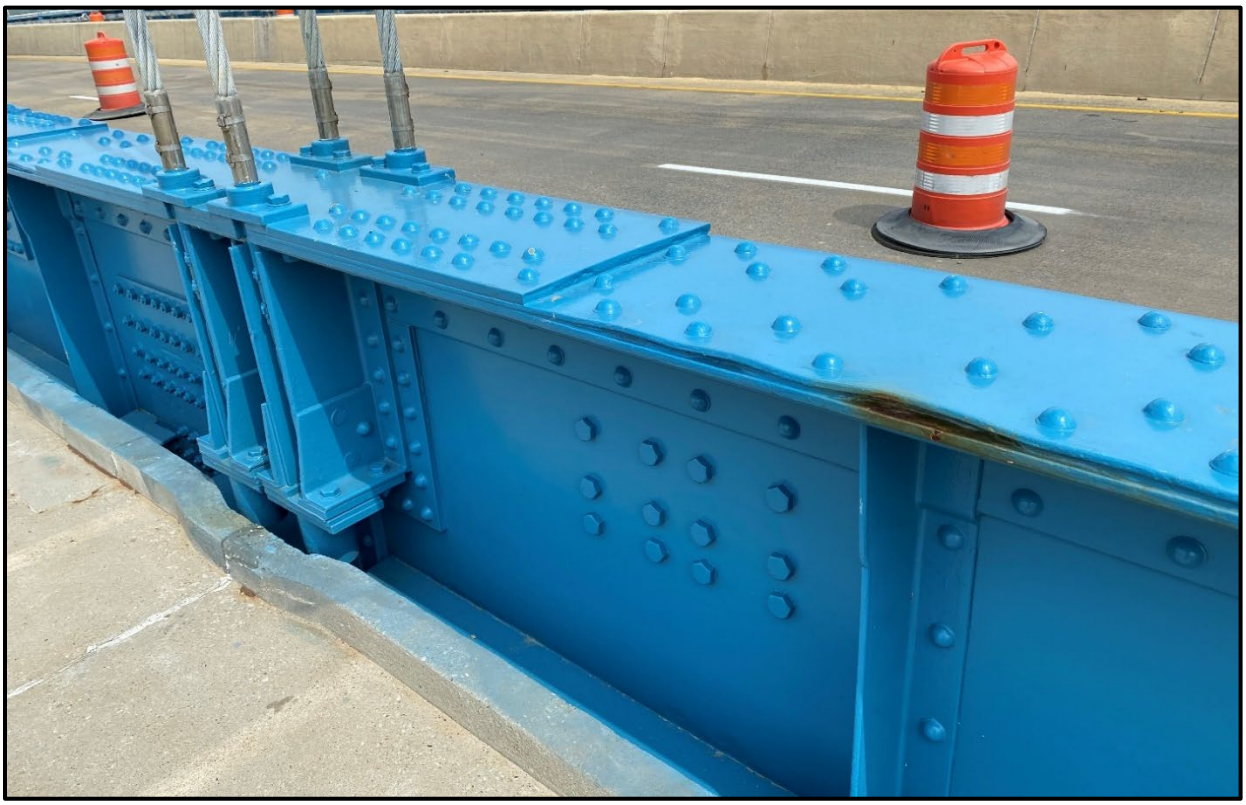


Photo 16 - Typical Condition of Top Flange/Web of Suspension Girders

Photo 17 - Impact Damage to Bottom Flange of Beam S02 in Span 14E

Element #113 / 515 - Steel Stringer

STRINGERS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
113	Steel Stringer	LF	33,258	30,893	92	2,273	0
515	Steel Protective Coating	SF	206,484	206,418	66	0	0

Section loss greater than 1/16" at floor beam/stringer connections and sidewalk connections was typical in approach and suspension spans.

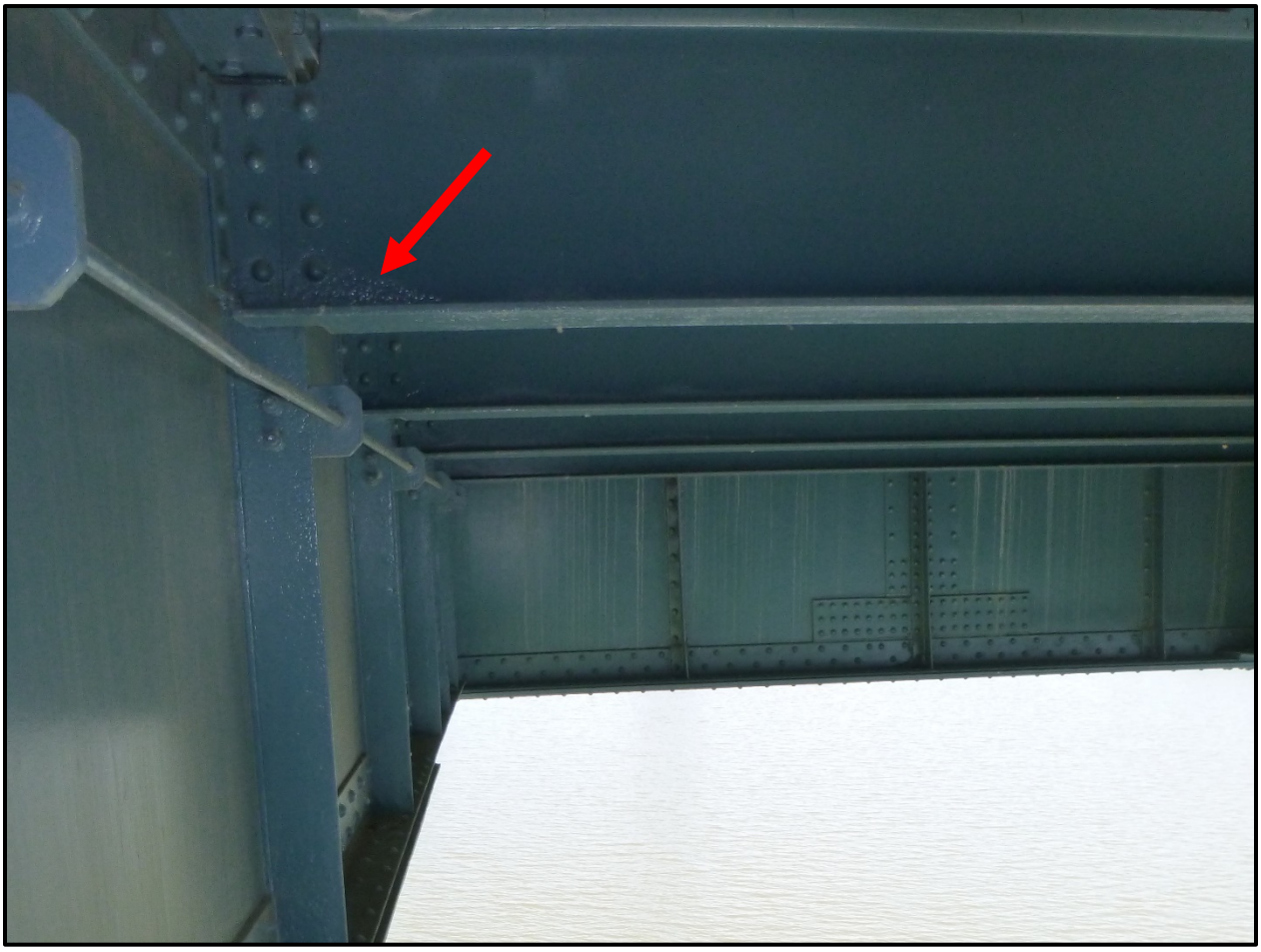


Photo 18 – Typical Painted Over Section Loss at Floor Beam Connection

Photo 19 – Typical Painted Over Section Loss at Sidewalk Stringer Connections

Element #152 / 515 - Steel Floor Beam

FLOOR BEAMS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
152	Steel Floor Beam	LF	9,516	6,597	519	2,400	0
515	Steel Protective Coating	SF	146,566	146,014	552	0	0

Floor beam top flange section loss greater than 1/16" was a prominent finding in the suspension spans. Other findings included freckled rusting, minor pack rust, and distortion caused by pack rust.

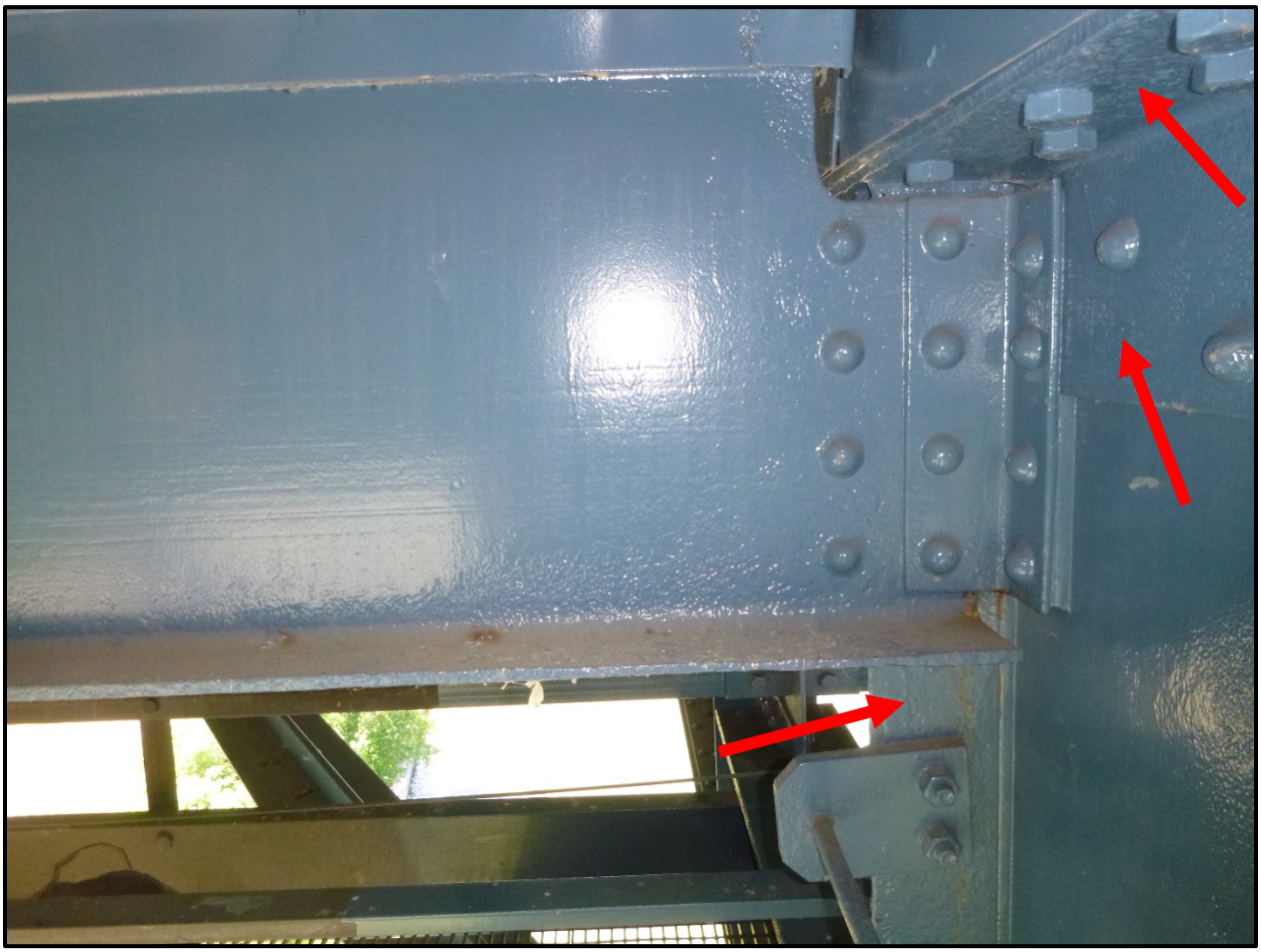


Photo 20 - Floor Beam Top Flange Section Loss

Additionally, cracks in the top flange of the floor beam cantilever at south sidewalk FB 10, 15, 16, 17, 18, 47, 50, 51 and north sidewalk FB 51 were discovered. A structural analysis of the cracked section was performed, and it was determined that the floor beams have adequate capacity for the applied loading. Gannett Fleming recommended that the onsite contractor drill out the crack and caulk and paint the affected area. These 9 cracks were deemed CS3.

Photo 21 - Location of Cracks in Floor Beam Cantilever Top Flange

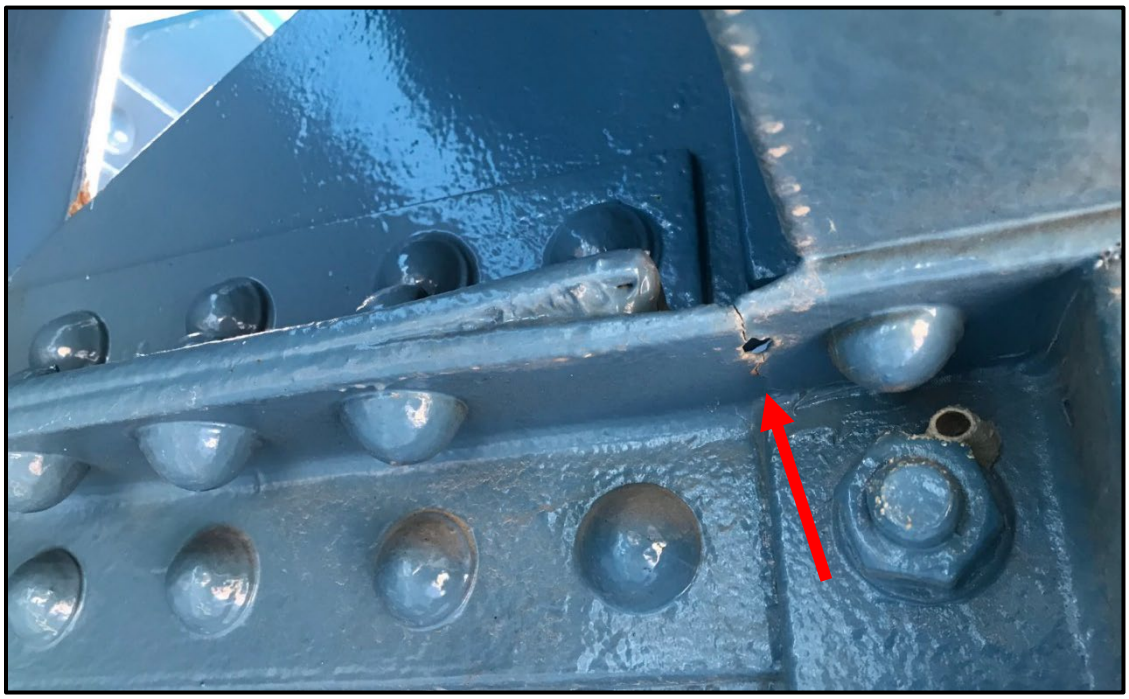


Photo 22 – Typical Crack in Floor Beam Cantilever Top Flange, FB 47 shown

Element #310 - Elastomeric Bearing

ELASTOMERIC BEARINGS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
310	Elastomeric Bearing	EA	118	115	3	0	0

The elastomeric bearings are in good condition, with only the a few bearings at the rear abutment showing minor bulging up to ¼".

Photo 23 - 1/4" Bulge Rear Abutment Elastomeric (S08 shown, S03 & S09 similar)

Element #311 - Movable Bearing

MOVABLE BEARINGS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
311	Movable Bearing	EA	48	39	7	2	0

Overall, the movable bearings are in satisfactory condition. Bearings at Pier 6W are tilted 10 degrees opposite of temperature. At Pier 2W, the bearings under girder LG are touching, resulting in bottom flange girder contact and restricted movement (CS3). Pictures of the noted condition state defects are below.

Photo 24 – Bearings below Span 6W Girders at Pier 6W are Tilted approximately 10 degrees East, Opposite of Temperature (RG shown, LG similar)

Photo 25 - LG Bearings at Pier 2W are both Tilted approximately 10 Degrees Towards Each Other, Resulting in Girder Contact and Restricted Movement

Photo 26 - S1 Bearing Plate at Anchorage A Overhangs Beam Seat by ½"

Photo 27 - S2 Bearing Plate at Anchorage A Beginning to Undermine. Also note Section Loss to Bearing Anchor Bolts

Element #312 - Enclosed Bearing

ENCLOSED BEARINGS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
312	Enclosed/Concealed Bearing	EA	13	13	0	0	0

The semi-integral bearings at the forward abutment show no signs of distress.

Element #313 - Fixed Bearing

FIXED BEARINGS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
313	Fixed Bearing	EA	84	83	1	0	0

The fixed bearings are in good condition with only a minor defect at S05 on Pier 12E.

Photo 28 - Bent Anchor Rod and Loose Nut on Northeast Corner of S05 Bearing at Pier 12E

SUBSTRUCTURE

Substructures are in good condition with a National Bridge Inventory Rating of 7. Overall, patches are sound with intermittent, minor unsound areas. All minor cracks are sealed.

Element #205 - Reinforced Concrete Column

PIER COLUMN							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
205	Reinforced Concrete Column	EA	68	68	0	0	0

All pier columns are sound and show no signs of distress

Element #210 - Reinforced Concrete Pier Wall

PIER WALL							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
210	Reinforced Concrete Pier Wall	LF	162	103	31	28	0

The concrete walls of the anchorage chambers are in fair condition overall. There are various minor spalls, cracks, rust staining, and efflorescence on the anchorage pier exteriors. Large spalls and unsound areas were noted throughout the interior concrete faces of all four anchorage chambers. These areas have, for the most part, been marked out for repair in the ongoing repair contract. Moisture was present inside the anchorage chambers which may accelerate deterioration of the main cable components within.

Photo 29 - Typical Rust Staining of Pier Wall (West Face of Anchorage A shown)

Photo 30 - Unsound Areas of Concrete Marked for Repair (Northeast Anchorage Chamber show, others similar)

Element #215 - Reinforced Concrete Abutment

ABUTMENT							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
215	Reinforced Concrete Abutment	LF	153	141	12	0	0

There are several minor spalls, delaminations and rust stains at the Forward Abutment.

Photo 31 - Forward Abutment Elevation

Element #231 / 515 - Steel Pier Cap

STEEL PIER CAP							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
231	Pier Cap, Steel	LF	118	118	0	0	0
515	Steel Protective Coating	SF	1,064	1,062	0	0	2

The steel frames supporting the new replacement spans are in good condition and show no signs of distress. The bearing pins at Pier E are unpainted.

Photo 32 - Steel Frame Supporting Span RW-1 @ Pier B

Photo 33 - Unpainted Bearing Pin at Pier E (South Bearing shown, North similar)

Element #234 - Reinforced Concrete Pier Cap

PIER CAP							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
234	Reinforced Concrete Pier Cap	LF	1,110	899	211	0	0

The numerous pier caps exhibit minor spalls, rust staining, cracks, and delaminations. All defects are sealed.

Photo 34 - Typical Sealed Cracks and Rust Staining of Pier Cap (Pier B shown)

Photo 35 - Typical Condition of Partially Buried Cap Supporting Suspension Towers (Pier E shown)

Element #830 (ODOT) - Abutment Backwall

ABUTMENT BACKWALL							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
830	Abutment Backwall (ODOT)	LF	77	75	2	0	0

The rear abutment backwall is in good condition, with only one minor defect noted.

Photo 36 - 2' Wide Delamination between B5 & B6 at the Rear Abutment

SUSPENSION COMPONENTS

Element #147 - Steel Main Cables

MAIN SUSPENSION CABLES							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
147	Cable - Primary/Main, Steel	LF	3,318	3,289	22	7	0

The steel main cables are in satisfactory condition overall. Noted deficiencies were limited to the East and West anchorage metalwork. Considerable moisture was present in all anchorage chambers resulting in condensation forming on the cables, strands and eyebars. Dehumidifiers are present in the chambers but are unable to maintain adequately dry conditions. The splay saddles located at the top of the anchorage pits have widespread moderate to severe corrosion, especially at the concrete interface. Areas of minor to moderate corrosion are present on several of the strands at their interface with the strand shoes. These areas serve as pockets that allow debris and moisture to collect and accelerate corrosion. Crevice corrosion up to 3/16" was noted between the eyebars and strand shoes at several locations. Section loss up to 1/4" deep was noted in some anchorage eyebars at the embedment concrete on the floor of each anchorage chamber. It was noted that water and debris accumulate in these areas as well.

Photo 37 - South Main Cable in the East Side Span. Note that a portion of the cable wrap has been removed to accommodate the dehumidification collar and the area has been temporarily covered with a clamped rubber sheet.

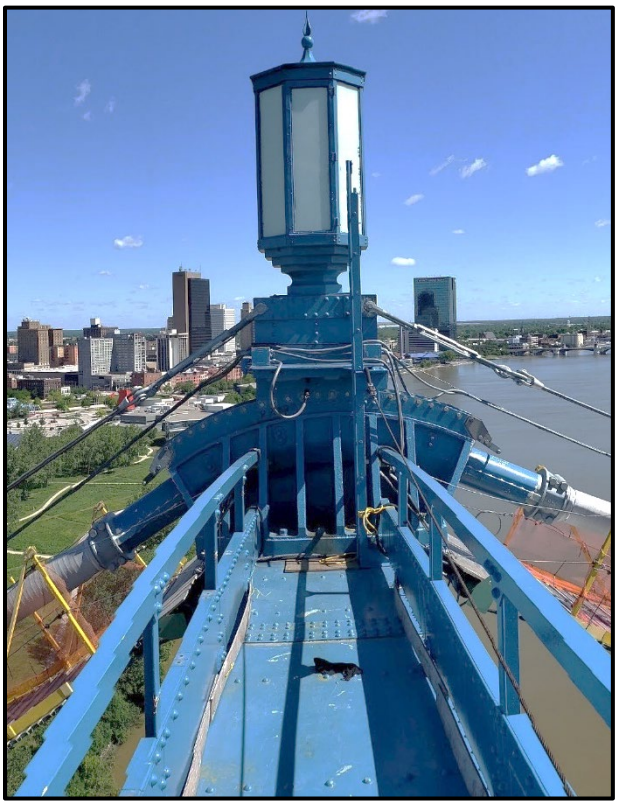


Photo 38 - Top of West Tower Main Cable and Saddle Configuration

Photo 39 - Deviation Saddle Inside Northwest Anchorage Chamber. Note that the main cable enters the saddle at the left side of the picture.

Photo 40 - Strand Shoes and Anchorage Eyebars in Northwest Anchorage Chamber

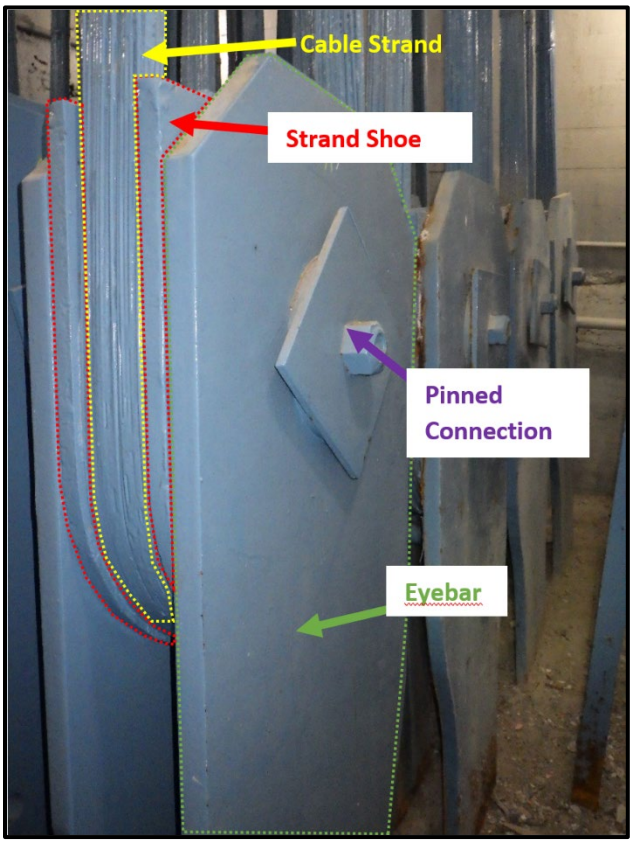


Photo 41 - Strands, Strand Shoes, and Anchorage Eyebars in Northeast Anchorage Chamber

Photo 42 - Moderate to Severe Corrosion of the Splay Saddle Castings in the Northeast Anchorage

Photo 43 - Severe Corrosion of the Main Cable Wires just above the top of the Strand Shoe. Location - Northeast anchorage, east half of 2nd cable strand from West at 5th row of eyebar pairs.

Photo 44 - Typical Corrosion and Section Loss at the Base of the Eyebars, Southeast Anchorage Chamber at Southwest Eyebar Pair Shown

Element #148 - Secondary Steel Cables

HANGER SUSPENSION CABLES							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
148	Cable - Secondary, Steel	LF	124	71	53	0	0

The secondary steel cables are in satisfactory condition overall. The first stages of galvanic corrosion have initiated throughout the length of the exterior surfaces of the wire ropes. Within the roadway splash zone (lower 20'-0" approximately) and areas where the galvanic coating has been damaged, corrosion is more advanced resulting in surface corrosion without measurable section loss to the wires. The portion of the suspender ropes below the top flange of the stiffening girder has recently been painted and is in good condition; however, the area between the socket bearing stiffening angles and the suspender ropes form a pocket that is highly susceptible to the accumulation of debris. These areas should be routinely cleaned out as part of regular bridge maintenance.

The lower ends of the hold-down suspender ropes located at the east and west ends of the side spans exhibited more significant surface corrosion and debris collection at the lower anchor block.

Photo 45 - Cable Band and Suspender Ropes of South Cable in East Side Span

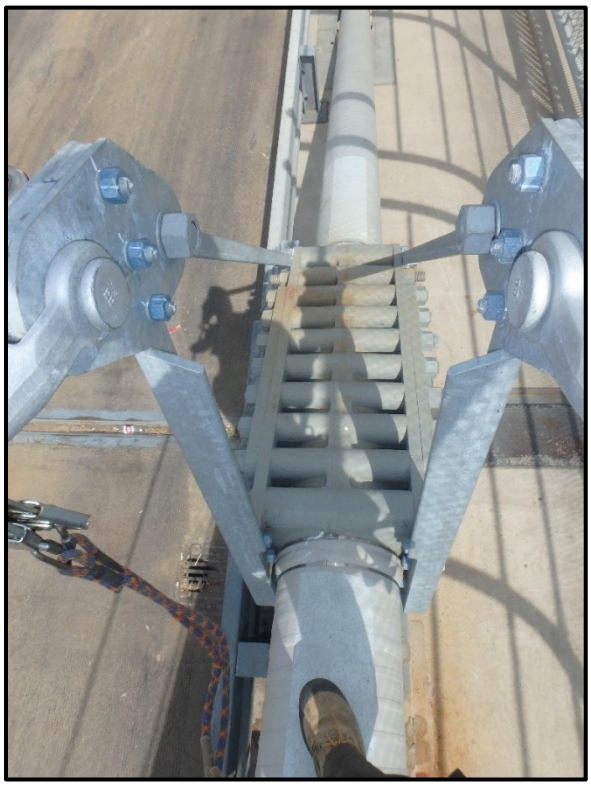


Photo 46 - Larger Cable Band for Hold-Down Suspender Ropes on South Cable at Panel Point 65

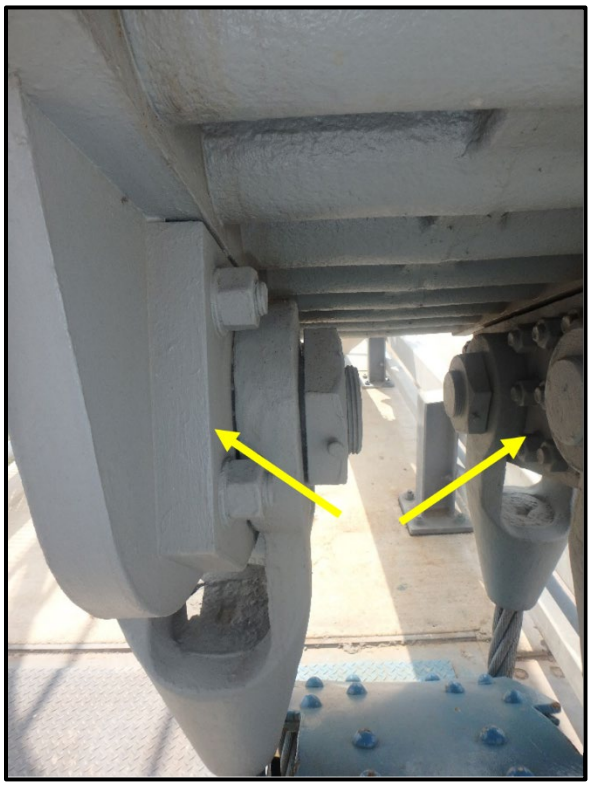


Photo 47 - West Hold-Down Ropes on South Cable. Note that the previously crack welded pin plates have been replaced with bolted plates.

Photo 48 - Typical Connection for Hold-Down Suspender Ropes below Roadway. East Cable Bent, South Link Upper Pin shown

Photo 49 - Typical Suspender Ropes with Areas of Moderate Corrosion near the Roadway Level

Photo 50 - Typical Suspender Rope at Stiffening Girder Socket Connection

Photo 51 - Typical Corrosion and Section Loss at the Base of the Wire Ropes at the Cable Bents. East cable bent, south column, northwest suspender rope shown.

Element #161 - Pin & Hanger Assembly

STEEL PIN & HANGER ASSEMBLIES							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
161	Pin and Hanger Assembly, Steel	EA	24	20	4	0	0

The pin and link assemblies located at the steel towers and at the cable bents are in good condition overall. At the west side of the east tower (main span side), the north and south upper pins exhibit corrosion staining emanating from the inboard face of the pins. At each tower link, the link plates were found to be in hard contact with the edges of the tower metalwork retaining the pins. In some locations minor wear and fretting corrosion in the tower links was occurring. The contact does not appear to restrict movement of the tower links but may result in wear grooves developing in the link plates over time.

The detailed results for HRV's phased array ultrasonic testing of the Tower Pins can be found in Appendix D. Minor wear and a few internal indications were observed. The pin load rating calculations assumed 1/8" of wear and are included in Appendix E.

Photo 52 - Minor Corrosion Staining Emanating from the Tower D, South Leg, West Link, Top Pin

Photo 53 - Typical Hard Contact between Tower Link Plates and Tower Metalwork which Retains the Lower Pin

Element #202 - Steel Column

PIER B & PIER E COLUMNS							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
202	Columns, Steel	EA	4	0	0	4	0

The cable bent towers are in fair condition. There are areas of significant pitting section loss at the interior faces of the link plates at each cable bent column which has been painted over. The transverse strut between the column links at the cable bents exhibit significant section loss with up to 100% section loss in the web near the connection to the link column.

Photo 54 - 5/16" Pitting Section Loss in the East Cable Bent, North Column, Outboard Face of the Inboard Link Plate at the Top Pin

Photo 55 - Large Corrosion Hole in the West Web of the East Cable Bent Upper Strut near the North Link Column. Note corrosion holes are also present in the east web of the strut

Element #207 - Steel Tower

STEEL TOWER							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
207	Column Tower, Steel	LF	766	745	6	15	0

The steel towers are in good condition overall. The exterior paint is in very good condition with a few isolated areas with minor paint chipping with no corrosion of the underlying tower metalwork. The tower struts and cross-braces exhibit more significant deterioration which has been painted over, with large corrosion holes in batten plates, lacing angles, and other horizontal surfaces where debris and moisture accumulate. There are widespread areas of pitting section loss up to 3/16" in the exterior of the web plates of the tower struts below the roadway with several small corrosion holes. There are areas with significant crevice corrosion remaining between faying surfaces at connections, particularly at the centerline connection plates for the cross-bracing where there is up to 1-1/2" of crevice corrosion, however, the crevice corrosion appears to be arrested by paint cover at the majority of locations. Many of the tower anchor bolts exhibit section loss ranging from 10% to 40% in the lower 6" just above the embedment surface, with adjacent anchor bolt stiffeners exhibiting section loss and corrosion holes. At the tower tops, the previously reported cracked welds between the cable saddles and the sole plates have been repaired at all four corners of all four saddles.

The interior paint of the steel towers is in fair condition overall. Each tower leg cross-section has 3 chambers that run the full height of the tower. These chambers are designated as the East, West and Center chambers corresponding with the bridge orientation. Regularly spaced horizontal diaphragms are placed throughout the height of each of the chambers, dividing the towers into numerous cells. The east and west chambers of each tower have only an original orange primer coat of paint (red lead paint). The center chamber of each tower leg also has an original coat of blue finish paint throughout their height. Furthermore, at roadway level, all chambers were recently painted. Due to the presence of lead paint, only the west tower, south leg received a full inspection to minimize exposure to inspectors. The original primer and finish paints are generally in fair condition with peeling and flaking paint. The underlying steel generally does not have any corrosion or measurable section loss except for minor section loss at the bottom of the base chambers.

Photo 56 - Tower C Bracing

Photo 57 - Tower D Strut Above the Roadway. Note numerous repairs have been made to strut bracing members.

Photo 58 - Tower C Bracing above Roadway

Photo 59 - Large Corrosion Hole in Stiffening Angle of Tower Bracing Batten Plate in Tower C Strut above Roadway

Photo 60 - The Center Gusset Plate below Roadway Level in Tower D Bracing has up to 1.5" Pack Rust Distortion between Gusset and Fill Plates

Photo 61 - Up to 40% Loss to the Anchor Bolt at the Northeast Corner of North Leg of Tower D

Photo 62 - Typical Paint Peeling in Tower Interior Chambers. Center Chamber at 2nd Cell above Roadway Level in South Leg of Tower C shown.

Photo 63 - Typical Brittle and Peeling Orange Primer Paint in Tower Side Chambers. West Chamber at 7th Cell above Roadway Level in South Leg of Tower C shown.

Photo 64 - Typical Minor Section Loss to the Lower 2" of Chamber Walls. Center Chamber at Base of Tower C shown.

CHANNEL

Channel is in good condition with a National Bridge Inventory Rating of 7. No signs of obstructions or erosion. New navigation lights were being installed during the 2020 element level inspection.

Photo 65 – Channel from Above, Looking North

APPROACH

Overall, the approach roadway is in satisfactory condition. All lanes on the west and east approaches exhibit map, transverse and longitudinal cracks. The approach slabs and approach slab terminations are in good condition and show no signs of distress.

Photo 66 - West Approach

Photo 67 - East Approach

Element #321 - Reinforced Concrete Approach Slab

APPROACH SLAB							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
321	Reinforced Concrete Approach Slab	SF	3,250	3,250	0	0	0

Photo 68 - Typical Approach Slab Condition (Eastbound, East Approach shown)

Element #840 (ODOT) - Approach Slab Termination

APPROACH SLAB TERMINATION							
Elem #	Description	Unit	Quantity	CS1	CS2	CS3	CS4
840	Approach Slab Term. and Joint (ODOT)	LF	112	112	0	0	0

Photo 69 - Typical Approach Slab Termination Condition (Eastbound, West Approach shown)

RECOMMENDATIONS

The following repairs and maintenance tasks should be performed to extend the service life of the bridge and minimize future repair costs:

High Priority

- Seal the steel girder-concrete curb interface in the suspension spans to slow the water infiltration and efflorescence.
- Inspect the cracks in the top flange of the floor beam cantilevers to ensure they were correctly drilled out and have been arrested.
- Clean and paint anchorage metalwork inside all anchorage chambers.
- Clean and paint lower portion of suspender ropes located within "splash zone" (approximately lower 25'). Include full-length of hold-down suspender ropes at Panel Points 0 and 65.
- Monitor section loss in anchorage eyebars at embedment concrete during future inspections.
- Monitor tower anchor bolts that exhibit significant section loss for any additional signs of deterioration.
- Monitor adjacent contacted bearings/girders at Pier 2W during future inspections.

High Priority - Inspection

- Authorize and perform special inspection of anchorage chambers to measure corrosion of all cable strands to set a baseline for monitoring future section loss.

Lower Priority

- Replace broken deck drainage grate at south curb near Pier B.
- Reset bearings atop Pier 2W and Pier 6W.
- Remove debris and sediment from the deck drainage grates.
- Remove debris and sediment from the deck expansion joints.
- Repair spalls in anchorage chamber interior walls (note that areas are already marked for repair).
- Clean around suspender sockets and strengthening metalwork on stiffening girders as part of routine maintenance.
- Consider trimming tower metalwork at locations of contact with tower links.
- Patch large corrosion holes in cable bent bracing members at Pier B and Pier E.
- Remove and replace any remaining tower bracing stiffening angles that have large corrosion holes.
- Clean and repaint tower interiors.

APPENDIX A

AssetWise Bridge Report

STATE OF OHIO
BRIDGE INSPECTION REPORT

Structure File Number: 4800303

Inventory Bridge Number: LUC-00002-1862 _(4800303)

HIGH LEVEL BRIDGE over MAUMEE RIVER,RRS&STREETS

Inspection Type: Routine and Fracture Critical

Inspection Date: 06/12/2020 12:00:00 AM

District: 02

County: 48 - Lucas

Place Code (FIPS): 77000

Bridge Type:

3 - Steel

13 - Suspension

N- Not Applicable

Type of Service:

5 - Highway-pedestrian

Maintenance Responsibility:

01 - State Highway Agency

Inspection Responsibility:

01 - State Highway Agency

Routine Maintenance Responsibility:

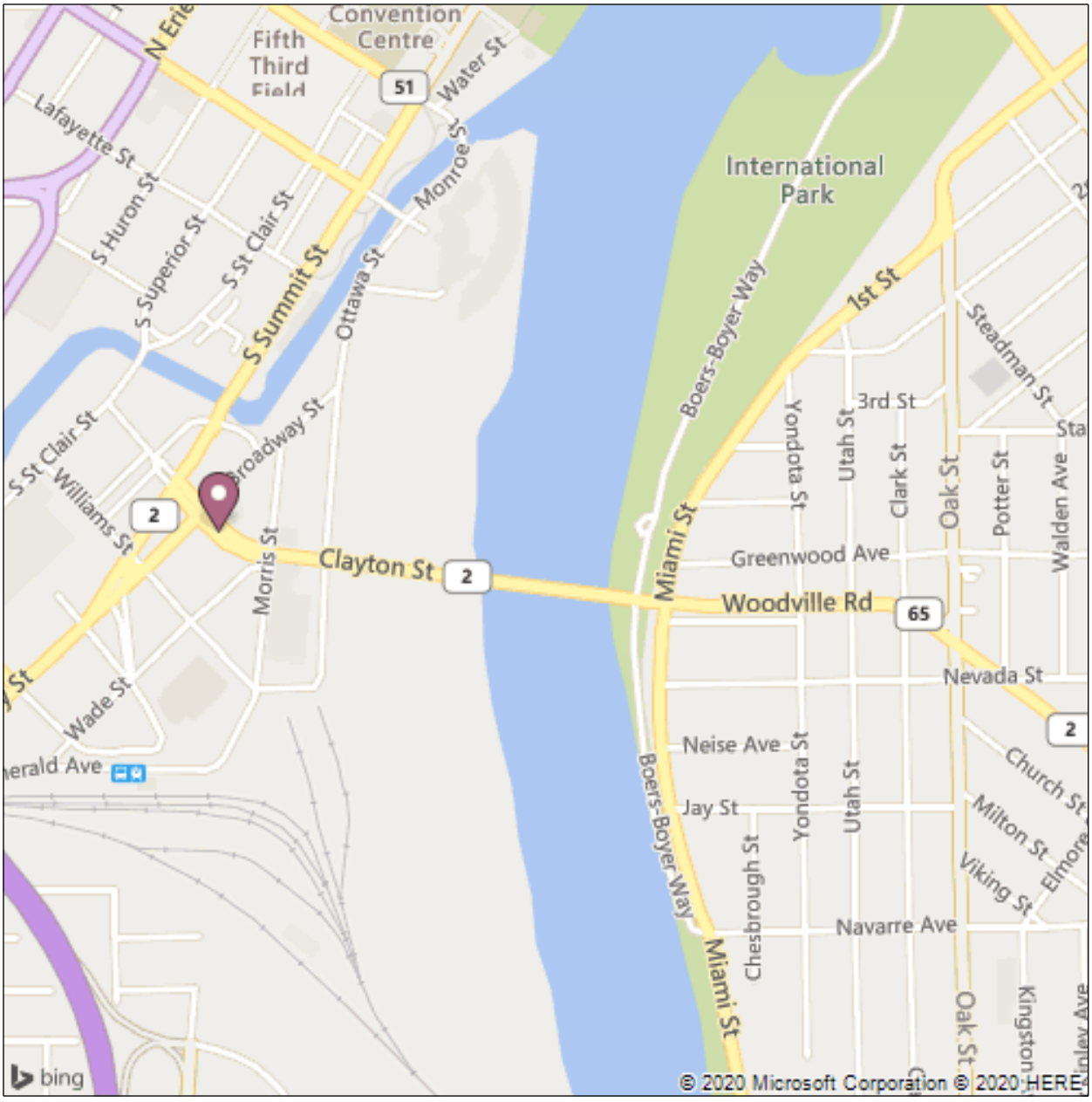
04 - City or Municipal Highway Agency

Lead Inspector: Marburger,Cole

Reviewed by: Kent Jr.,Daniel

TABLE OF CONTENTS

Location Map



Latitude: 41.64189

Longitude: -83.53998

Executive Summary

The Anthony Wayne Bridge over the Maumee River is in ***Satisfactory*** condition, or ***6*** on the NBIS Rating Guideline.

DECK – GOOD

The deck is in good condition, with a NBIS Rating of 7. The only notable finding was the excessive effloresence and longitudinal deck cracking at the underside of deck, at girder/deck edge interface in the suspension spans.

WEARING SURFACE – GOOD

The wearing surface is in good condition, with a NBIS Rating of 7. Abrasion is present in west bound lanes near both towers and there are minor transverse cracks scattered across the bridge.

EXPANSION JOINT – GOOD

The expansion joints are in good condition, with a NBIS Rating of 7. All the joints are full of sediment, but movement doesn't appear to be affected.

SUPERSTRUCTURE – SATISFACTORY

The superstructure is in satisfactory condition, with an NBIS Rating of 6. The Protective Coating System is in good condition with a NBIS Rating of 7. Common findings include freckled rusting, painted over section loss, and painted over distortion caused by pack rust. In addition, cracks in the top flange of the floor beam cantilevers at south sidewalk FB 10, 15, 16, 17, 18, 47, 50, 51 and north sidewalk FB 51were discovered. A calculation verified that the capacity of the compromised cantilever section was adequate for the sidewalk loading.

SUBSTRUCTURE – GOOD

The substructure is in satisfactory condition, with a NBIS Rating of 7. Overall, patches are sound with intermittent, minor unsound areas. All minor cracks are sealed.

SUSPENSION COMPONENTS – SATISFACTORY

The suspension components are in satisfactory condition. Notable deficiencies include moderate to severe corrosion of the splay saddles at the top of the anchorage pits, moderate corrosion of the main cable strands at the strand shoe interface, section loss of anchorage eyebars at the embedment concrete in the anchorage chambers, surface corrosion of the secondary steel cables, and section loss of the link plates in the cable bents of Piers B & E.

CHANNEL – GOOD

The channel is in good condition with a NBIS Rating of 7. No signs of obstructions or erosion were found.

APPROACH - SATISFACTORY

The approach roadway is in satisfactory condition. All lanes on the west and east approaches exhibit map, transverse and longitudinal cracks.

LUC-00002-1862 _(4800303)

ODOT District:	02					Date Built:	07/01/1931
Major Maint:	01 - State Highway Agency	Facility Carried:	HIGH LEVEL BRIDGE	Traffic On:	5 - Highway-pedestrian	Rehab Date:	06/06/2015
Routine Maint:	04 - City or Municipal Highway Agency	Feature Inters:	MAUMEE RIVER,RRS&STREETS	Traffic Under:	6 - Highway - waterway	Insp. Resp A:	01 - State Highway Agency
FIPS Code:	77000 - TOLEDO (LUC county)	Location:	LUC 0.2 mile west of Summit			Insp Resp B:	

Inspector Marburger,Cole Inspection Date 06/12/2020 12:00:00 AM Reviewer Kent Jr.,Daniel

National Bridge Inventory

Status 0 - ND

Sufficiency Rating 61.0

Identification

(1) State Code	395 - Ohio
(8) Structure File Number (SFN)	4800303
(7) Facility Carried	HIGH LEVEL BRIDGE
(208) Route on the Bridge	10 - State (ODOT) (Toll Free)
(2) Highway Agency District	02
(3) County Code	48 - Lucas
(209) Interstate Mile Marker	
(201) Special Designation	
(4) Place Code (FIPS)	77000 - TOLEDO (LUC county)
(5) Inventory Route	
(A) Record Type On/Under Always "On"	1: Route carried "on" the structure
(B) Route Signing Prefix (Highway System)	3 - STATE HIGHWAY
(C) Designated Level of Service (Highway Designation)	1 - MAINLINE
(D) Route Number	00002
(E) Directional Suffix	0 - NOT APPLICABLE
(6) Features Intersected	MAUMEE RIVER,RRS&STREETS
(9) Location	0.2 mile west of Summit
(11) Milepoint	18.620
(12) Base Highway Network	Inventory Route is on the Base Network
(13A) LRS Inventory Route	2
(13B) Subroute Number	0
(16) Latitude	41.64189 Degrees
(17) Longitude	-83.53998 Degrees
(16.01) Latitude - Ohio	41.641892
(17.01) Longitude - Ohio	-83.539978
(98A) Border Bridge State Code	
(98B) Border Bridge State Percent Responsibility	
(99) Border Bridge Struct No.	

Inspections

(90) Inspection Date			06/12/2020
(91) Designated Inspection Frequency			12
(92) Critical Feature Inspection			(93) CFI Date
A. Fracture Critical Detail	Y	24	06/12/2020
B. Underwater Inspection	N	0	
C. Other Special Inspection	N	0	
D.01 Snooper Inspection	N		
E.01 Drone Inspection			

Condition

(58) Deck	7 - Good Condition
(58.01) Wearing Surface	7 - Good (1% distress)
(58.02) Expansion Joint	7- Good (no leaking)
(59) Superstructure	6 - Satisfactory Condition
(59.01) Protective Coating System (PCS)	7 - Good (1-5% corr.)
(60) Substructure	7 - Good Condition
(61) Channel & Channel Protection	7 - Bank protection needs minor repairs
(61.01) Scour	7 - Good
(62) Culvert	N - Not Applicable
(67.01) General Appraisal	6 - Satisfactory Condition (minor deterioration)

ODOT District: 02

LUC-00002-1862 _(4800303)

Date Built: 07/01/1931

Major Maint: 01 - State Highway Agency | Facility Carried: HIGH LEVEL BRIDGE | Traffic On: 5 - Highway-pedestrian | Rehab Date: 06/06/2015

Routine Maint: 04 - City or Municipal Highway Agency | Feature Inters: MAUMEE RIVER,RRS&STREETS | Traffic Under: 6 - Highway - waterway | Insp. Resp A: 01 - State Highway Agency

FIPS Code: 77000 - TOLEDO (LUC county) | Location: LUC 0.2 mile west of Summit | Insp Resp B:

Inspector Marburger,Cole | Inspection Date 06/12/2020 12:00:00 AM | Reviewer Kent Jr.,Daniel

Structure Type and Material

(43) Main Structure Type	A.	3 - Steel
	B.	13 - Suspension
	C.	N- Not Applicable
(44) Approach Type	A.	0 - Other
	B.	00 - Other
	C.	N- Not Applicable

(45) Number of Spans in Main Unit 3

(46) Number of Approach Spans 27

(107) Deck Structure Type 1 - Concrete Cast-in-Place

(107.01)

(108B) External Deck Protection N - NA

(108C) Internal Deck Protection 1 - Epoxy Coated Reinforcing

(422) Wearing Surface Date 06/06/2015

(108A) Wearing Surface Type 1 - Monolithic Concrete (concurrently placed with structural deck)

(108A.01) N- Not Applicable

(423) Wearing Surface Thickness 1.0 in

(483) Protective Coating System Date 10/01/2017

Age of Service

(27) Year Built 1931

(263) Date Built 07/01/1931

(106) Year Reconstructed 2015

(264) Major Reconstruction Date 06/06/2015

(42) Type of Service

On 5 - Highway-pedestrian

Under 6 - Highway - waterway

(28) Lanes On 04 Under 13

(29) Average Daily Traffic 21253 (30) ADT Yr. 2015

(109) Truck Percentage 7 % Truck

(114) Future Avg Daily Traffic 29499 (115) Future ADT Yr. 2038

(19) Bypass Detour Length 8 mi.

Load Rating and Posting

(31) Design Load 4 - H 20

(63) Operating Rating Method 6 - Load Factor (LF) rating reported by rating factor (RF) method using MS18 loading.

(64) Operating Rating Factor 1.9

(65) Inventory Rating Method 6 - Load Factor (LF) rating reported by rating factor (RF) method using MS18 loading.

(66) Inventory Rating Factor 1.2

(41) Structure Open, Posted, or Closed to Traffic A - Open

(70) Bridge Posting 5 - Equal to or above legal loads

(70.01) Date Posted

(70.02) Posted Sign Type

(70.03) Posted Weight

Appraisal

(67) Structural Evaluation 6 - Equal to present minimum criteria

(68) Deck Geometry 4 - Meets minimum tolerable limits

(69) Underclearances, Horizontal and Vertical 4 - Meets minimum tolerable limits

(71) Waterway Adequacy 8 - Bridge Above Approaches

(72) Approach Roadway Alignment 6 - Equal to present minimum criteria

(36) Traffic Safety Feature

A. Bridge Railings: 1 - Meets acceptable standards

B. Transitions: 1 - Meets acceptable standards

C. Approach Guardrail 1 - Meets acceptable standards

D. Approach Guardrail Ends 1 - Meets acceptable standards

(113) Scour Critical 5 - Scour within limits of footing or piles

ODOT District: 02

LUC-00002-1862 _(4800303)

Date Built: 07/01/1931

Major Maint: 01 - State Highway Agency | Facility Carried: HIGH LEVEL BRIDGE | Traffic On: 5 - Highway-pedestrian | Rehab Date: 06/06/2015

Routine Maint: 04 - City or Municipal Highway Agency | Feature Inters: MAUMEE RIVER,RRS&STREETS | Traffic Under: 6 - Highway - waterway | Insp. Resp A: 01 - State Highway Agency

FIPS Code: 77000 - TOLEDO (LUC county) | Location: LUC 0.2 mile west of Summit | Insp Resp B:

Inspector Marburger,Cole | Inspection Date 06/12/2020 12:00:00 AM | Reviewer Kent Jr.,Daniel

Classification

(112) NBIS Bridge	Yes
(104) Highway System of the Inventory Route	1 - Structure/Route is on NHS
(26) Functional Classification of Inventory Route	14 - Urban - Other Principal Arterial
(100) Strahnet Highway Designation	Not a STRAHNET route
(101) Parallel Structure Designation	N - No parallel structure
(102) Direction of Traffic	2-way traffic
(103) Temporary Structure Design	
(105) Federal Lands Highways	Not Applicable
(110) Designated National Network	Inventory route not on network
(20) Toll	3 - On Free Road
(225) Routine Maintenance Responsibility	A. 04 - City or Municipal Highway Agency B.
(21) Maintenance Responsibility	01 - State Highway Agency
(21B) Major Maint. Responsibility B	
(221) Inspection Program Responsibility	A. 01 - State Highway Agency B.
(22) Owner	01 - State Highway Agency
(37) Historical Significance	2 - Eligible for National Register

Navigation Data

(38) Navigation Control	1 - Navigation control on waterway (bridge permit required)	
(39) Nav Vert Clearance	93.0	Ft.
(40) Nav Horizontal Clearance	747.0	Ft.
(111) Pier or Abutment Protection	2 - In place and functioning	
(116) Minimum Navigation Vertical Clearance, Vertical Lift Bridge	0.0	Ft.

Geometric Data

(48) Longest Span	785.0	Ft.
(49) Structure Length	3218	Ft.
(50A) Curb/Sidewalk Left Side - Width	6	Ft.
(50B) Curb/Sidewalk Right Side - Width	6	Ft.
(51) Brdg Roadway Width Curb-to-Curb	54.0	Ft.
(52) Deck Width, Out-to-Out	68	Ft.
(32) Approach Roadway Width	54	Ft.
(33) Bridge Median	3 - Closed median with non-mountable barriers	
(34) Skew	0	Deg.
(35) Structure Flared	0 - No flare	

Clearances

(10) Practical Maximum Vertical Clearance	33	Ft.
(53) Minimum Vertical Clearance Over Bridge Roadway	33	Ft.
(47) Total Horizontal Clearance (Inventory Route)	25	Ft.
(54) Minimum Vertical Under Clearance	B. 14	Ft.
	A. H - Highway beneath structure	
(56) Minimum Lateral Under Clearance on Left	4	Ft.
(55) Minimum Lateral Under Clearance on Right	B. 4	Ft.
	A. H - Highway beneath structure	

Inventory Route Clearances

NBI 005A: On/Under: 1: Route carried "on" the structure

NBI 005D: Route No.: 00002

	Cardinal Direction		Non-Cardinal Direction	
(336) Minimum Vertical Clearance on IR	33	Ft.	0	Ft.
(335) Minimum Horizontal Clearance on IR	25	Ft.	25	Ft.

Ohio Bridge Inventory

General

(203) Bridge Name (Dedicated Name)	ANTHONY WAYNE
(204) Ohio Designated MPO	15 - TMACOG (Toledo)
(205) Route Number Extension	
(206) Inventory Preferred Route	P - Inventory route is the preferred route in an overlap area.
(5.01) Priority System Code (Inventory Route)	
(213) NLF_ID Inventory Route	SLUCSR00002**C
(218) Major Bridge	Y - Yes
(220) Inventory Location	LUC
(226) Seismic Susceptibility	N - not applicable
(227) GASB	Y - Yes
(236) Future Traffic Factor	1.388
(245) Aperture Cards Fabrication	2 - No
(246) Aperture Cards Original	1 - Yes
(247) Aperture Cards Repair	1 - Yes
(248) Original Construction Project Number	UNKNWN
(251) Standard Drawing Number	
(252) Microfilm Reel Number	00039A
(261) Bridge Remarks	
(265) Electric Line Present	Y - Bridge carries this utility
(266) Gas Line Present	U - Unknown
(269) Sanitary Sewer Present	U - Unknown
(306) NBIS Bridge Length	3215
(207) Route Under the Bridge	41

Inventory Route Clearances

Inventory Route		Cardinal	Non-Cardinal	
(336) Minimum Vertical Clearance	33		0	ft.
(335) Minimum Horizontal Clearance	25		25	ft.

Load Rating	
(717) 2F1 Operating Rating Factor (GVW 15 T)	2.02
(720) 3F1 Operating Rating Factor (GVW 23 T)	1.38
(723.01) 4F1 Operating Factor (GVW 27 T)	1.27
(726.01) 5C1 Operating Rating Factor (GVW 40 T)	1.43
(723.02) SU4 Operating Rating Factor (GVW 27 T)	
(726.02) SU5 Operating Rating Factor (GVW 31 T)	
(732.01) SU6 Operating Rating Factor (GVW 34.75 T)	
(732.02) SU7 Operating Rating Factor (GVW 38.75 T)	
(735) EV2 Operating Rating Factor (GVW 28.75 T)	
(738) EV3 Operating Rating Factor (GVW 43 T)	
(734) Ohio Percent Legal	150
(705) Load Rater First Name	
(706) Load Rater Last Name	
(707) Load Rater PE Number	0
(704) Load Rating Date	05/18/2009
(708) Load Rating Software	8 - Other program
(709) Rating Source	1 - Plan information available for load rating analysis (Default)

Inspection Access	
(92.02) Snooper Inspection Traffic Control	
(92.03) Snooper Inspection Est. Crew Hours	
(459) Inspection Access	Y - The bridge includes this feature

Deck & Approach

(224) Temporary Subdecking	N - No		
(404) Approach Slab Type	1 - Reinforced Concrete		
(405) Approach Slab Length	25		
	1	2	3
(406) Bridge Median Type	2 - Raised Median	3 - 32" Deflector Type (New Jersey Shape)	N - No Joint
(407) Bridge Railing Type	6 - Steel Post and Steel Panel (Decorative)		
(408) Composite Deck Code	Y - Composite Construction		
(419) Expansion Joint with Trough Retrofit 2			
(421) Joint Trough (Y/N)			
(431) Fence	Y - The bridge includes this feature		
(432) Fence Height on Bridge	13		
(433) Glare Screen	N - The bridge does not include this feature		
(434) Noise Barrier Walls	N - The bridge does not have Noise Barrier Walls		
(424) Deck Area	237910.0		
(427) Left Sidewalk/Curb Material	1 - Concrete		
(428) Left Sidewalk/Curb Type	2 - Sidewalk (greater than 2' in width)		
(429) Right Sidewalk/Curb Material	1 - Concrete		
(430) Right Sidewalk/Curb Type	2 - Sidewalk (greater than 2' in width)		

Substructure

(526) Abutment Forward Type	4 - Cellular or "U"
(527) Abutment Forward Material Type	2 - Concrete
(528) Abutment Forward - Foundation Type	U - Unknown
(531) Abutment Rear Type	4 - Cellular or "U"
(532) Abutment Rear Material Type	2 - Concrete
(533) Abutment Rear - Foundation Type	U - Unknown
(534) Pier 1 (Predominate) Type	1 - Gravity
(535) Pier 1 (Predominate) Material	2 - Concrete
(536) Pier 1 Type - Foundation Type	U - Unknown
(537) Pier 2 Type	5 - Capped Column
(538) Pier 2 Material	7 - Steel and Concrete
(539) Pier 2 Type - Foundation Type	U - Unknown
(547) Slope Protection Type	N - None

Superstructure

(711) Live Load Response	S - Satisfactory		
(468) Hinges/Pins/Hangers Type	2 - Pins, Pin Plates		
(409) Deck Drainage Type	4 - Inlets with drain pipes		
(411) Deck Concrete Type	B - QSC2-Superstructure concrete		
	A	B	C
(414) Expansion Joint Type	A - Modular	8 - Elastomeric Strip Seal	N - None
(301) Horizontal Curve Degree			
(453) Bearing Device 1, Type	2 - Rockers & Bolsters		
(455) Bearing Device 2, Type	4 - Elastomeric (Plain)		
(465) Framing Type	4 - Straight Beams/Girders		
(466) Haunched Girder	N - Bridge does not contain a haunched girder		
(467) Haunched Girder Depth			
(474) Main Structure System	1 - Two Girder Bridge		
(475) Main Member Type	2 - Riveted Built-Up Steel		
(482) Protective Coating System Type	5 - Paint System OZEU		
(487) Structural Member Steel Type	8 - A7		
(498) Protective Coating System Surface Area	725000		
(499) Structural Steel Paint	2 - Field		
(478) Post Tensioned Main Member Code	N - Bridge is not Post Tensioned		

Culvert and Waterway

(575) Culvert Type	N - Not a Culvert or Rigid Frame
(578) Culvert Length Inlet_to_Outlet	0
(580) Fill Depth Over Culvert	0
(651) Scenic River	Y - Waterway is classified as Scenic River
(587) Rise	
(588) Shape	
(655) Channel Protection Type	1 - Concrete (cast-in-place)
(663) Stream Velocity	
(672) pH	

Element Inspection

	Environment	Total Quantity	Units	Condition State 1	Condition State 2	Condition State 3	Condition State 4
12 - Reinforced Concrete Deck	3 - Mod.	187865	sq. ft.	186024	530	1311	0
	CS2 - Efflorescence on underside of deck and down girder face at the curb/girder interface in all three suspension spans CS3 - Longitudinal cracking on underside of deck, near curb/girder interface. Crack length and width varies (1/8" width, 5' long typical)						
	See photo(s): 5						
805 - Wearing Surface - Monolithic Concrete		167165	sq. ft.	166730	435	0	0
	CS2 - Abrasion: 25'x15' in west bound lanes just west of Tower C, 12'x5' in west bound lanes just west of Tower D						
107 - Steel Open Girder/Beam	3 - Mod.	10852	ft.	8564	111	2177	0
	Approach span girders/beams: CS2 - 111 feet, 110' of freckled rusting and/or minor pack rust, 1' impact damage to bottom flange of S02 in Span 14E CS3 - 393 feet of section loss greater than 1/16" and/or pack rust induced distortion (painted over) Suspension span girders: CS3 - 1784 feet, 1774' of section loss greater than 1/16" and/or pack rust induced distortion (painted over), 10' impact damage with distortion on exterior of north girder near FB30						
515 - Steel Protective Coating		186590	sq. ft.	186119	470	0	1
	CS2 - Substantially effective paint with sporadic freckled rust CS4 - No paint present due to impact damage on bottom flange of S02 in Span 14E						
113 - Steel Stringer	3 - Mod.	33258	ft.	30893	92	2273	0
	Approach span stringers: CS2 - 92 feet of freckled rusting and/or minor pack rust CS3 - 359 feet of section loss greater than 1/16" and/or pack rust induced distortion (painted over) or missing bolts/rivets Suspension span stringers: CS3 - 1914 feet of section loss greater than 1/16" and/or pack rust induced distortion (painted over)						
515 - Steel Protective Coating		206484	sq. ft.	206418	66	0	0
	CS2 - Substantially effective paint with sporadic freckled rust						
147 - Steel Main Cables	3 - Mod.	3318	ft.	3289	22	7	0
	CS2/CS3 - Section loss in the anchorage eyebars just above the embedment surface in each anchorage and isolated areas of moderate corrosion at areas of coating failure on the main cable wires and areas of moderate corrosion and section loss at the tops of the eyebar sets where the parallel cable wires protrude.						

Element Inspection

148 - Secondary Steel Cables	3 - Mod.	124	each	71	53	0	0
	CS2 - Surface corrosion on suspender ropes near roadway level and at the bases of the cables at the top of cable bent columns Both suspender cables around each main cable band are considered one cable group						
152 - Steel Floor Beam	3 - Mod.	9516	ft.	6597	519	2400	0
	Approach span floor beams: CS2 - 519 feet of freckled rusting and/or minor pack rust CS3 - 297 feet of section loss greater than 1/16" and/or pack rust induced distortion (painted over) Suspension span floor beams: CS3 - 2103 feet, 2094' of section loss greater than 1/16" and/or pack rust induced distortion (painted over), 9' of cracks located in the top flange of the floor beam cantilever @ South Sidewalk FB 10, 15, 16, 17, 18, 47, 50, 51 and North Sidewalk FB51						
	See photo(s): 6						
515 - Steel Protective Coating		146566	sq. ft.	146014	552	0	0
	CS2 - Substantially effective paint with sporadic freckled rust						

161 - Steel Pin and Pin & Hanger Assembly or both	3 - Mod.	24	each	20	4	0	0
	CS2 - Tower C, North Leg, East Link, Top pin; Tower C, South leg, East Link, Lower pin; Tower D, North Leg, West Link, Top Pin; Tower D, South Leg, West Link, Top Pin all exhibit corrosion staining emanating from them 4 at each cable bent, 8 at each tower						
202 - Steel Column	3 - Mod.	4	each	0	0	4	0
	CS3 - Areas of pitting section loss in link plates at each cable bent column						
	See photo(s): 7						
205 - Reinforced Concrete Column	3 - Mod.	68	each	68	0	0	0
207 - Steel Tower	3 - Mod.	766	ft.	745	6	15	0
	CS2/3 - Isolated areas of crevice corrosion and section loss. Section loss at the tower bases						
210 - Reinforced Concrete Pier Wall	3 - Mod.	162	ft.	103	31	28	0
	CS2 - Anchorage A - 20 feet, 1' spall at south sidewalk stringer beam seat, 1' spall at south sidewalk cheekwall, 1' efflorescence on north face, 1' rust staining on southeast face, 4' efflorescence on northwest face, 8' rust staining on west face, 4' horizontal crack and spall on southwest face; Anchorage F - 11 feet, 4' rust staining on west face, 3' rust staining on east face, 4' diagonal crack from south sidewalk beam seat on southwest face CS3 - Anchorage interiors - 27 feet of spalls and delaminations throughout; Anchorage F exterior - 1 foot spall on west face between S1 and G1						

Element Inspection

215 - Reinforced Concrete Abutment	3 - Mod.	153	ft.	141	12	0	0
	CS2 - Forward Abutment - 12 feet, 7' of sporadic rust staining, 1' delamanation between beams 3 and 4, 1' spall between beams 7 and 8, 2' spall between beams 9 and 10, 1' for spall on south face						
231 - Steel Pier Cap	3 - Mod.	118	ft.	118	0	0	0
	Steel frames at Piers B and E						

515 - Steel Protective Coating		1064	sq. ft.	1062	0	0	2
	The bearing pins at Pier E are not painted.						

234 - Reinforced Concrete Pier Cap	3 - Mod.	1110	ft.	899	211	0	0
	CS2 - Pier 5W - 8 feet, 3' rust staining, 3' sealed crack, 2' honeycombing; Pier 2W - 8 feet, minor rust staining from rebar ties; Pier B - 36 feet, rust staining from rebar ties and sealed cracks on underside; Tower D - 55 feet, entire top of cap is spalled/cracked (sealed); Pier E - 5 feet, 4' rust staining from rebar ties, 1' spall @ south edge between bearing and column; Pier 1E - 10 feet, 5' sealed crack > 0.05" below north bearing, 5' rust staining; Pier 2E - 11 feet, 3' sealed crack > 0.05" on west face near bottom of cap, 8' rust staining; Pier 3E - 27 feet, 24' sealed spalls on top of cap, 3' rust staining; Pier 8E - 25 feet, 10' sealed spalls on top of cap, 15' rust staining; Pier 9E - 15 feet, 5' sealed spalls on top of cap, 10' rust staining; Pier 10E - 2 feet delam/spall in the middle of west face; Pier 11E - 6 feet, 2' delam on west face above column 2, 2' spall on top near Beam 10, 2' spall on west face above south column; Pier 12E - 3 feet spalls/delams on west face						
300 - Strip Seal Expansion Joint	3 - Mod.	1596	ft.	0	1596	0	0
	CS2 - All joints are partially filled with sediment but movement does not appear to be affected on any of them						
303 - Assembly Joint with Seal	3 - Mod.	108	ft.	0	108	0	0
	CS2 - Both modular joints are partially filled with sediment but movement does not appear to be affected						
310 - Elastomeric Bearing	3 - Mod.	118	each	115	3	0	0
	CS2 - Bearings under S03, S08, S09 at rear abutment have 1/4" bulging The quantity includes all expansion elastomeric bearings on the structure.						

Element Inspection

311 - Movable Bearing	3 - Mod.	48	each	39	7	2	0
	CS2 - LG and RG at Pier 6W are tilted east 10 degrees opposite temperature; LG, Span 6W bearing at Pier 5W exhibits rust from pin; RG bearings @ Pier 2W are both tilted ~10 degrees towards each other resulting in less than 1/2" separation between Span 3W and 2W bottom flanges; S2, Span RW-2 bearing at Anchorage A beginning to undermine, slight loss of bearing area; S1, Span RW-2 bearing plate at Anchorage A overhangs beam seat by 1/2" CS3 - LG bearings @ Pier 2W are both tilted ~10 degrees towards each other resulting in contact between Span 3W and 2W bottom flanges, movement is restricted The quantity includes all rocker and sliding plate bearings on the structure						
	See photo(s): 8						
312 - Enclosed/Concealed Bearing	3 - Mod.	13	each	13	0	0	0
	The quantity includes the bearings at the semi-integral forward abutment						
313 - Fixed Bearing	3 - Mod.	84	each	83	1	0	0
	CS2 - S05 northeast anchor rod bent and nut not tight at Pier 12E The quantity includes all fixed elastomeric and bolster bearings on the structure						
321 - Reinforced Concrete Approach Slab	3 - Mod.	3250	sq. ft.	3250	0	0	0
330 - Metal Bridge Railing	3 - Mod.	6432	ft.	6427	1	4	0
	CS2 - Missing bolt in top rail/post connection at northeast corner of bridge (Span 15E) CS3 - 4' of impact damage to lower rail at first post on southwest corner of bridge						
331 - Reinforced Concrete Bridge Railing	3 - Mod.	3215	ft.	2297	918	0	0
	Median Parapet CS2 - Vertical cracking @ 3' spacing typical (593 LF in west approach spans, 321 LF in east approach spans); 4 LF of delamination and spalling under light poles adjacent to Tower D (2 LF each);						
815 - Drainage	3 - Mod.	26	each	8	17	1	0
	CS2 - Most grates were partially or fully covered in sediment/debris but there were no signs of ponding CS3 - Broken grate at south curb near Pier B						
830 - Abutment Backwall	3 - Mod.	77	ft.	75	2	0	0
	CS2 - Rear Abutment - 2 feet of delamination between beams 5 and 6						
840 - Approach Slab: Termination or Joint	3 - Mod.	112	ft.	112	0	0	0

Inspector Comments - Deck and Approach

Deck

Overall, deck is in good condition. All spans have stay-in-place forms. Underside of deck at girder/deck edge interface in suspension spans exhibits efflorescence and longitudinal cracking. We are currently investigating the source and potential remediation.

Wearing surface is in good condition. Abrasion present in west bound lanes near both towers. Minor transverse cracks.

Expansion joints are in good condition, no signs of leaking observed. Modular joints at the towers, elastomeric strip seals everywhere else. All are full of sediment, but movement doesn't appear to be affected.

Median parapet exhibits vertical cracking @ 3' spacing typical in approach spans. Delamination and spalling under both light poles adjacent to Tower D. Construction note - light pole anchor bolts were placed in wrong sized pattern; bolts were bent in order to set poles.

All grates are partially covered in sediment/debris but appear to be draining.

Approach

Overall, approach roadway is in satisfactory condition. All lanes on the west and east approaches exhibit map, transverse and longitudinal cracks.

Inspector Comments - General Appraisal

Superstructure

Overall, superstructure is in satisfactory condition. Painted over section loss and pack rust induced distortion is present throughout approach and suspension spans. Minimal locations exhibit sporadic, active corrosion.

9 sidewalk floor beam cantilevers in the suspension spans have cracks in the top flange. After the cracks were discovered, an analysis of their current condition was performed and it was determined that under normal loading (no Safe Span in place) the floor beams have ample capacity for the required loading.

Substructure

Substructures are in good condition. Overall, patches are sound with intermittent, minor unsound areas. All minor cracks are sealed.

Culvert

Inspector Comments - Waterway

Waterway Adequacy

Channel

Channel is in good condition. No signs of obstructions or erosion. New navigation lights were being installed during the 2020 element level inspection.

Scour Critical

Complex Bridge Superstructure Comments

The suspension components are in satisfactory condition. Main steel suspension cables have areas of corrosion and section loss in the anchorage chambers.Secondary steel cables have surface corrosion on suspender ropes near roadway level and at the bases of the cables at the top of each cable bent column. The following 4 pins exhibit corrosion staining emanating from them: #1 - Tower C, North Leg, East Link, Top pin; #2 - Tower C, South leg, East Link, Lower pin; #3 - Tower D, North Leg, West Link, Top Pin; #4 - Tower D, South Leg, West Link, Top Pin

Historic Bridge Data

Status

(8) Structure File Number (SFN)	4800303	(37) Historical Significance Code	2 - Eligible for National Register
(826) NR Recommendation		(837) Historical District	
(840) Historical National Register Listed		(834) Reviewed By	
(850) In Management Plan (2009)	N- No		

Identification

(825) Historical Bridge Name		(7) Facility Carried	HIGH LEVEL BRIDGE	
(22) Owner	01 - State Highway Agency	(6) Feature Intersected	MAUMEE RIVER,RRS&STREETS	
(4) Place Code (FIPS)	77000 - TOLEDO (LUC county)	(5) Inventory Route		
(3) County (Parish) Code	48 - Lucas	(B) Route Signing Prefix	3 - STATE HIGHWAY	
(2) Highway Agency District	02	(D) Route Number	00002	
(9) Location	0.2 mile west of Summit	(16) Latitude at Rear Abutment	41.64189	degrees
(883) UTM		(17) Longitude at Rear Abutment	-83.53998	degrees

Structural Information

(43) Main Structure Type	3 - Steel	13 - Suspension	N- Not Applicable	(827) Historical Year Built	1931
(828) Historical Bridge Type	190 - SUSPENSION			(836) Historical Data Source	014 - ODOT
(49) Structure Length	3218	ft		(831) Historical Builder	243
(45) No. of Main Spans	3			(842) Historical Bridge Designer	171
(407) Bridge Railing Type	6 - Steel Post and Steel Panel (Decorative)			(106) Year Reconstructed	2015
				(829) Previous Inventory Date	1980

Classification of Service

(26) Functional Class of Inventory Route	14 - Urban - Other Principal Arterial	(29) Average Daily Traffic (ADT)	21253
(104) Highway System of the Inventory Route	1 - Structure/Route is on NHS	(30) Year of ADT	2015
(71) Waterway Adequacy	8 - Bridge Above Approaches	(109.01) Avg. Daily Truck Traffic (ADTT)	1488
		(102) Direction of Traffic	2-way traffic

Historical Significance

(843) Historical Setting/Context

The bridge carries a 4-lane median-divided highway over the Maumee River and adjacent railroads and city streets in downtown Toledo.

(844) Historical Physical Description

The bridge's main span is a three-span 1,252'-long suspension bridge with a center span length of 785'. The built-up steel towers have latticed struts and crossbracing.

(845) Historical Integrity

(846) Historical Significant Description

The Anthony Wayne Bridge dates to the 1920s to 1930s revival period in suspension highway bridge design in the United States. There has been no significant change in the bridge's status since the prior evaluation. The eligible recommendation remains ap

(847) Historical Bridge Remarks

Field checked. 5/23/00. Is there anything significant about the cable? I say not very significant in the suspension bridge scheme of things.

(860) Justification

Capacity

(51) Bridge Rdwy Width Curb-Curb	54.0	ft	(66) Inventory Rating Load	1.2	
(873) Bridge Rdwy Width Required		ft	(64) Operating Rating Load	1.9	
(872) Bridge Rdwy Width Adequare	Y		(878) Inventory Rating Load - Required		
(32) Approach Rdway Width	54	ft	(877) Inventory Rating Load - Adequate	Y	
(841) Bridge Wider	N		(28) Lanes On	04	
(52) Deck Width Out-Out	68	ft	(880) Lanes On - Required		ft
(50A) Curb/Sidewalk Left Side - Width	6	ft	(879) Lanes On - Adequate	Y- Yes	
(50B) Curb/Sidewalk Right Side - Width	6	ft	(876) Geometry Adequate		
(10) Minimum Vertical Clearance On, Cardinal	33	ft	(871) Alignment/Sight Distance Adeqaute		

(874) Conformance Comments

(882) Structural Deficiency Summary

(875) Crash Data

Historic Bridge Management Plan

(853) Historical Management Summary

Preservation Potential

(861) Prudent and Feasible to Leave Bridge in Place

(862) Preservation Potential

(863) Preservation Summary

(864) No Build Alternative Consideration

(881) Rehab Without Adverse Effect

(865) Historic Bypass Information

(866) Other Preservation Options

(867) Preservation Recommendation

(868) Comment Recommendation

(869) Comment Date

(870) Plan Comment

LUC-00002-1862 _(4800303)

ODOT District:	02			Date Built:	07/01/1931
Major Maint:	01 - State Highway Agency	Facility Carried:	HIGH LEVEL BRIDGE	Traffic On:	5 - Highway-pedestrian
				Rehab Date:	06/06/2015
Routine Maint:	04 - City or Municipal Highway Agency	Feature Inters:	MAUMEE RIVER,RRS&STREETS	Traffic Under:	6 - Highway - waterway
				Insp. Resp A:	01 - State Highway Agency
FIPS Code:	77000 - TOLEDO (LUC county)	Location:	LUC 0.2 mile west of Summit	Insp Resp B:	

Inspector Marburger,Cole Inspection Date 06/12/2020 12:00:00 AM Reviewer Kent Jr.,Daniel

Under Records

Under Record 1

Identification

(1) State Code	395 - Ohio	(6) Features Crossed Over	SR 2
(11) Milepoint	00.03	(7) Facility Carried Under	HIGH LEVEL BRIDGE
(201) Special Designation		(8) Structure No.	4800303
(5A) Roadway On/Under	2: Single route goes "under" the structure	(12) Base Highway Network	Inventory Route is on the Base Network
(5B) Route Type	5 - CITY STREET	(13A) LRS Route	
(5C) Level of Service	1 - MAINLINE	(13B) Subroute Number	
(5D) Route Number	0072A	(213) NLF_ID Under Route	MLUCMR00072A*C
(5E) Directional Suffix		(206) Preferred Under Route	

Age of Service

(19) Bypass Detour Length		(381) Intersected Route Daily Truck Traffic	0
(29) Est Average Daily Traffic	6200	(109) Average Daily Truck Traffic	
(30) Year of Average Daily Traffic	1974		

Geometric Data

(10) Practical Maximum Vertical Clearance	14	(47) Total Horizontal Clearance	24
	CARDINAL		NON-CARDINAL
(336A) Minimum Vertical Clearance	14	(336B) Minimum Vertical Clearance	0
(335A) Minimum Horizontal Clearance	24	(335B) Minimum Horizontal Clearance	0

Classification

(20) Toll		(101) Parallel Highway	N - No parallel structure
(26) Functional Classification	17 - Urban - Collector	(102) Direction of Traffic	2-way traffic
(209) Interstate Mile Marker		(104) Highway System of the Under Route	0 - Under Route is NOT on NHS
(100) STRAHNET Highway	Not a STRAHNET route	(110) Designated National Network	Under route not on network

Pictures

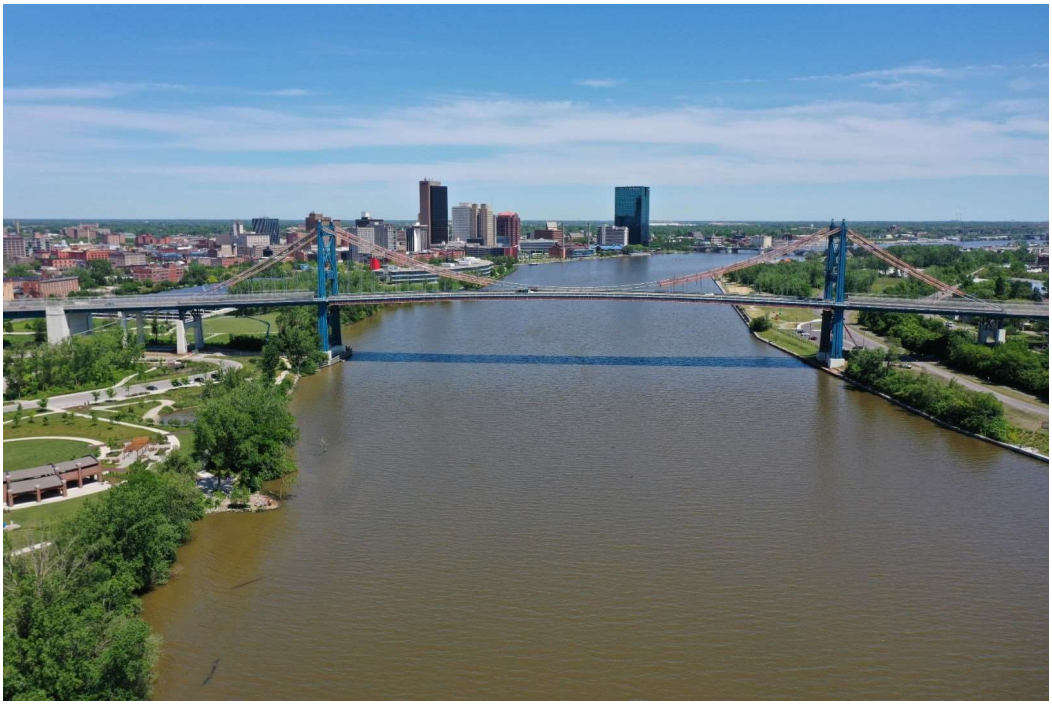


PHOTO 1 Elevation

Description 1

PHOTO 2 Elevation

Description Elevation view, looking east

Pictures

PHOTO 3 Elevation

Description West approach spans

PHOTO 4 Elevation

Description East approach spans

Pictures

PHOTO 5 Condition

Description Typical condition on underside of deck at girder interface in the suspension spans

PHOTO 6 Condition

Description Crack in top flange of floor beam cantilever (in suspension span near towers)

Pictures

PHOTO 7 Condition

Description East Cable Bent, North Column, Outboard Face of the Inboard Link Plate at the Top Pin

PHOTO 8 Condition

Description Ends of bottom flanges of the left girders at Pier 2W are in contact and restricting movement

APPENDIX B

Fracture Critical Inspection Plan

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

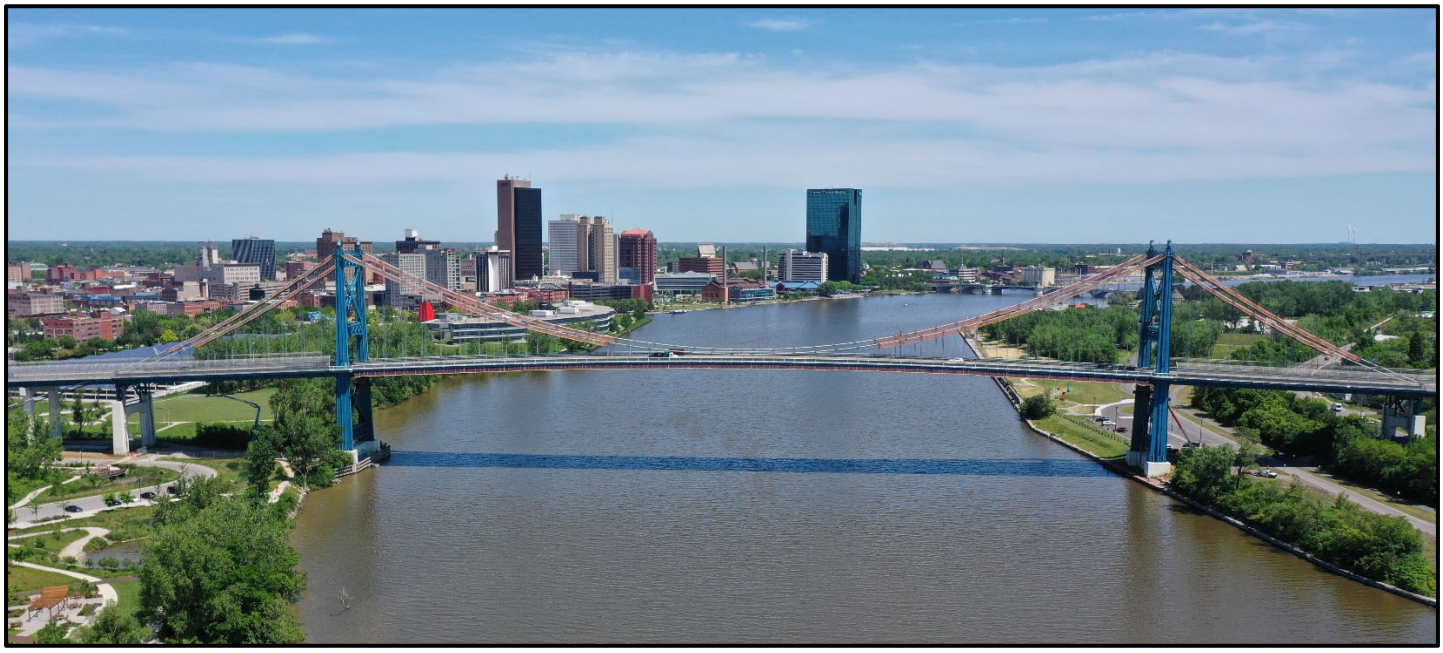


Photo 1 - Elevation View, Looking North

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.

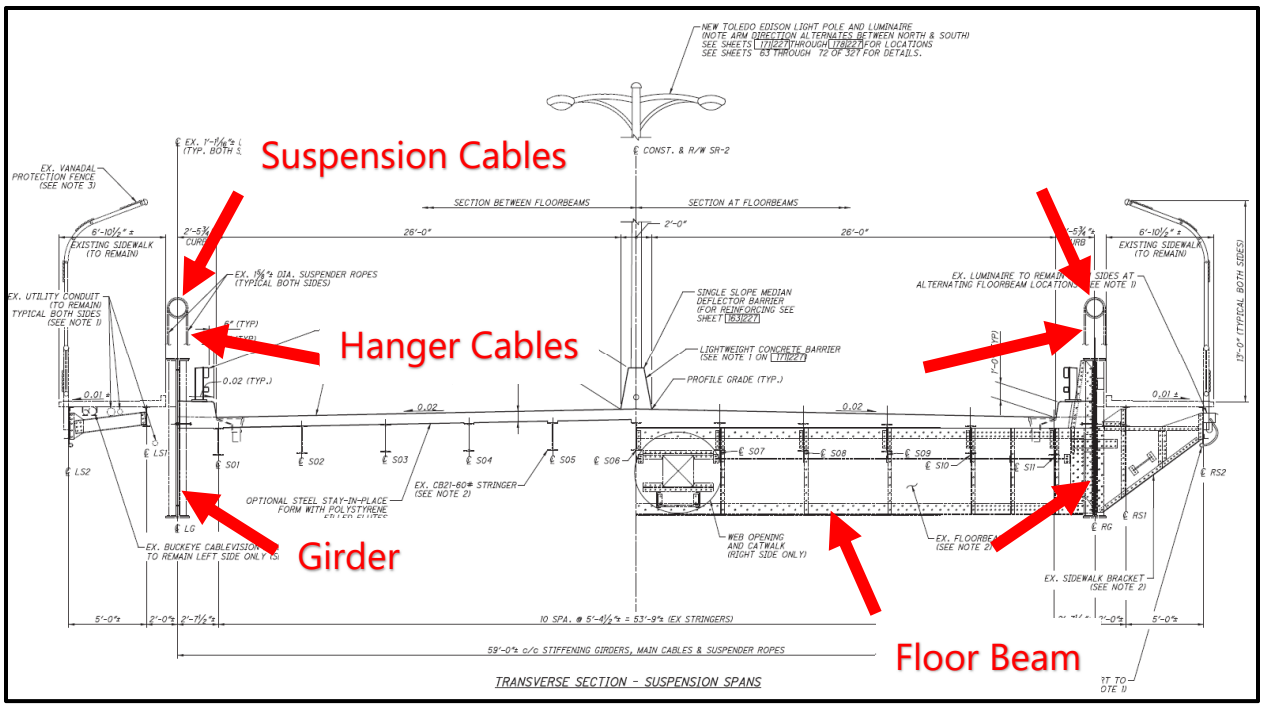


Figure 2 - Suspension Span Typical Section

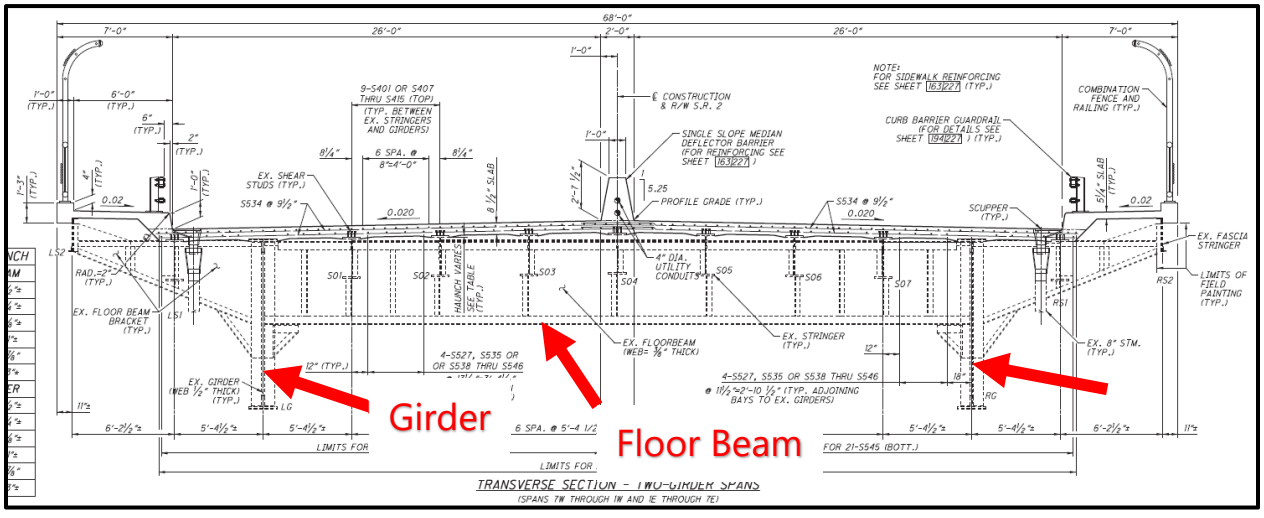


Figure 3 - Two-Girder Span Typical Section

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.

APPENDIX C

Complex Inspection Procedure

Complex Bridge Inspection Procedure

LUC-00002-1862, SFN 4800303

Anthony Wayne Bridge over Maumee River

Toledo, Ohio

Bridge Type:

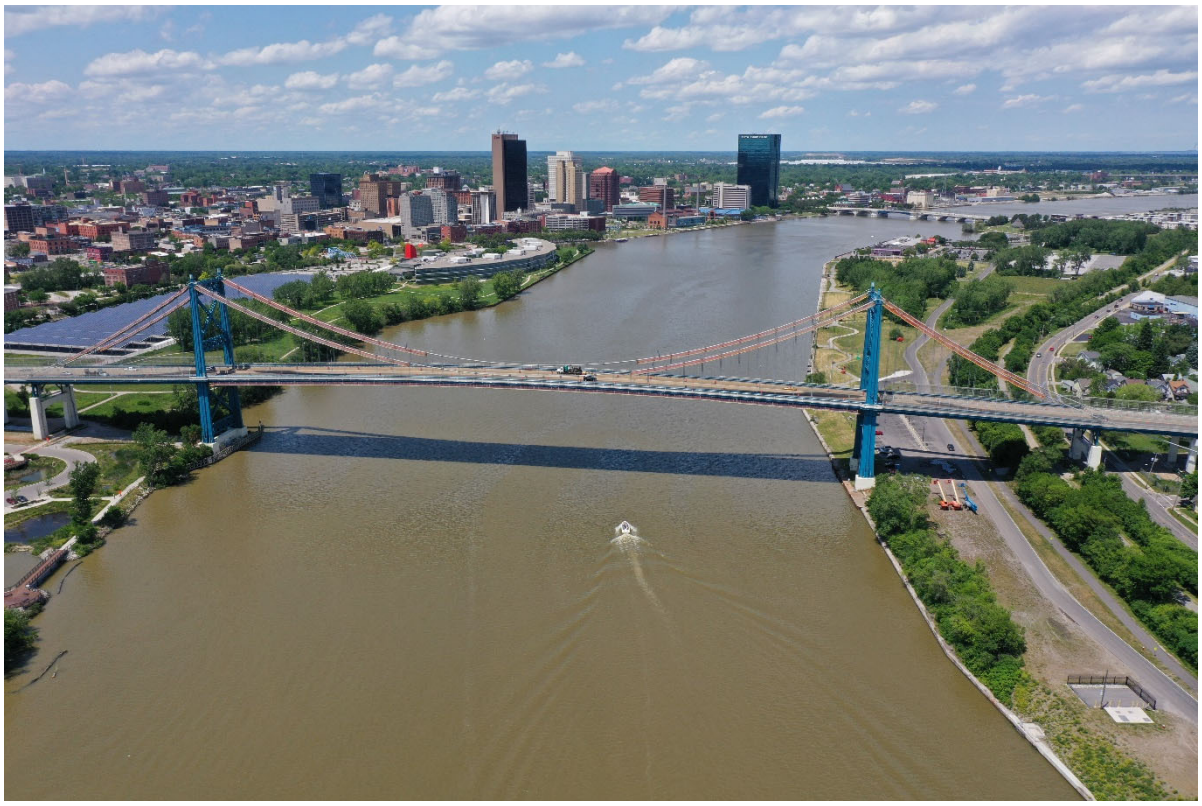
Main spans consist of three suspension spans with a light weight reinforced concrete deck supported with two built up steel towers and two reinforced concrete hold down piers. Approach spans consist of continuous steel plate girder spans, simple plate girder spans, and simple multi-beam spans. All approach spans have reinforced concrete deck supported on reinforced concrete substructures. Abutments, approach piers and hold down piers have foundations supported with precast cast concrete piles driven to rock or hard pan. Approach retaining walls are supported on spread footings. Towers are supported on deep concrete mass block foundations socketed into bedrock and anchorage piers are supported with deep concrete caissons embedded into rock.

Spans:	North Approach Spans, 45’-3”, 68’-10”, 2@ 69’-7”, 81’-6”, 107’-10”, 91’-7”, 163’-8”, 105-7”, 98’-2” Suspension Span, 233’-6”, 784’-10”, 233’-6” South Approach Spans, 98’-2”, 105’-7”, 93’-9”, 5 @ 80’-0”, 79’-3”, 5 @ 40”-0”, 32’-6”, 32’-0”, 20”-0”
Roadway:	26’-0” f/f barrier each side with 5’ sidewalks each side.
Loading:	HS-20-44, Superstructure
Skew:	Varies
Wearing surface:	Monolithic concrete
Approach Slabs:	AS-1-81, 25’-0” long

Location Map:

The Anthony Wayne Bridge, also named the High Level Bridge, is located 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.

Elevation:



End View:

General Information:

Public Entity	Contact Name and Number
Bridge Inspection Responsibility	Ohio Department of Transportation
Bridge Maintenance, Major Bridge Maintenance, Minor	Ohio Department of Transportation City of Toledo

Complex Features on this Bridge:

Complex Feature	III. Frequency of Inspection
Main Towers	Routine Annual to spot-check known deficiencies, In-Depth Inspection every 60 months
Suspension cables, suspender cables & hanger brackets and saddles.	
Stiffening girders, floor beams & stringers	
Anchorage piers	
Dehumidification system on suspension cables (To be determined)	

Describe Risk Factors Unique to this Bridge:

Risk Factors	Description
Under Bridge Inspection from cat walks and by climbing methods	Access from man ladders, some in excess of 50' high and 15' to 20' above ground line.
Main Towers	Access doors at deck level. Inside towers man ladders in excess of 100' high.
Suspension cables, suspender cables & cable saddles by climbing methods.	Access from bridge deck or from main towers.
Anchorage piers	Access from doors and man ladders in excess of 50' below ground level.
Dehumidification system	To be determined

Detail the Inspection Methods and Equipment to be employed on this Bridge:

Inspection of the suspension spans will mostly be completed by climbing methods. Inspection of the approach spans can be competed with climbing methods and assisted with man lifts from ground level. Sounding of substructures will require man lifts. Inspection of the bridge deck, suspension cable hangers and stiffing girders may require traffic lane closures. Lane closures are to be coordinated with the City of Toledo.

Safety:

Inspectors shall refer to the procedures outlined by their own employer's health and safety policies for the minimum safety requirements. Local police should be notified prior to any personnel being on the suspension.

Contacts for this Bridge:

Agency	Contact Name and Number
ODOT District 2	ODOT District 2 Headquarters 317 E. Poe Rd. Bowling Green, OH 43402 Primary Phone: 419-353-8131
City of Toledo	Streets, Harbor and Bridges 1189 Central Ave. Toledo, OH 43610 419-936-2508
Toledo Police	525 N. Erie Str. Toledo, OH 43604 419-245-3340
Toledo Fire	Non-Emergency 419-939-3550

Additional Inspector Training, Experience, Licensing and Certification Required to Inspect Complex Features listed:

	Inspector Training, Experience, Licensing and Certification Required
Team Leader	• The inspection team shall be led by a Professional Engineer or supervised by a Professional Engineer who meets the minimum requirements for a Team Leader in the National Bridge Inventory. • Familiar with suspension span bridges, their construction, design and current inspection techniques. • Understanding of where and how defects occur. • Understanding and ability to perform testing or recommend advanced testing procedures at problem areas.

Relevant Operating Manuals, Guides and Supporting Documents Necessary for the Successful Inspection of the Complex Features on this Bridge:

Document Name, Agency and Year	Location of Document
Previous Inspection Reports	ODOT Bridge Database
Previous Inspection Photographs	ODOT Bridge Database, ODOT District 2 local server

History:

The most recent In-Depth and Routine Inspection Reports need to be reviewed prior to performing the inspection in order to determine specific risk factors on the bridge.

- 1931 – The Anthony Wayne Bridge, designed by Waddell and Hardesty, was opened to traffic. The McClintic Marshall Company was the contractor for the erection of the superstructure and HP Converse and the Holmes Construction Company were the substructure contractors.
- 1960-61 – Improvements to the structure included concrete deck replacement, lighting improvements, structural steel repair, expansion joint replacement, new scuppers, and downspouts.
- 1978 – Concrete barrier built on centerline.
- 1981 – Fences constructed on east approach spans.
- 1984-85 – Structural steel was painted using ODOT System A (inorganic zinc silicate primer and a vinyl finish coat).
- 1987 – Decorative lighting added in the suspension spans.
- 1988 – City of Toledo, Division of Streets, Bridges, and Harbors started to replace sidewalk in the suspension spans.
- 1989 – Plans and specifications were developed to repair the substructure concrete, rehabilitate the link bearing members, including pin replacement at the towers, install new strip seal expansion joints, drainage troughs and downspouts, pavement relief joints, and curb railing on the bridge approach spans. In addition, Physical Condition Report was prepared by SSOE, Incorporated.

- 1991 – Burgess & Niple, Limited (B&N) performed the first annual inspection of the bridge. Modjeski & Masters was hired as a sub consultant to inspect the suspension components with B&N. A night field survey was performed to provide geometric data for a structural and geometric behavior analysis of the suspension spans. Improvements included substructure concrete repair, rehabilitation of the link bearing members at the towers, new strip seal expansion joints, new drainage troughs and downspouts, and installation of curb railing on bridge approach spans.
- 1992 – B&N performed the second annual inspection of the bridge. Modjeski & Masters was hired as a consultant to inspect the suspension components with B&N.
- 1993 – B&N performed the third annual inspection of the bridge. Modjeski & Masters was hired as a sub consultant to inspect the suspension components with B&N. Commercial Diving Service, Inc. was hired as a sub consultant to perform a subaqueous inspection.
- 1995 – B&N prepared rehabilitation plans for various improvements, including a superplasticized dense concrete overlay, sidewalk replacement, finger joint replacement, new deck joints, structural steel repairs, new suspender ropes, new cable wrap, painting the entire structure, etc.
- 1997-98 – American Bridge Company performed 1995 plan rehabilitation.
- 2003 –Gannett Fleming inspected the structure. Modjeski & Masters was hired as a sub consultant to inspect the suspension components. Mannik & Smith was hired as a sub consultant to inspect the east and west approach span components.
- 2012- Cable opening inspection-Plasecki Steel Const. Corp.
- 2014-15 - E.S. Wagner Const. Co. performed plan rehabilitation which replaced bridge deck, made structural steel repairs, replaced approach truss spans with continuous steel girders, and patched concrete substructures. The suspension span deck was replaced with lightweight concrete. Consulting engineers were Arcadis, Gannett Fleming & Modjeski & Masters.
- 2016-17- UCL Inc. preformed plan work to replace the bridge paint system.
- 2018-2020- Future planned work- Replace cable wrap and installation of cable dehumidification system, install dynamic lighting system.
- 2020 – Gannett Fleming performed in-depth, element level and fracture critical inspection. Modjeski & Masters was hired as a sub consultant to inspect the suspension components.

General:

This document is not comprehensive and is intended to supplement the current Ohio Department of Transportation Bridge Maintenance Manual. All inspections are to be conducted in compliance with the Ohio Department of Transportation Manual of Bridge Inspection. Maintenance procedures and repair materials should conform to the standard procedures where possible.

Regular systematic inspections and maintenance is critical to the long-term operation of the bridge. Inspections should be carefully documented to be able to determine the progress of any deterioration to the bridge structure. This allows the timely scheduling of maintenance and repairs that will extend the life of the structure and reduce the maintenance costs.

In addition to the normal inspection process, department personnel should report any deficiencies noted during routine operations to the Bridge Engineer. This is particularly critical for any safety equipment such as damage to the barriers or attenuators.

When conditions or areas of concern are identified they should be monitored to determine the rate at which further deterioration is progressing. Areas where the conditions are stable and not changing significantly should be reviewed for their effects on the long-term maintenance or durability of the structure and the appropriate maintenance activities should be scheduled.

When the conditions are changing between inspections a more detailed review needs to occur to determine if the distress or deterioration is a symptom of a more critical condition that could impair the performance of the structure. It also needs to be determined if the continued deterioration will result in any significant damage to the structure or increased repair costs prior to the next maintenance or repair cycle.

When deterioration is continuing an appropriate inspection interval should be determined to monitor the deterioration and to provide for a proactive maintenance or repair program in a cost-effective manner.

Safety:

All inspections are to be conducted at a minimum in compliance with the NBIS and the Ohio Department of Transportation Manual of Bridge Inspection.

It may be necessary to set up traffic control or safety zones on the bridge or sidewalks to safely conduct inspection or maintenance operations. Any required traffic control for the inspection, repair or maintenance of the structure shall be in conformance with the requirements of the FHWA Manual for Uniform Traffic Control Devices and shall be coordinated with the City of Toledo and the ODOT district 2 office. Contacts are as provided above.

Entry of some bridge components may pose OSHA requirements regarding confined spaces. Locations that could require special concern are the inside of the tower bases, tower wind locks, and anchorage pits.
Therefore, entry of these items may include additional challenges with requirements for personal protective equipment following the protocols of the Ohio Department of Transportation Confined Space Entry Program and the Alternate Entry Procedures for bridge inspection as set forth in the Department's Manual of Bridge Inspection.

The bridge engineer is to be notified before the inspection starts so that he can advise local authorities.

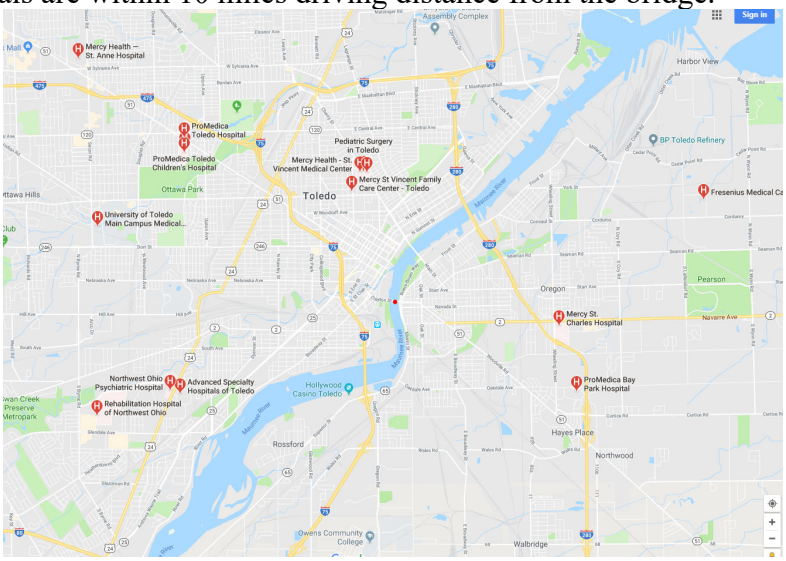
When accessing some components of the bridge proper safety procedures, clothing and personal protective equipment including a radio, flashlight, and possibly an air monitor are to be used. Note that cell phone and two-way radio service could be erratic at some locations on the structure.

Manlifts and other specialized equipment shall only be used by personnel trained for the use of that equipment.

Climbing to obtain access to areas on the structure shall only be done by trained experienced personnel using the appropriate climbing safety equipment and techniques.

Access to the suspension span catwalk, towers and anchorage pits is limited. Therefore, the inspection team needs to be aware of any physical limitations that might require them to return to the egress point.

More than five hospitals are within 10 miles driving distance from the bridge.



Suspension Span Catwalk:

When using the inspection walkway under the suspension spans care is to be taken to abide by all load restrictions. The walkway is designed to provide access for inspection personnel only. The spans are limited to three persons or 750 lbs. of persons and equipment per walkway span.

The catwalk system and railings are NOT designed to provide fall arrests. Do not use the railings or any part of the catwalk or its support framing as an anchor point for fall arrest equipment. The rails are purely to function as safety railings and are not to be loaded as part of any construction or maintenance activities.

All required fall protection for operations outside of the handrails is to be independent of the catwalk system and shall be designed by a qualified person, in accordance with OSHA, not to provide any loads to the catwalk or handrail system.

No additional loads are to be placed along the catwalks due to mechanical equipment, maintenance or repair operations. Any maintenance or construction scaffolding is to be supported independently of the catwalk system and railings.

The catwalk is to be visually inspected for any signs of corrosion or deterioration prior to being fully loaded.

Access:

A. Main Suspension Span Access:

Access to the main suspension span catwalk system located below the bridge deck is accessible from the hold down piers B and E, located each side of the river and opposite of the towers. Equipment required to access the top of the hold down pier caps or ladder cages are extension ladders or man lift. Even though the paint system has been replaced, inspectors should be cautioned that areas of lead paint may remain and to be cautious of bird droppings.

B. Tower Access:

Access to the inside of the four towers is through hinged man doors located at the sidewalk level. The doors are locked, keys may be obtained from the bridge engineer. Keys are not to be reproduced unless granted permission from the bridge engineer and are to be returned after the inspection is completed unless the inspector has authorization to keep the key. Each tower consist of five cells and each cell is accessible using installed man ladders. The height of the ladders inside the towers varies on the location of the internal bulkheads. Bulkhead manhole openings in the center cell are 16”x 18” and in other cells are 16”x13”. The only cell that exits to the top of the tower is the center cell. When exiting the towers, it is important that the upper doors are kept closed to keep birds out and the sidewalk doors are locked to prevent vandals from entering. The tower cells are unlighted, contain lead paint and bird droppings. Inspectors are cautioned to have the proper equipment.
Confined space entry techniques and equipment may be required for entry into these areas. Inspectors are advised to review the plans and site conditions before entering the towers.

C. Cable Access:

The cables are accessible from the sidewalks or from the towers. Locked gates on the cables have been installed to prevent vandals from climbing the bridge. Keys may be obtained from the bridge engineer and are not to be reproduced unless permission is grated and are to be returned after the inspection unless permission is granted for the key to remain with the inspector. The cables are equipped with safety cables. Inspectors must have proper climbing equipment when on the cable. When working on the cables the lead engineer or bridge engineer will be required to contact the local authorities at the contact information provided above.

D. Anchorage Pit Access:

Access to the four anchorage pits is by locked hinged doors located on the ground level of the anchorage piers. Keys can be obtained from the bridge engineer. Keys are not to be reproduced unless permission is grated and are to be returned

after the inspection unless permission is granted for the key to remain with the inspector. The pits are lighted and have ventilation systems. Inspectors should not enter these areas if these systems are found to not work. Also, if standing water is visualized inspectors should not enter. If any of the above is found it should be reported to the bridge engineer for repair. Located in these pits is electrical equipment, sump pumps and dehumidifiers. Even though this equipment is powered from ground fault circuits, to avoid electrical shock, inspectors should not enter until it is confirmed by a certified electrician that the equipment is de-energized or repaired. Access to the lower and upper levels of these pits is by uncaged man ladders, some in excess of 50' in length. Inspectors should have the proper equipment when accessing these ladders.

Routine Inspection:

Routine inspections are to be performed annually. Throughout this time the bridge should be observed to ensure that it is functioning properly through the different seasons. Routine inspections shall include a general inspection of the following items:

ALL SPANS:

1. Approaches including pavement, curbs and sidewalks, median barriers and parapets and crash attenuators.
2. Approach slabs and bridge decks including sidewalks, median barriers and parapets, railings and vandal fencing.
3. Expansion joints, Modular and strip seal, Bearings
4. Superstructure- steel stringers, floor beams, and continuous built up girders.
5. Drainage system- scuppers, catch basins, leader pipes, and trash separators.
6. Substructures including approach retaining walls and three staircases.
7. Bridge lighting mast and supports.

SUSPENSION SPAN:

1. Suspender ropes and hanger brackets.
2. Hold down brackets, ropes and pier anchors.
3. Main cable –check for wrap tears and open seams, dehumidification system.
4. Anchorage pits-access system, cable anchors, mechanical equipment
5. Superstructure- access ladders, catwalk, floor beams & stringers, wind braces & gusset plates
6. Navigation lights upstream and downstream.
7. Channel- seawall and fender system.

Fracture Critical Inspection:

The bridge shall receive fracture critical inspection on all fracture critical members every 24 months at an arm's length distance. The stay cables, hangers, edge girders and floor beams are fracture critical. Inspectors shall consult the previous inspection for deficiencies and nomenclature.

In-Depth Inspection:

On a five-year plan, the bridge should receive an in-depth inspection requiring that all components of the bridge be inspected within arm's reach. This inspection should include all the above items in addition to the following:

1. Approach spans exceeding a vertical clearance of 25' need to be inspected with a man lift or by climbing.
2. On the suspension span:
    A. Cable saddles including spot checking bolt tensions, minimum one per saddle, 1 ¾" dia. @ 54,000 lbs., 120 locations.
    B. Suspender ropes.
    C. Tower wind struts, check gusset and batten plates.
    D. Tower airplane light anchor bolts.
    E. Main cable above and below the suspension span, checking wrap system, including the cable bands at the saddles.

Maintenance:

Routine maintenance is performed by the City of Toledo and includes the following:

1. Cleaning and sweeping sidewalks and gutters.
2. Cleaning suspension span hanger brackets.
3. Cleaning catch basins, scuppers, drain leaders and trash separators.
4. Cleaning expansion joints, bearings and abutment and pier bearing seats.
5. Making repairs to bridge sidewalks and bridge deck wearing surfaces.
6. Maintaining street, navigation and airplane lighting systems, including access systems.
7. Maintaining median barrier wall crash attenuator.

Major maintenance is by ODOT. Regardless of maintenance responsibility all deficiencies should be reported to the bridge engineer so that repairs can be scheduled.

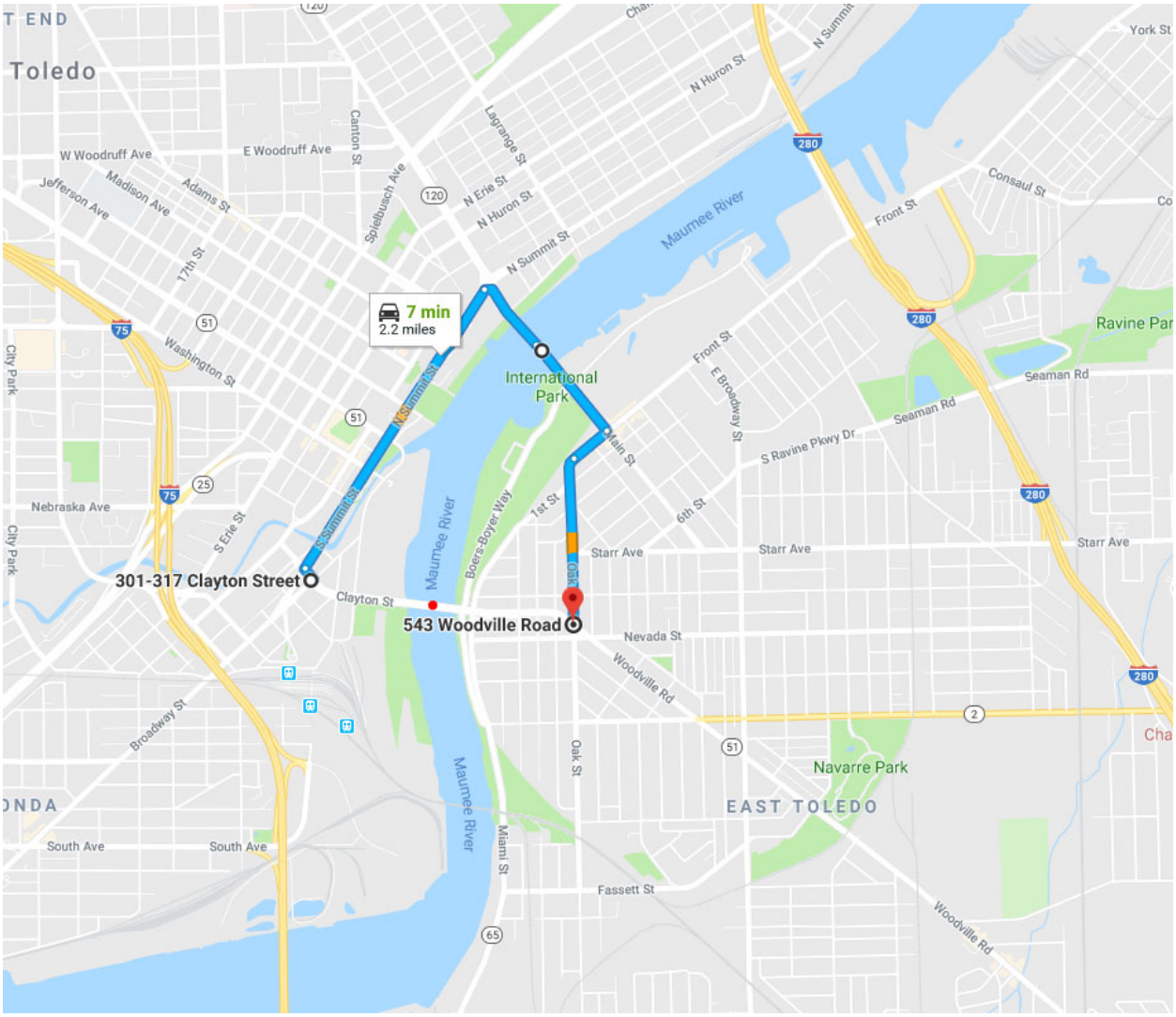
Cable Dehumidification system:

When installed this system will be inspected and maintained with a yearly maintenance contract. The inspection of all mechanical and electrical equipment relating to this system will be per manufacturer's requirements and performed by a specialist, recommended by the manufacturer. Any potential air leaks noted in any of the piping systems or on the cable wrap system should be brought the bridge engineers attention. Air leaks that affect the performance of the system will be repaired with the maintenance contract.

11. Maintenance of Traffic:

Since the bridge has shared maintenance responsibility, both ODOT and the City of Toledo need to approve any maintenance of traffic plans. One lane can be closed with a merge temporary traffic control. When closing a lane and maintaining traffic (MT) Standard Construction Drawings (SCD) must be followed, (http://www.dot.state.oh.us/Divisions/Engineering/Roadway/DesignStandards/traffic/SCD/Pages/CurrentMaintainingTraffic(MT)SCDs.aspx). If warranted for all lanes to be closed for short durations, detours may be approved and provided by the city of Toledo.

Detour Map:



APPENDIX D

Phased Array Ultrasonic Testing Results of Tower Pins

200 Hightower Boulevard • Suite 400 • Pittsburgh, PA 15205
Phone: (412) 788-2522 • Fax: (412) 788-1697 • www.hrvinc.com

Weekly Narrative Report

Client Name:	Gannett Fleming	HRV Service Order:	2492-001
Project Description:	Anthony Wayne Bridge	Report No.:	001
Project Number:	PID 108045 State Job 428312	Inspector:	Shawn Barrett
HRV Proposal:	20191986	Inspection Period:	8/16/19
Fabricator:	N/A - Field	Location (city/state):	Toledo, OH

FABRICATION INSPECTION STATUS

	In Process	% Completed	100	HOURS:	Sunday:	0	Thursday:	10
X	Final				Monday:	6.75	Friday:	11.5
					Tuesday:	10.5	Saturday:	6.75
					Wednesday:	8		

X Attachments PAUT Reports

Narrative Description of Activities:

Type of Inspection: Phased Array Ultrasonic Testing

Inspector Licenses: AWS CWI 99080511, ICC S1 Bolting, ASNT Level III UT 141473, PAUT Level II, NACE CIP Level 3 28708

Report Number: VT 001

Location Inspection Performed: Anthony Wayne Bridge, Toledo, OH

Site Contact: Mr. Cole Marburger, Gannett Fleming

Inspection Code Utilized: AWS D1.5 – 2020 Bridge Welding Code

Testing Equipment Utilized: Tape Measure, Scraper, Hand and Power Wire Brushes, Flashlight, Mirror, Olympus MX2 PAUT w/ A24 Probe

Narrative: I performed Phased Array Ultrasonic Testing with the following results. Please see the specific location report for greater clarity to each location and item detected.

Tower C							
South – Face B				North – Face A			
USW	Tested	USE	Inaccessible	UNW	Tested	UNE	Compliant
LSW	Tested	LSE	Compliant	LNW	Compliant	LNE	Tested

Tower D							
South – Face B				North – Face A			
USW	Tested	USE	Tested	UNW	Compliant	UNE	Tested
LSW	Tested	LSE	Tested	LNW	Tested	LNE	Tested

Inspector Signature: *Shawn Barrett* Date: 6/15/2020

Client Name:	Gannett Fleming	HRV Service Order:	2492-001
Project Description:	Anthony Wayne Bridge	Report No.:	001
Project Number:	PID 108045 State Job 428312	Inspector:	Shawn Barrett
HRV Proposal:	20191986	Inspection Period:	8/16/19
Fabricator:	N/A - Field	Location (city/state):	Toledo, OH

PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862

Initial information for this project stated that the pins for this project were manufactured near 1930. A comparable pin was obtained from the Ohio Department of Transportation for comparative analysis. A bridge pin from the Ironton Bridge was supplied with a manufacture date of approximately 1929. The pin had three flaws placed in it for detection and sizing purposes. Two saw cut notches were placed in the material as well as a simulation of corrosion/porosity. The notches were cut with a depth of 0.125 inches, the corrosion had varying depths.

Inspector Signature: *Shawn Barrett* Date: 6/15/2020

Client Name:	Gannett Fleming	HRV Service Order:	2492-001
Project Description:	Anthony Wayne Bridge	Report No.:	001
Project Number:	PID 108045 State Job 428312	Inspector:	Shawn Barrett
HRV Proposal:	20191986	Inspection Period:	8/16/19
Fabricator:	N/A - Field	Location (city/state):	Toledo, OH

Inspections were performed at all locations with exception to Tower C South Side of the Tower at the Upper Southeast location. Rigging to accommodate the temporary side span walkway system blocked access to this location. Four different attempts for staging were used to attempt access to this location with all four failing to supply safe egress to the location.

It should be noted that an attempt was made to perform conventional ultrasonic testing of the pins but I was unable to receive a response from the backwall of the material with a traditional 0.5-inch diameter 2.25 MHz transducer operating at 0-degrees. It was decided in the field that I would be able to remove the three-coat paint system from one location to determine of the coating system was blocking the transmission of sound. The coating was removed in accordance with SSPC SP-3 Power Tool Cleaning to a clean and bright finish. The test was repeated with the same results. The gain was turned up to 89 dB, but no response was achievable. The hash on the bottom of the screen was approximately 0.375-inches high. I could get a response from the cotter pin hole, but the amplitude was only about 20% of full screen height and limited to near surface. It is my opinion that although both the conventional transducer and phased array probe were operating at 2.25 MHz, the phasing of the probe allowed a stronger wave front to be established obtaining a signal response from the backwall of the pin in each test. It should also be noted that removal of the coating system was not required for PAUT testing of these pins. I was able to achieve both penetration and response with the coating system intact. The area where the coating system was removed was recleaned in accordance with SSPC SP-2 Hand Tool Cleaning and two

Client Name:	Gannett Fleming	HRV Service Order:	2492-001
Project Description:	Anthony Wayne Bridge	Report No.:	001
Project Number:	PID 108045 State Job 428312	Inspector:	Shawn Barrett
HRV Proposal:	20191986	Inspection Period:	8/16/19
Fabricator:	N/A - Field	Location (city/state):	Toledo, OH

applications of ZRC High Solids Zinc Paste were applied as a protection system for the carbon steel surface.

The sample pin that was received from ODOT was returned to the site and supplied to Mr. Cole Marburger of Gannett Fleming for its return to the ODOT office in Columbus, OH. The sample was returned with the simulated flaws intact for future use by the owner.

Please see the attached PAUT reports for this project.

Shawn Barrett
CWI 99080511
QC1 EXP. 8/1/2020

Inspector Signature: *Shawn Barrett* Date: 6/15/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 07	MXU - 4.4R4	A24_probe_4-14-2020.ops	2020 / 06 / 07	MXU - 4.4R4	Report
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	ODOT PIN 6-7-2020	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
0.4 µs	-0.041 in	24.154 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	66	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	39.96 dB	PE (Pulse-Echo)	User-Defined	0.231 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	660.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	13.903 in	1.593 in	15.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty.	Used First Element	Last Element	Resolution	Wave Type	Material Velocity

16	1	16	1.0	User-Defined 0.231 in./µs

Start Angle	Stop Angle	Angle Resolution	Focus Depth	Law Configuration	Beam Skew
0.00º	26.00º	1.00º	1.000 in	Sectorial	0.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.750 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in

Synchro.	Max. scan speed
Encoder	2.365 in/s

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan 1		Quadrature	304.801 step/in	Normal

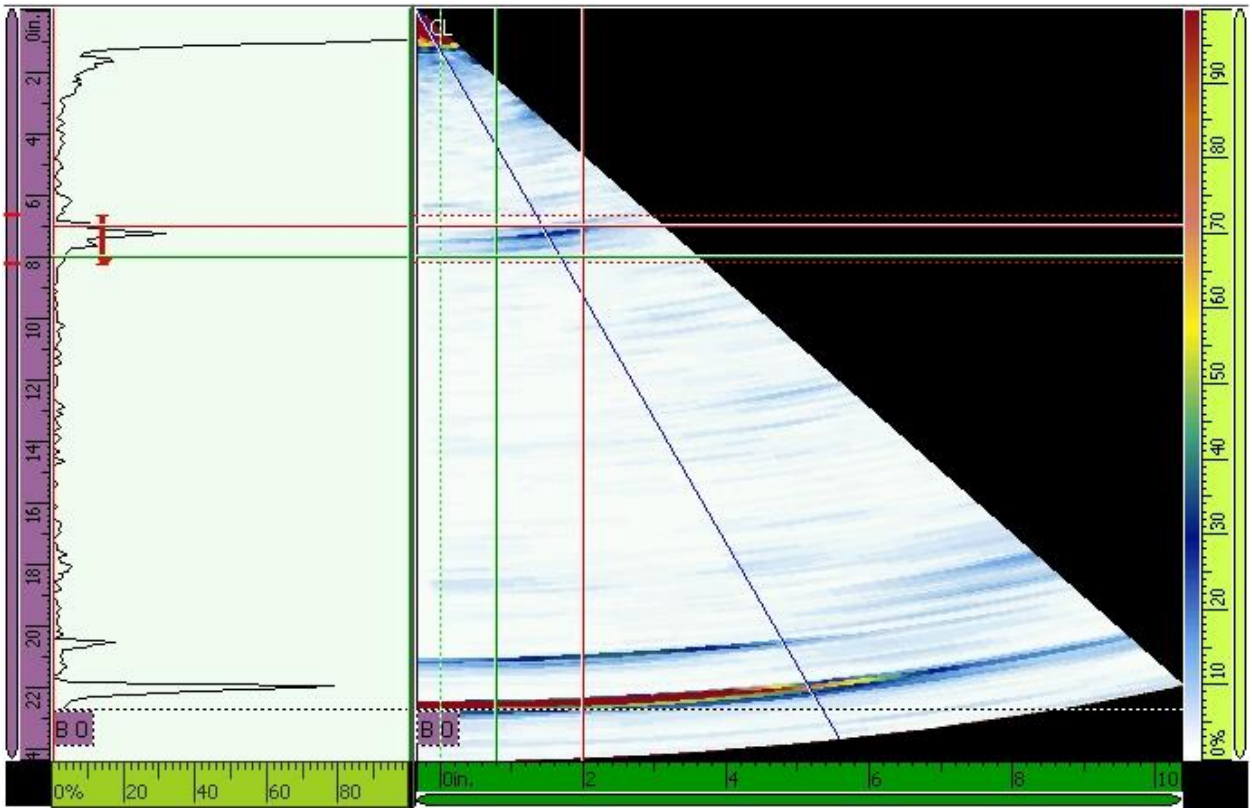
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	14.00º	32.3	7.263	1.499	7.485	0.994	1.220	1.574	---
	2	0.000	0.000	PA 1	5.00º	17.6	11.652	0.708	11.697	0.659	1.610	1.740	---
	3	0.000	0.000	PA 1	14.00º	28.4	15.003	3.429	15.462	0.744	2.500	2.608	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	14.00º	32.3 %	7.263 in	1.499 in	7.485 in	0.994 in	1.220 in	1.574 in	--- in

Comments

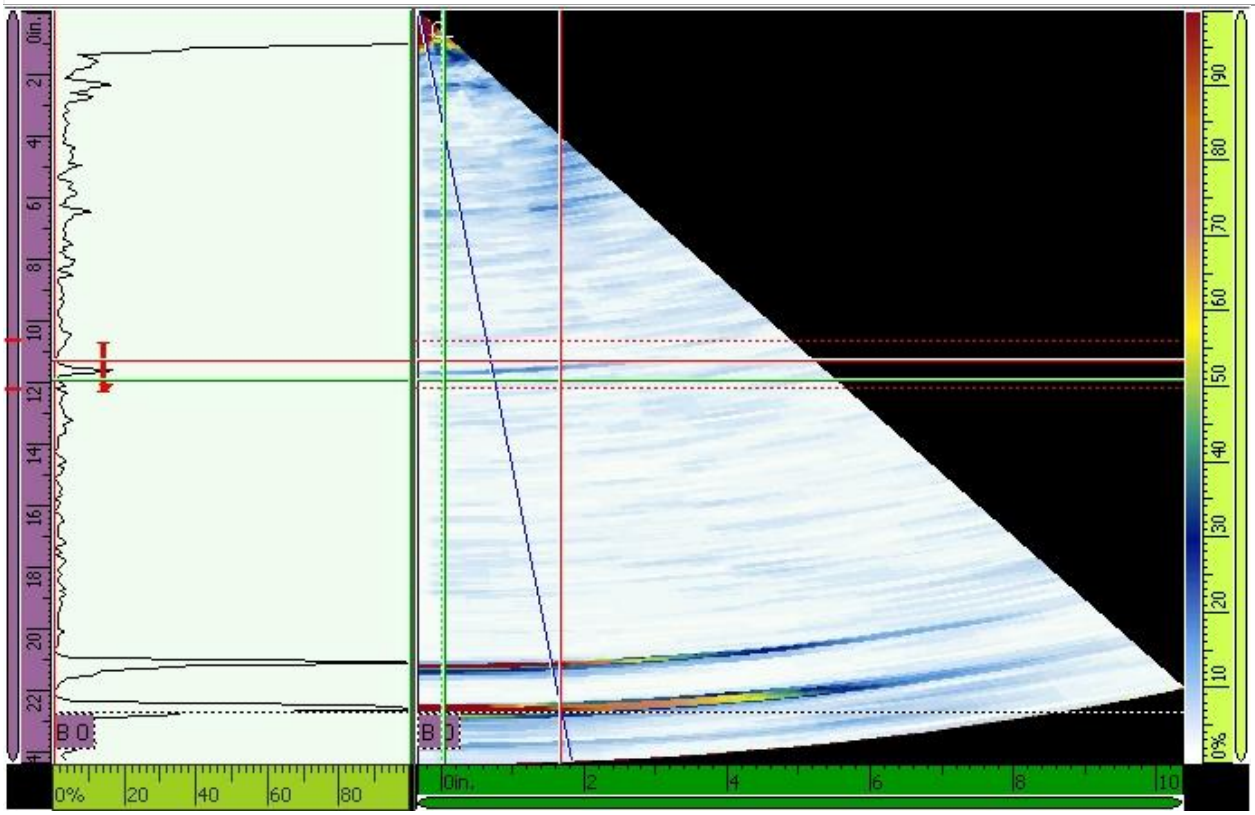
Rounded Simulated Corrosion 14 degree focal law selection with an amplitude of 32% of FSH.


0in.
2
4
6
8
10
12
14
16
18
20
22
B 0
CL
B 0
0%
20
40
60
80
0in.
2
4
6
8
10
90
80
70
60
50
40
30
20
10
0%

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	5.00º	17.6 %	11.652 in	0.708 in	11.697 in	0.659 in	1.610 in	1.740 in	--- in

Comments

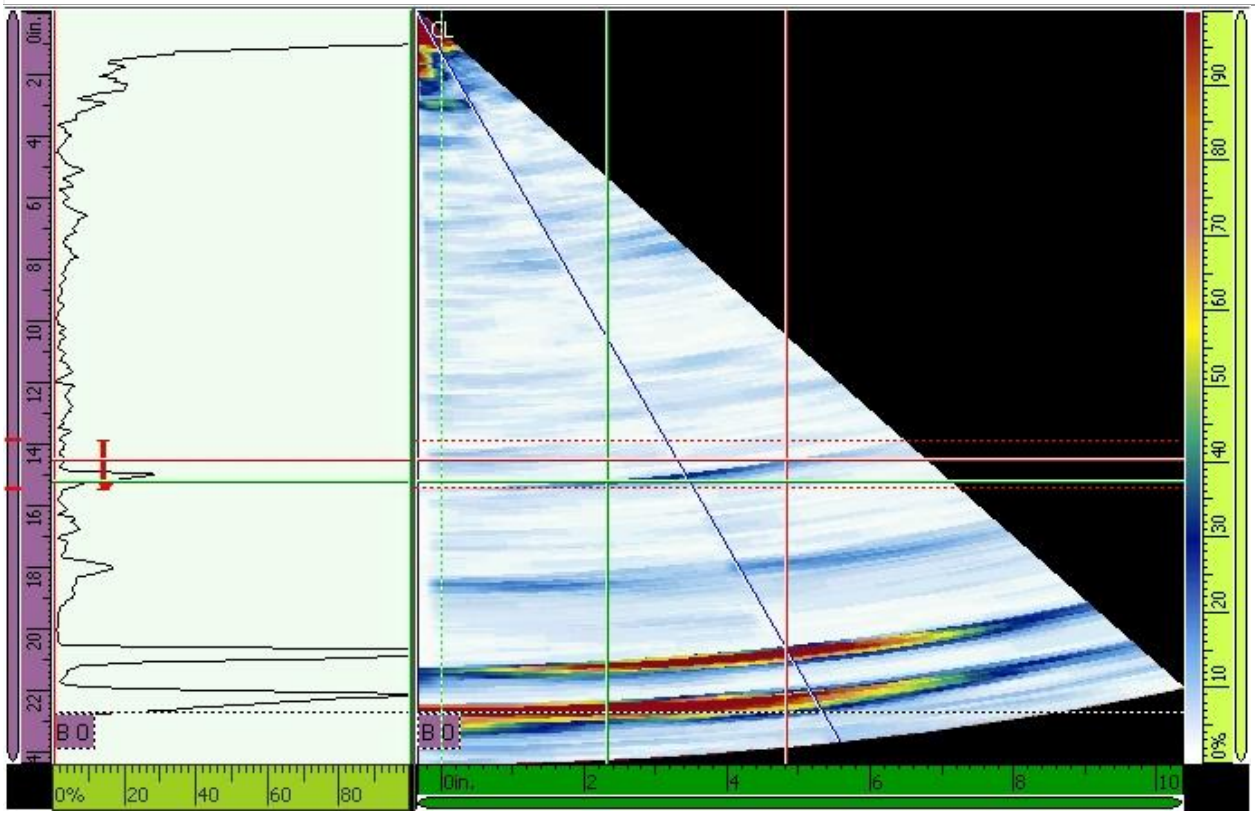
Linear Notch analyzed with the 5-degree focal law. Amplitude of 18% FSH.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.000 in	0.000 in	PA 1	14.00º	28.4 %	15.003 in	3.429 in	15.462 in	0.744 in	2.500 in	2.608 in	--- in

Comments

Linear Notch viewed with the 14 degree focal law and showing 28% FSH.



Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/7/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 11	MXU - 4.4R4	A24_probe_6-09-2020.ops	2020 / 06 / 11	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower C North LNE Face A	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.222 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	11.782 in	3.394 in	15.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty.	Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16		1	16	1.0	User-Defined	0.232 in./µs

Start Angle	Stop Angle	Angle Resolution	Focus Depth	Law Configuration	Beam Skew
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in

Synchro.	Max. scan speed
Encoder	2.365 in/s

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan 1		Quadrature	304.801 step/in	Normal

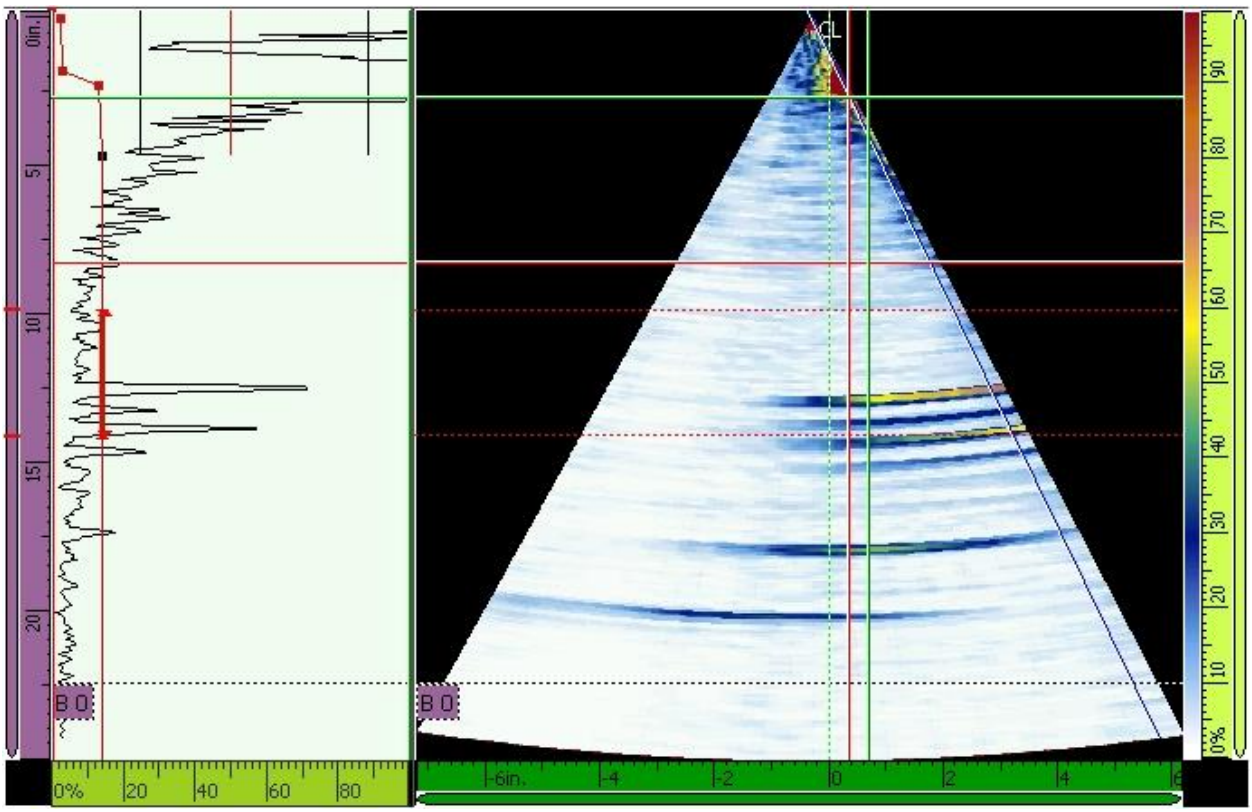
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	14.00º	71.4	12.510	2.808	12.893	5.571	0.333	5.581	---
	2	0.000	0.000	PA 1	15.00º	62.6	12.546	3.050	12.988	5.571	0.333	5.581	---
	3	0.000	0.000	PA 1	15.00º	69.5	17.486	4.374	18.103	5.571	0.333	5.581	---
	4	0.000	0.000	PA 1	0.00º	19.6	12.839	-0.311	12.839	5.571	0.333	5.581	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	14.00º	71.4 %	12.510 in	2.808 in	12.893 in	5.571 in	0.333 in	5.581 in	--- in

Comments

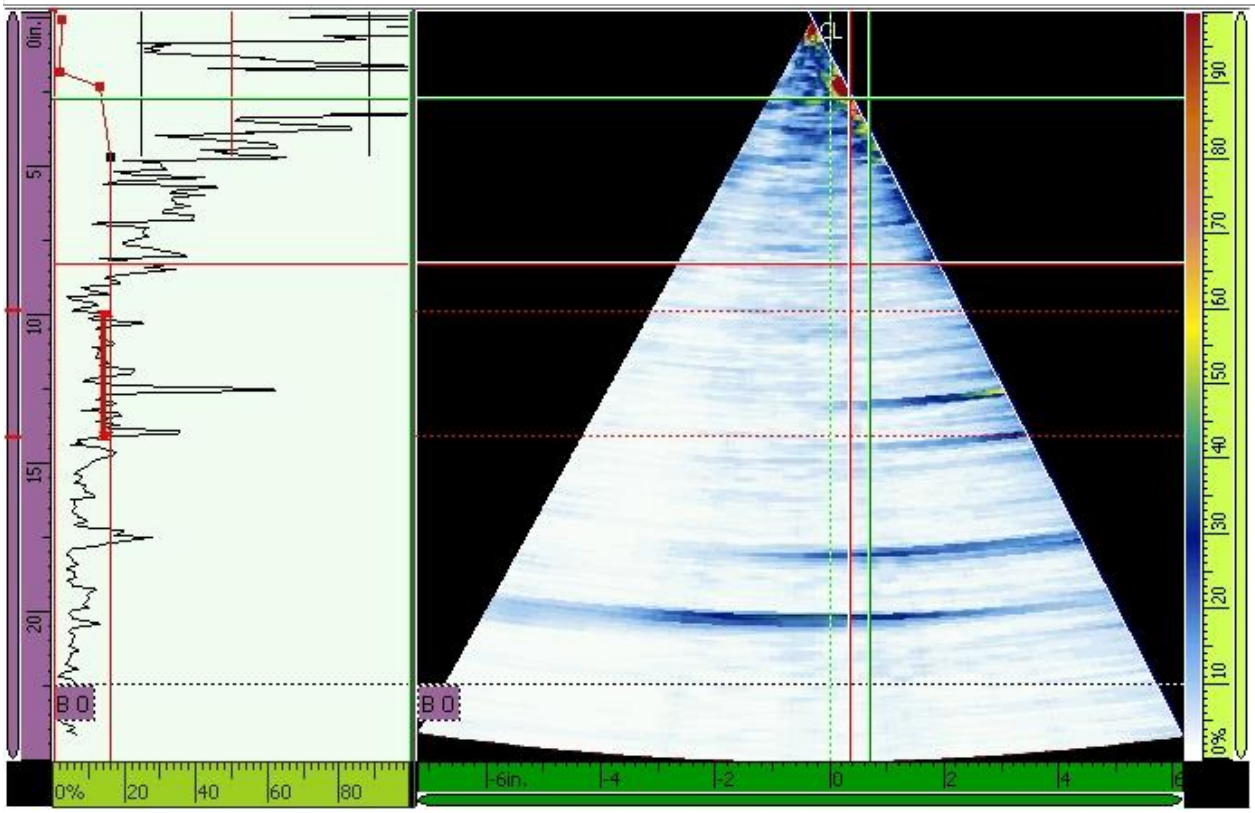
Indication One is the same indication as indication two but viewed from a different focal law. View One is viewed at 14 degrees while View Two is viewed at 15 degree. This indication is located from the 1 o’clock to 5 o’clock positions and the amplitude is above the SSL but below the ARL.


0in.
5
10
15
20
B 0
0%
20
40
60
80
B 0
-6in.
-4
-2
0
2
4
90
80
70
60
50
40
30
20
10
0%

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	15.00º	62.6 %	12.546 in	3.050 in	12.988 in	5.571 in	0.333 in	5.581 in	--- in

Comments

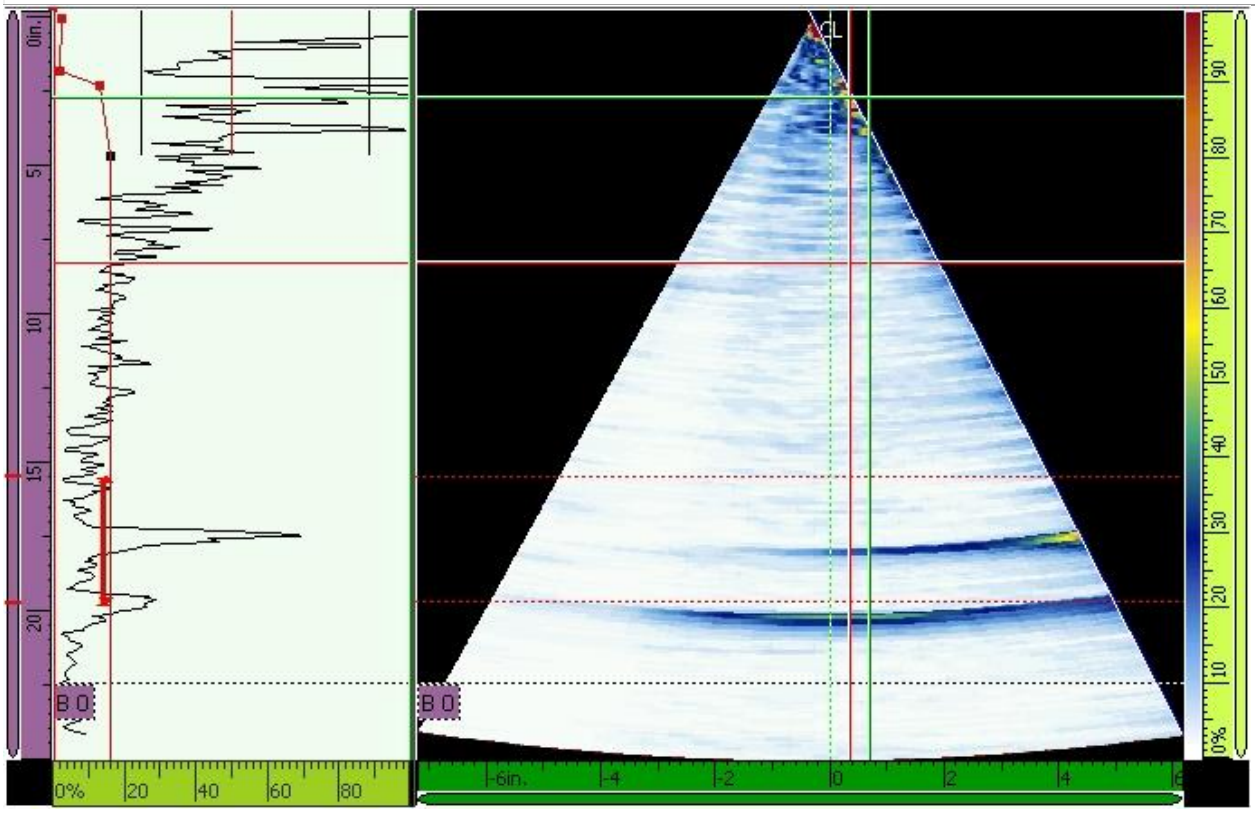
Indication Two is the same indication as indication one but viewed from a different focal law. View One is viewed at 14 degrees while View Two is viewed at 15 degree. This indication is located from the 1 o'clock to 5 o'clock positions and the amplitude is above the SSL but below the ARL.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.000 in	0.000 in	PA 1	15.00º	69.5 %	17.486 in	4.374 in	18.103 in	5.571 in	0.333 in	5.581 in	--- in

Comments

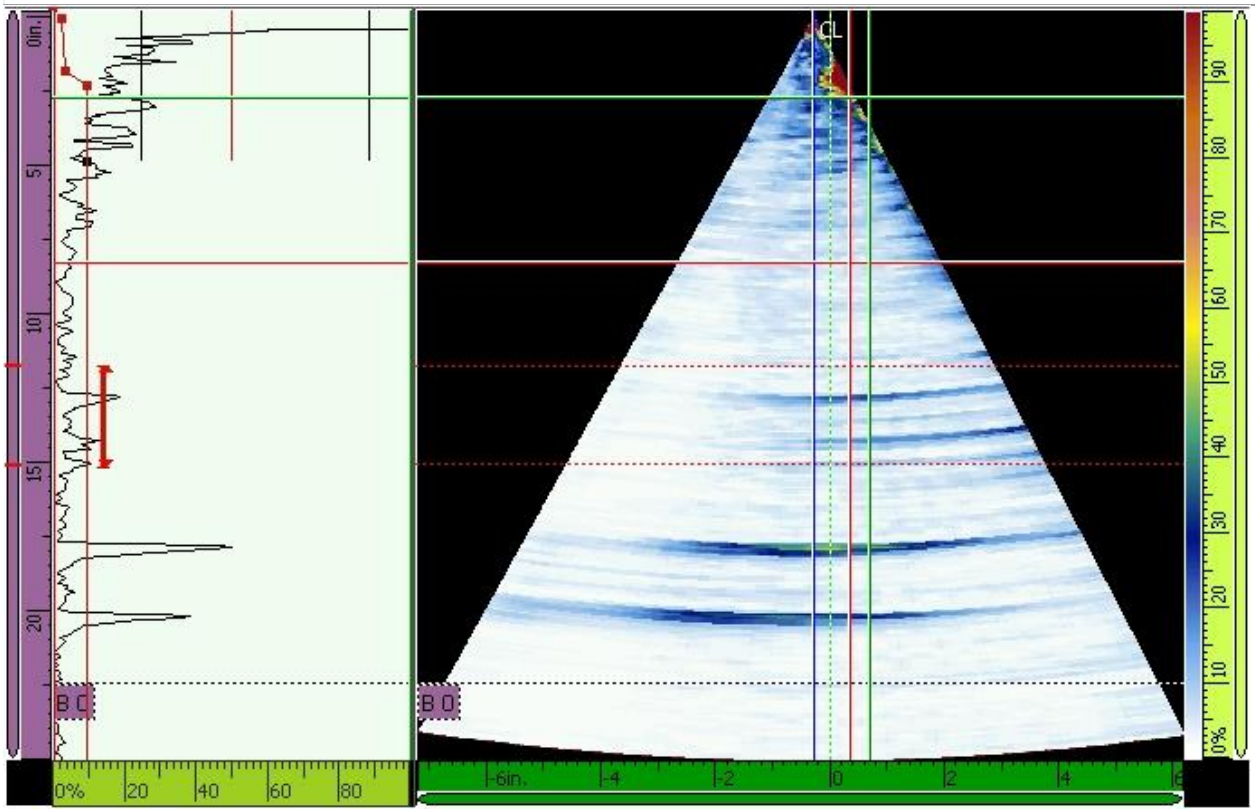
Indication Three is reference to show a clear backwall reflection.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	4	0.000 in	0.000 in	PA 1	0.00º	19.6 %	12.839 in	-0.311 in	12.839 in	5.571 in	0.333 in	5.581 in	--- in

Comments

Indication four is below the DRL line and viewed compliant. The indication is a discontinuity internally in the pin at the 9 o'clock position.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB

Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/11/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 09	MXU - 4.4R4	A24_probe_6-09-2020.ops	2020 / 06 / 09	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower C Lower NW Face A	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.218 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	12.232 in	2.344 in	25.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	0.232 in./µs

Start Angle	Stop Angle	Angle Resolution	Focus Depth	Law Configuration	Beam Skew
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in

Synchro.	Max. scan speed
Encoder	2.365 in/s

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan 1		Quadrature	304.801 step/in	Normal

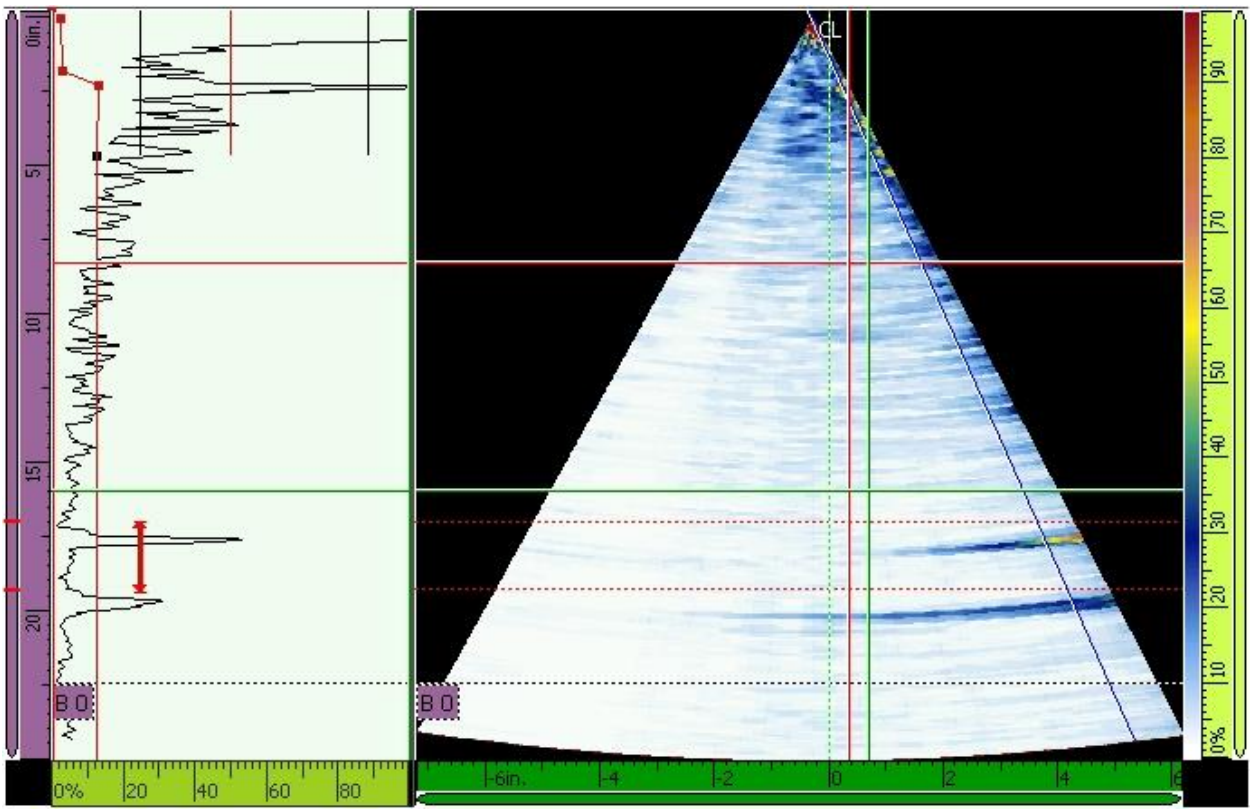
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	13.00º	53.8	17.662	3.766	18.127	7.744	0.333	7.751	---
	2	0.000	0.000	PA 1	14.00º	28.4	13.149	2.967	13.552	7.744	0.333	7.751	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	13.00º	53.8 %	17.662 in	3.766 in	18.127 in	7.744 in	0.333 in	7.751 in	--- in

Comments

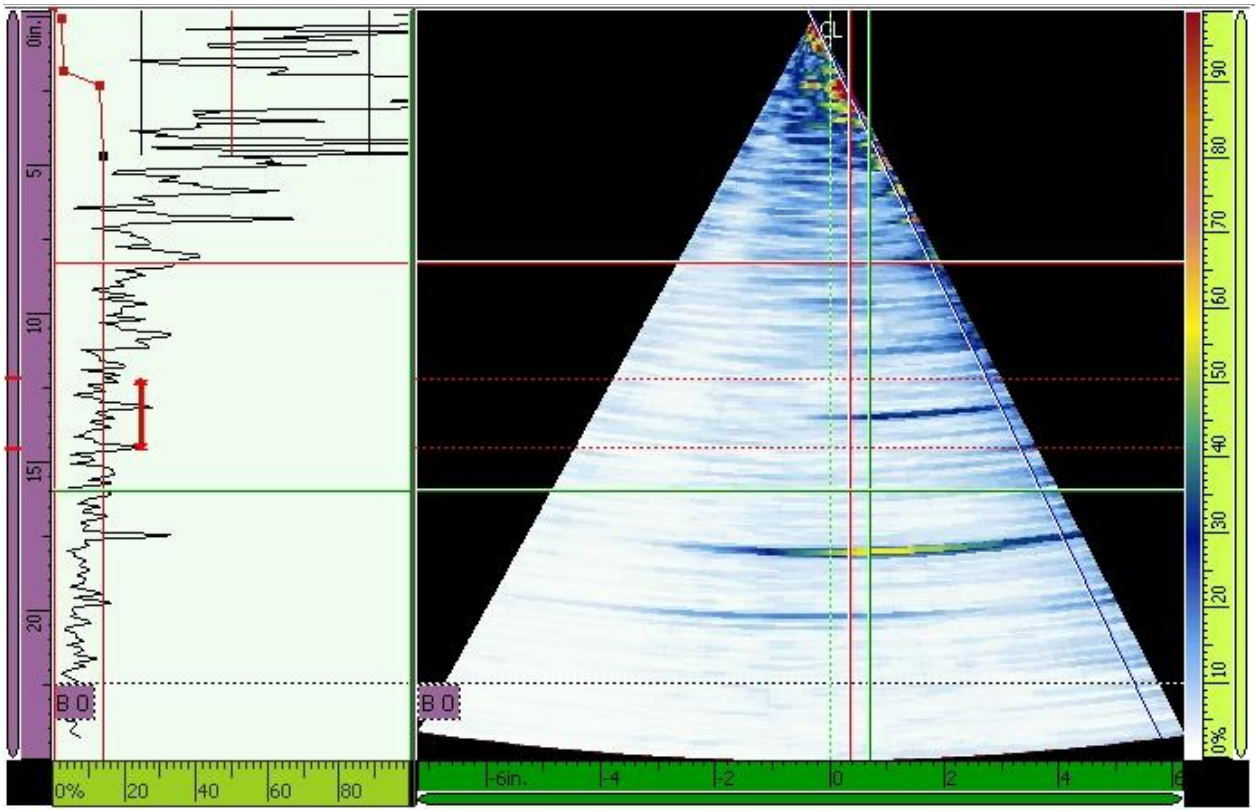
Indication One is a reference file to show a clear backwall with no discontinuities present.


0in.
5
10
15
20
B 0
0%
20
40
60
80
CL
B 0
-6in.
-4
-2
0
2
4
90
80
70
60
50
40
30
20
10
0%

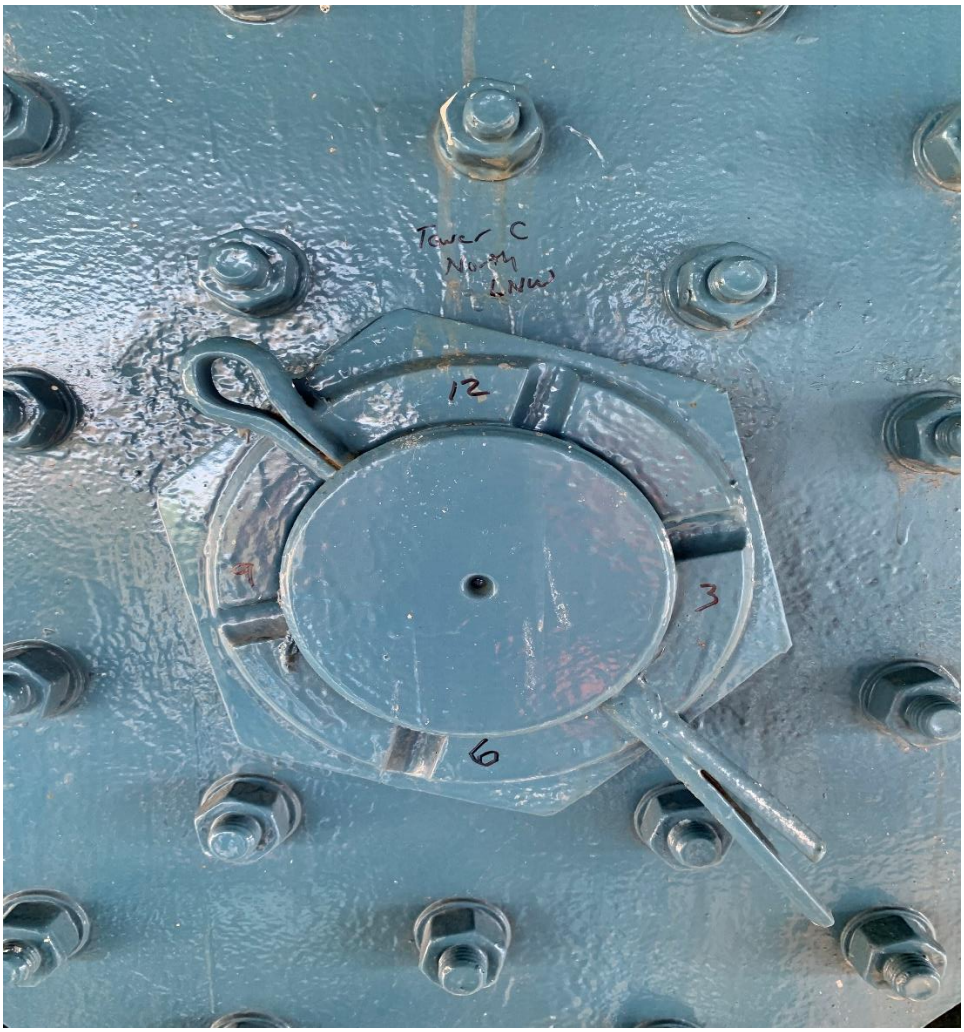
Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	14.00º	28.4 %	13.149 in	2.967 in	13.552 in	7.744 in	0.333 in	7.751 in	--- in

Comments

Indication Two is a compliant indication with a screen height above the DRL but below the SSL. The indication shows wear of the pin barrel face at the 9 o'clock position.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB



Technician Name	Mr. Shawn Barrett ASNT Level III 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/11/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 11	MXU - 4.4R4	A24_probe_6-09-2020.ops	2020 / 06 / 11	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower C North Upper Northeast Face A	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.218 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	14.382 in	1.193 in	15.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	0.232 in./µs

Start Angle	Stop Angle	Angle Resolution	Focus Depth	Law Configuration	Beam Skew
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in

Synchro.	Max. scan speed
Encoder	2.365 in/s

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan 1		Quadrature	304.801 step/in	Normal

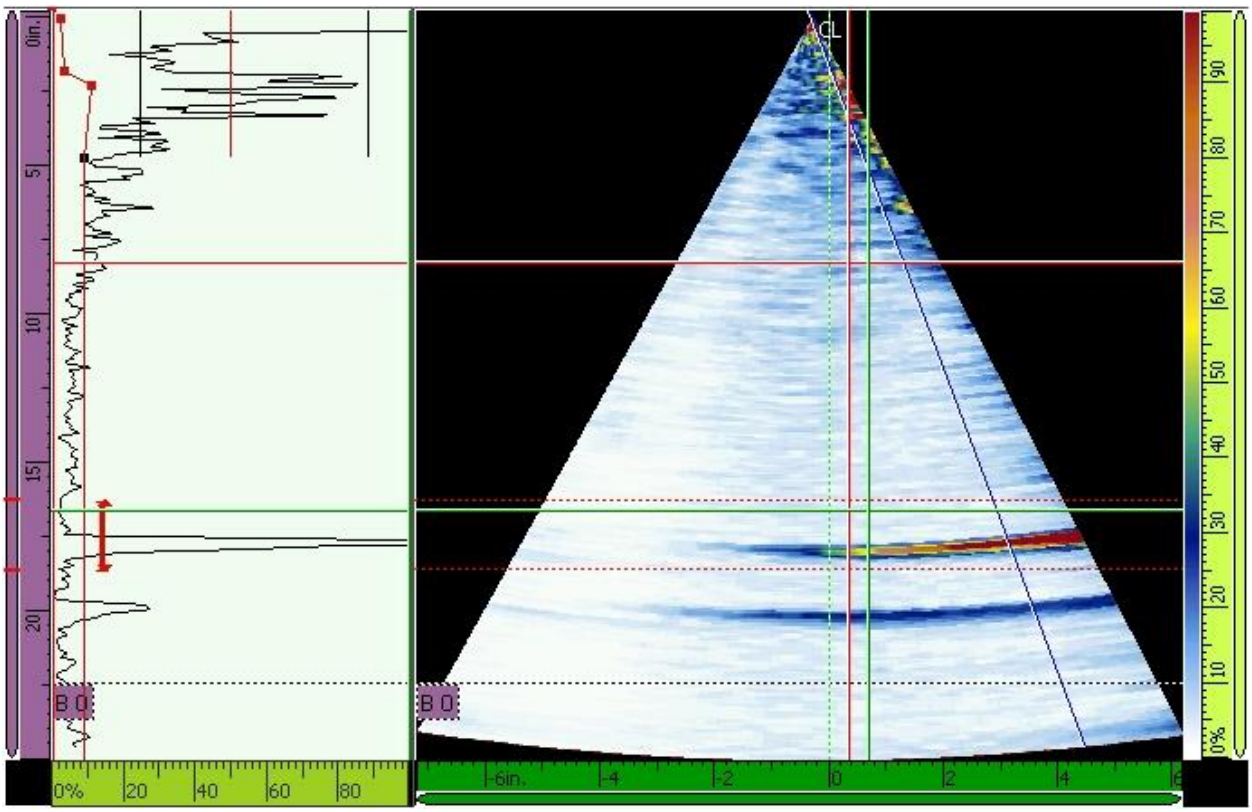
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	11.00º	118.4	17.696	3.128	18.027	8.429	0.333	8.435	---
	2	0.000	0.000	PA 1	14.00º	26.4	12.461	2.795	12.842	8.429	0.333	8.435	---
	3	0.000	0.000	PA 1	14.00º	28.4	14.844	3.390	15.299	8.429	0.333	8.435	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	11.00º	118.4 %	17.696 in	3.128 in	18.027 in	8.429 in	0.333 in	8.435 in	--- in

Comments

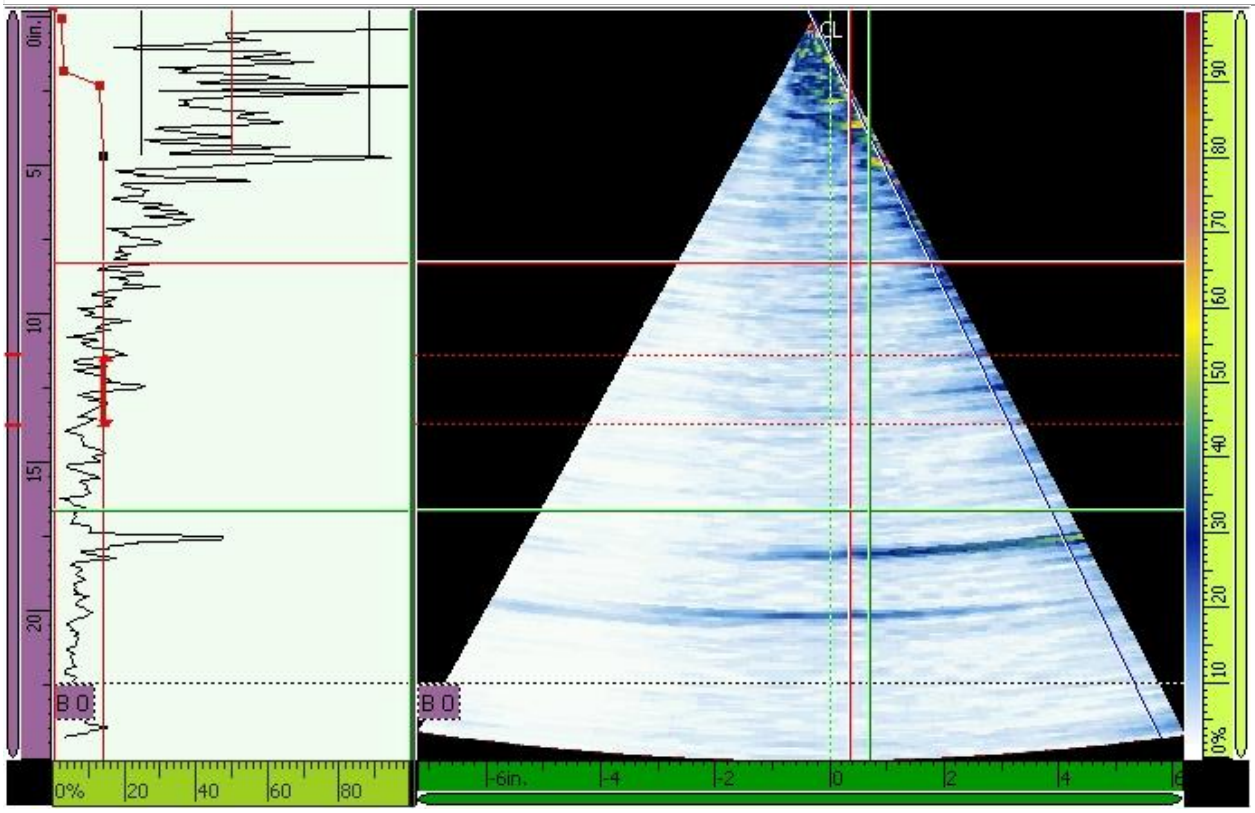
Screen One is to show a presentation without any discontinuity indications. The presentation shows a response from the backwall.


0in.
5
10
15
20
B 0
0%
20
40
60
80
CL
B 0
-6in.
-4
-2
0
2
4
90
80
70
60
50
40
30
20
10
0%

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	14.00º	26.4 %	12.461 in	2.795 in	12.842 in	8.429 in	0.333 in	8.435 in	--- in

Comments

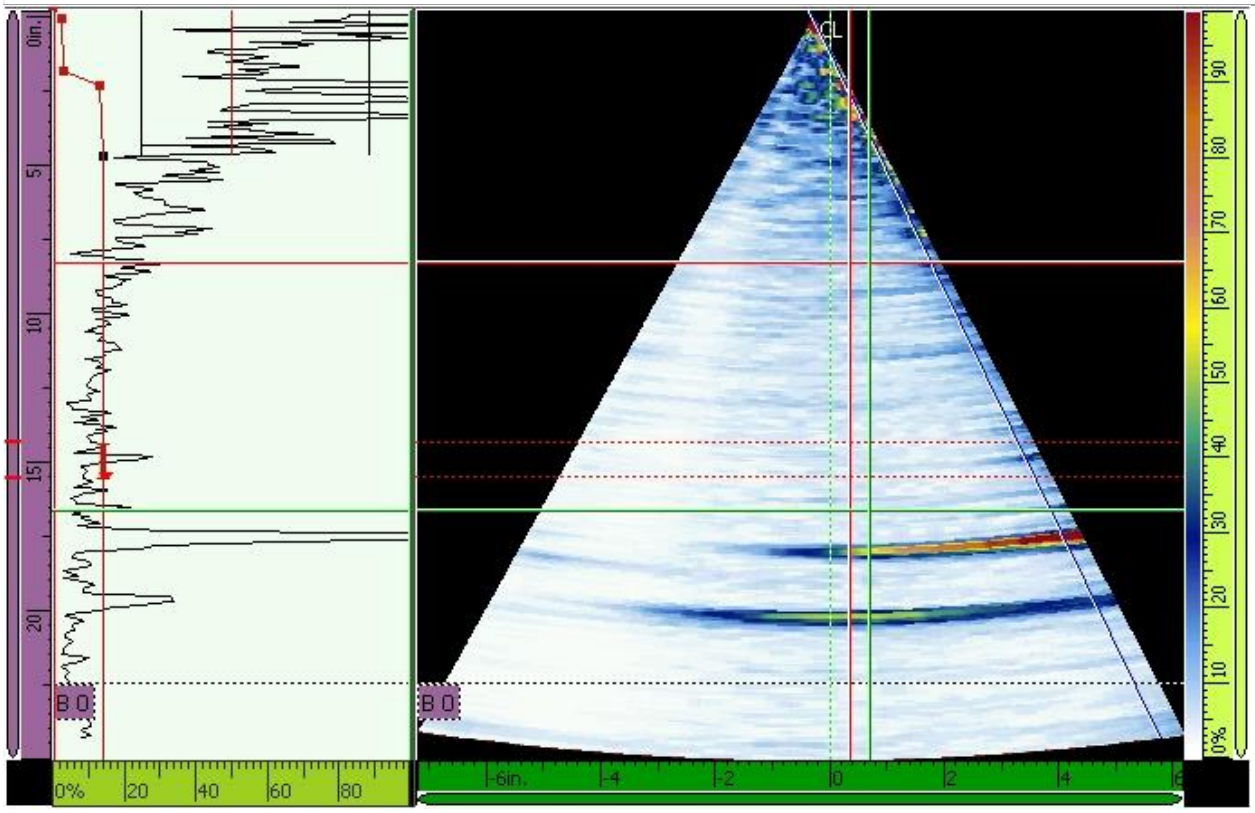
Indication two exceeds the DRL but is below the SSL. The indication is located at the 9 o’clock position.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.000 in	0.000 in	PA 1	14.00º	28.4 %	14.844 in	3.390 in	15.299 in	8.429 in	0.333 in	8.435 in	--- in

Comments

The indication exceeds the DRL but is below the SSL. The indication is located at the 6 o'clock position.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB

Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/11/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 09	MXU - 4.4R4	A24_probe_6-09-2020.ops	2020 / 06 / 09	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower C North Upper NW Face A	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.218 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	12.232 in	2.344 in	25.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty.	Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16		1	16	1.0	User-Defined	0.232 in./µs

Start Angle	Stop Angle	Angle Resolution	Focus Depth	Law Configuration	Beam Skew
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in

Synchro.	Max. scan speed
Encoder	2.365 in/s

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan 1		Quadrature	304.801 step/in	Normal

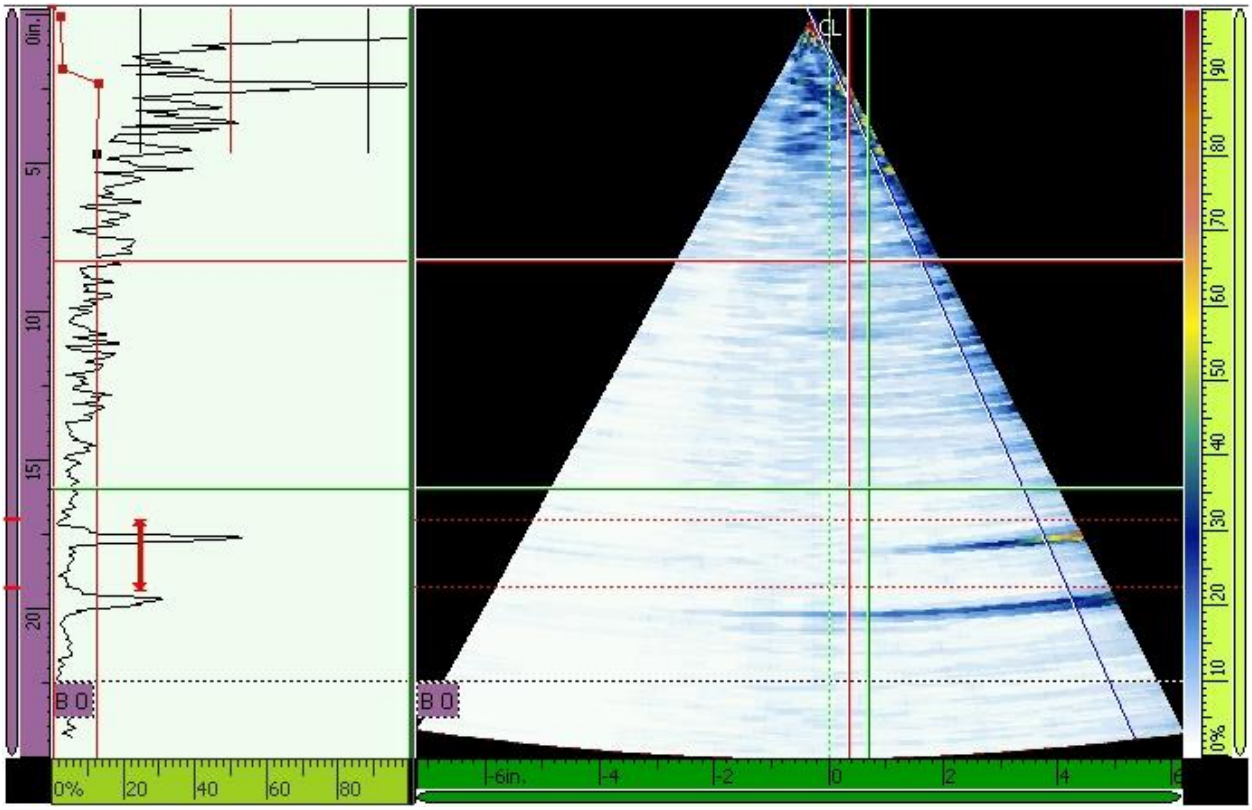
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	13.00º	53.8	17.662	3.766	18.127	7.744	0.333	7.751	---
	2	0.000	0.000	PA 1	14.00º	28.4	13.149	2.967	13.552	7.744	0.333	7.751	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	13.00º	53.8 %	17.662 in	3.766 in	18.127 in	7.744 in	0.333 in	7.751 in	--- in

Comments

Indication One is to show a screen with no indications. Indication One view is deemed compliant.



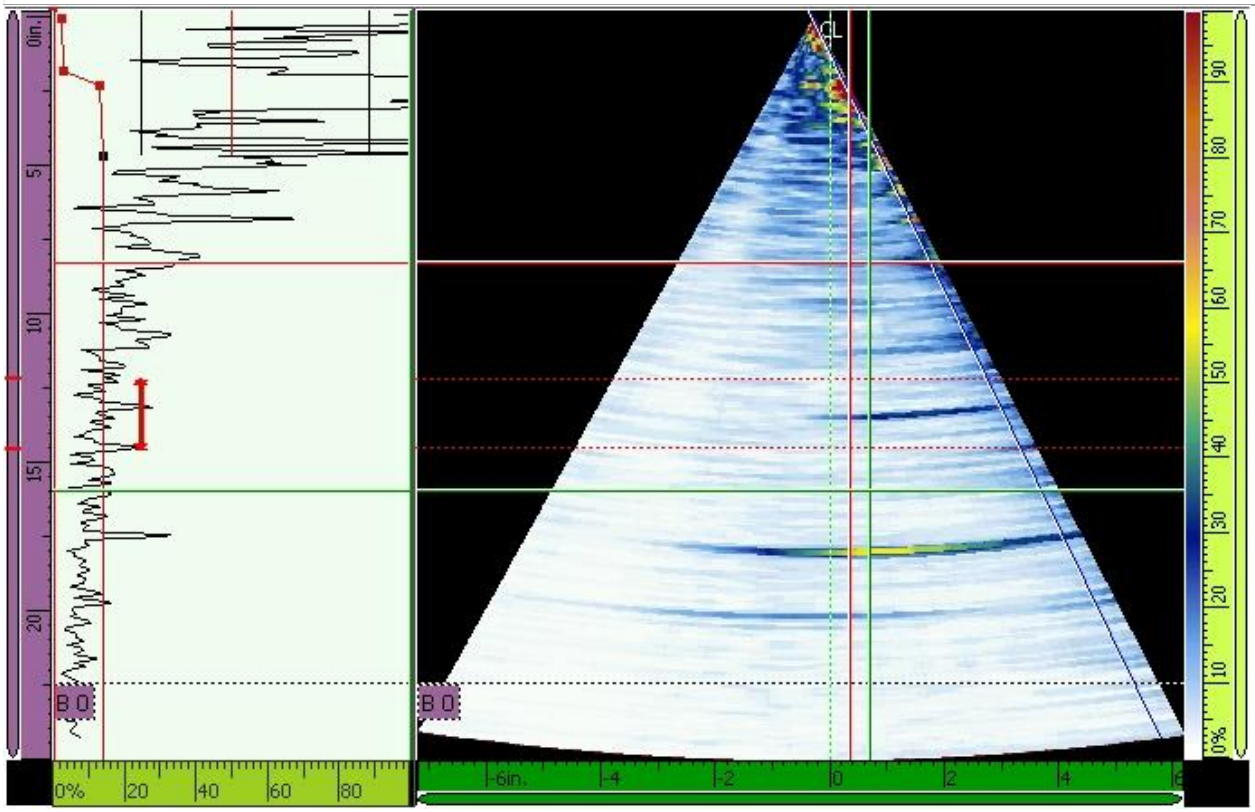
Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	14.00º	28.4 %	13.149 in	2.967 in	13.552 in	7.744 in	0.333 in	7.751 in	--- in

Comments

Indication 2 is in excess of the SSL for the 15 degree position along the barrel wall. Indication was located with a depth of 13.149 inches and is located from the 3 o'clock position down to 4 o'clock position. This indication measured to a depth which physically corresponded with the backside of the hanger assembly in a known wear area. It should be noted that the cotter pin is located across the face of the pin from 2 o'clock to 8 o'clock positions.


Tower C
12
NUNW

PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB



Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473, SNT-TC-1a PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/09/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 09	MXU - 4.4R4	A24_probe_6-09-2020.ops	2020 / 06 / 09	MXU - 4.4R4	Inspection Data

OmniScan Type	OmniScan Serial #	Module Type	Module Serial #	Data File Name
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower C South Lower Southeast Face B

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.225 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	16.332 in	2.344 in	15.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty.	Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16		1	16	1.0	User-Defined	0.232 in./µs

Start Angle	Stop Angle	Angle Resolution	Focus Depth	Law Configuration	Beam Skew
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in

Synchro.	Max. scan speed
Encoder	2.365 in/s

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan 1		Quadrature	304.801 step/in	Normal

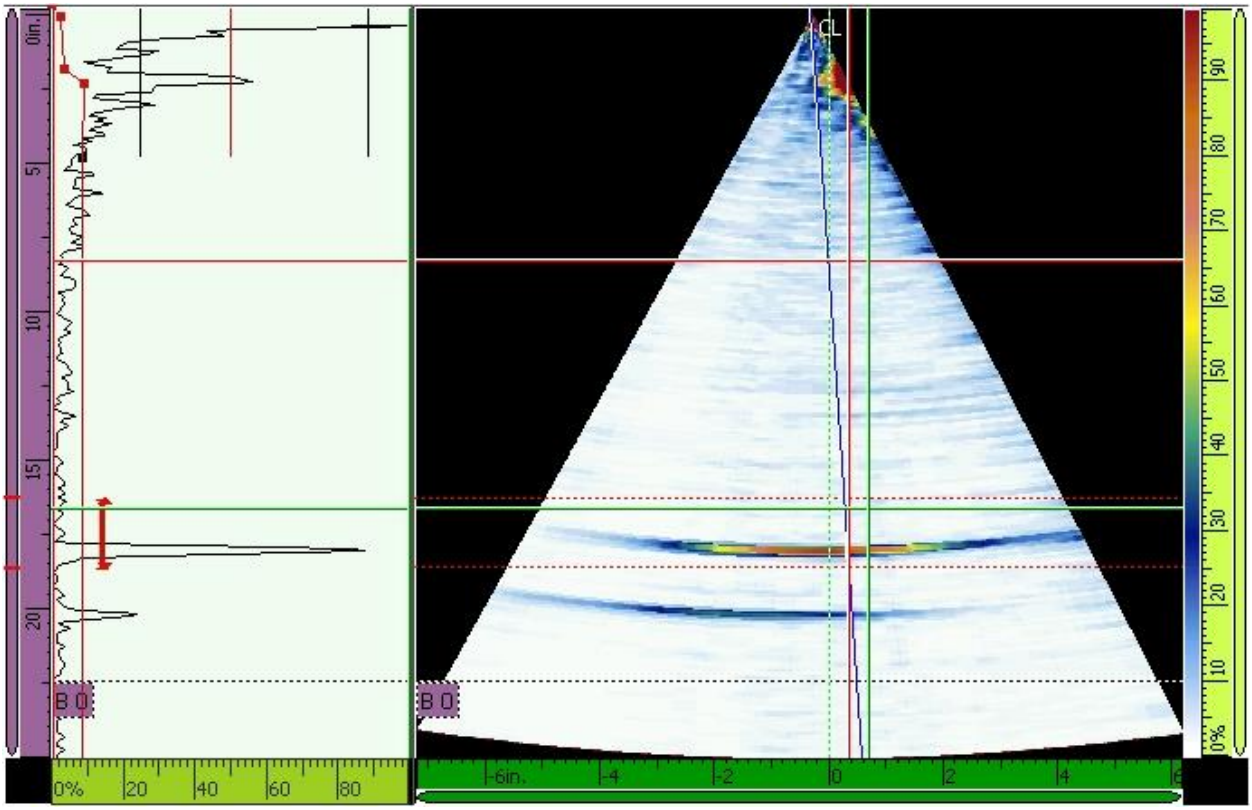
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	2.00º	88.1	18.042	0.319	18.053	8.429	0.333	8.435	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	2.00º	88.1 %	18.042 in	0.319 in	18.053 in	8.429 in	0.333 in	8.435 in	--- in

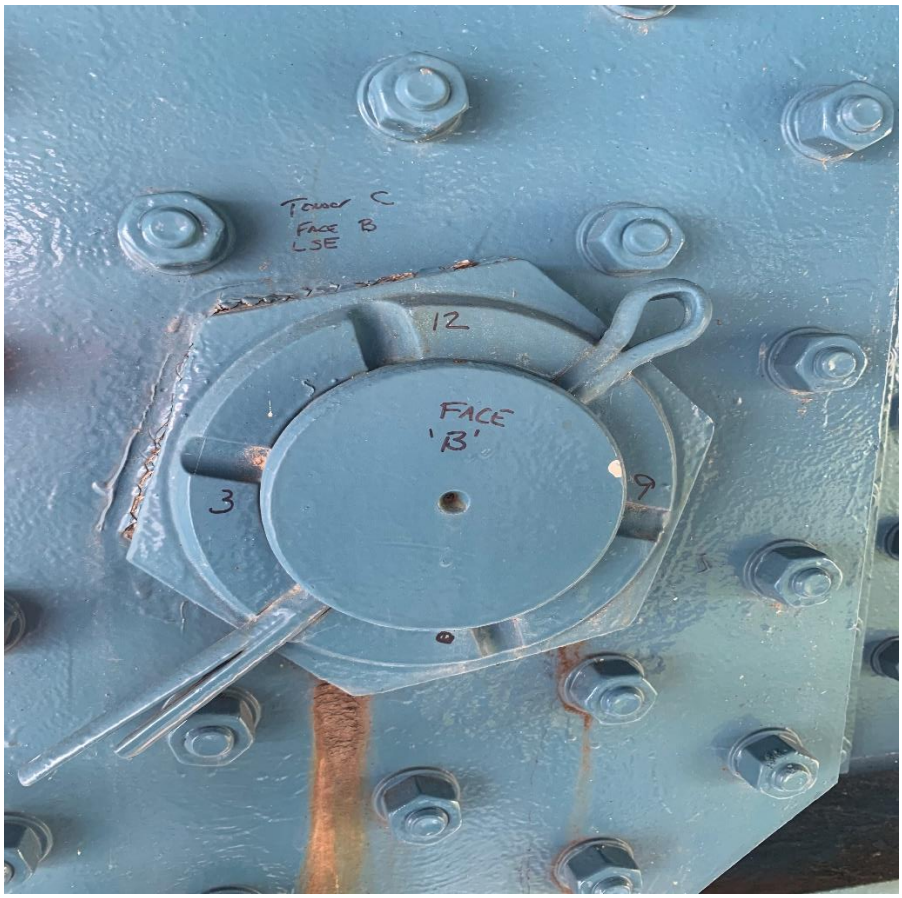
Comments

Indication One is for reference only to illustrate a clear backwall indication. No Relevant Indications found during this inspection. This location deemed compliant.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB

Picture supplied to illustrate the rolling or movement of the connection. The cracks in the coating system show that this pin location has moved since the coating operation took place. Also note the rust bleed out from the bottom of the connection.



Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	
Contractor	HRV, Inc.
Date	6/09/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 09	MXU - 4.4R4	A24_probe_6-09-2020.ops	2020 / 06 / 09	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower C South Lower Southwest Face B	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.218 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	11.683 in	2.344 in	32.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty.	Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	0.232 in./µs	

Start Angle	Stop Angle	Angle Resolution	Focus Depth	Law Configuration	Beam Skew
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in

Synchro.	Max. scan speed
Encoder	2.365 in/s

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan 1		Quadrature	304.801 step/in	Normal

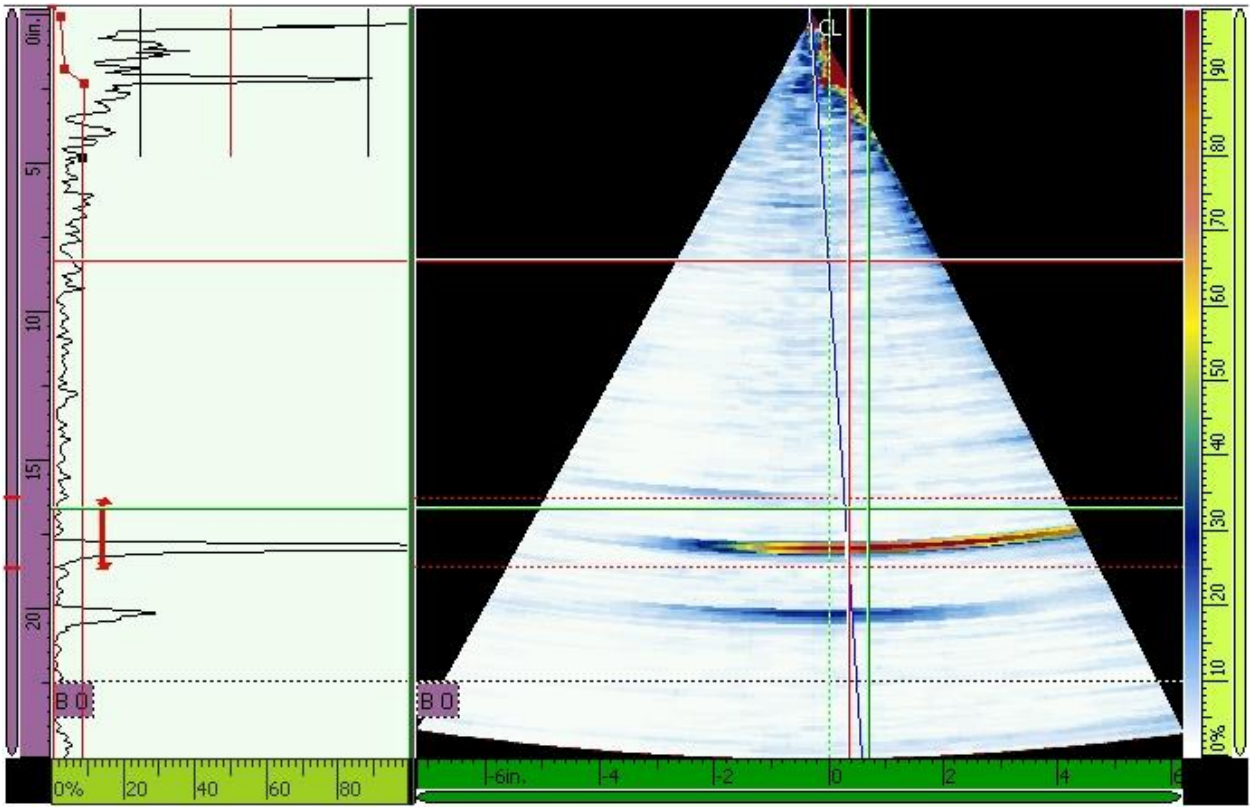
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	2.00º	127.2	17.952	0.315	17.963	8.429	0.333	8.435	---
	2	0.000	0.000	PA 1	14.00º	66.5	12.600	2.830	12.986	8.429	0.333	8.435	---
	3	0.000	0.000	PA 1	14.00º	86.1	12.617	2.834	13.004	8.429	0.333	8.435	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	2.00º	127.2 %	17.952 in	0.315 in	17.963 in	8.429 in	0.333 in	8.435 in	--- in

Comments

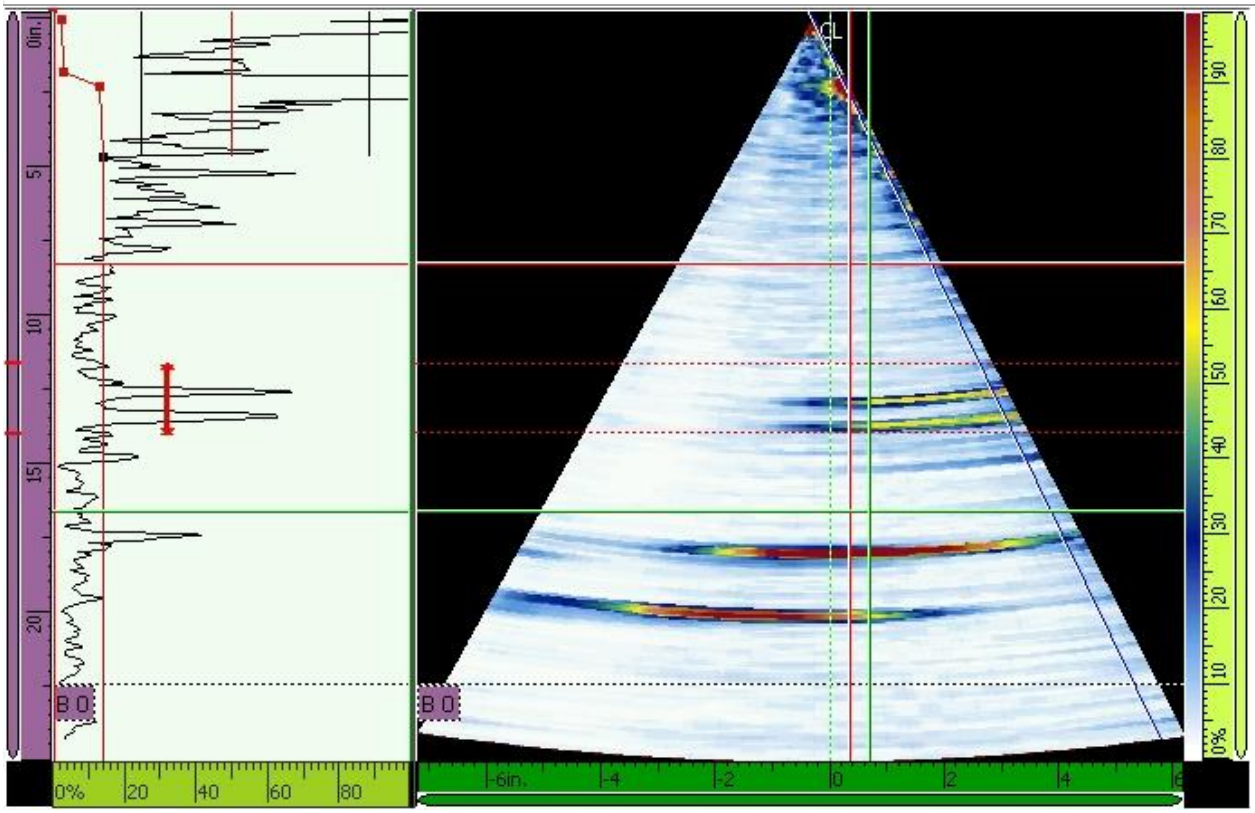
Indication One is showing backwall reflection.


0in.
5
10
15
20
BO
BO
0%
20
40
60
80
CL
-6in.
-4
-2
0
2
4
90
80
70
60
50
40
30
20
10
0%

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	14.00º	66.5 %	12.600 in	2.830 in	12.986 in	8.429 in	0.333 in	8.435 in	--- in

Comments

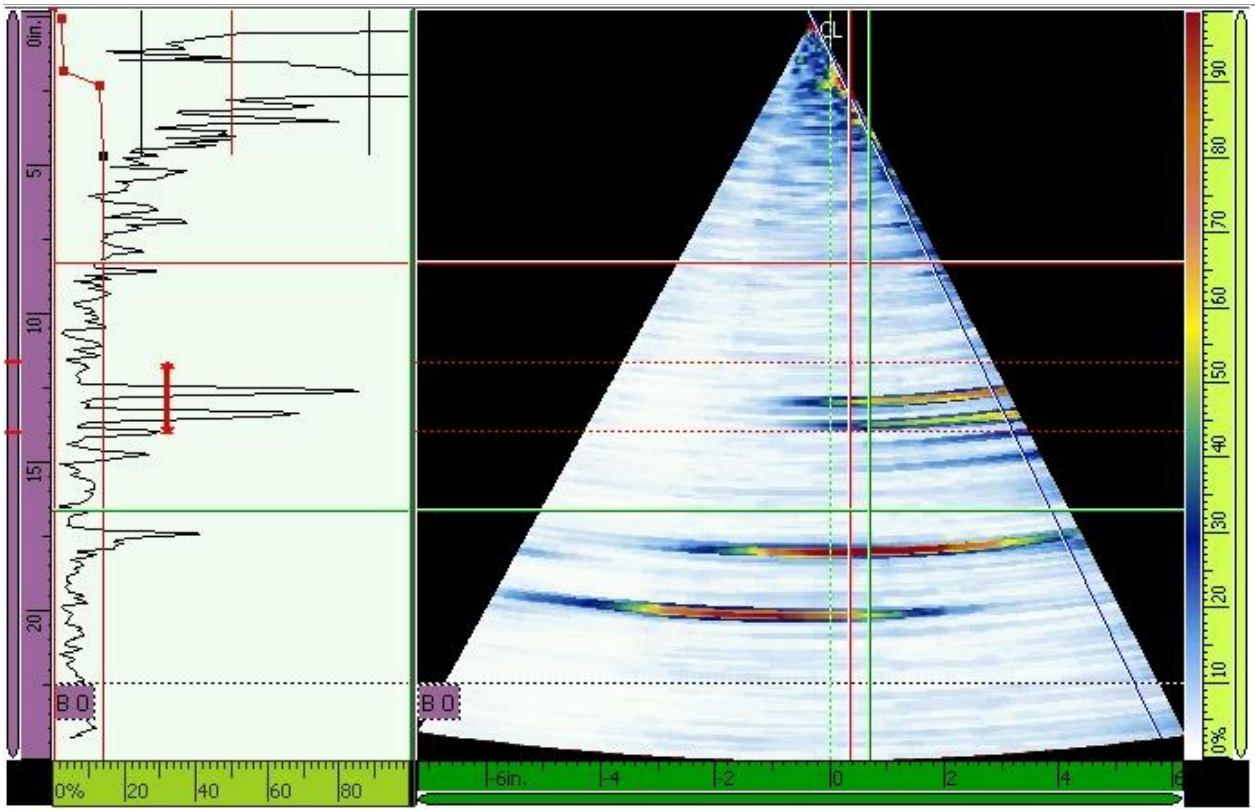
Indication Two is showing wear along the barrel face of the pin. This indication is the same indication as indication three, this view was the initial screenshot of the discontinuity. Please see the comments on Indication Three.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.000 in	0.000 in	PA 1	14.00º	86.1 %	12.617 in	2.834 in	13.004 in	8.429 in	0.333 in	8.435 in	--- in

Comments

Indication Three is located at the 7 o'clock to 9 o'clock position and is nearing the ARL. The indication is showing wear along the barrel face of the pin.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB

Technician Name	Mr. Shawn Barrett ASNT Level III UT PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/09/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 11	MXU - 4.4R4	A24_probe_6-09-2020.ops	2020 / 06 / 11	MXU - 4.4R4	Inspection Data

OmniScan Type	OmniScan Serial #	Module Type	Module Serial #	Data File Name
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower C South Upper Southwest Face B

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.217 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	14.683 in	2.344 in	15.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty.	Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16		1	16	1.0	User-Defined	0.232 in./µs

Start Angle	Stop Angle	Angle Resolution	Focus Depth	Law Configuration	Beam Skew
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in

Synchro.	Max. scan speed
Encoder	2.365 in/s

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan 1		Quadrature	304.801 step/in	Normal

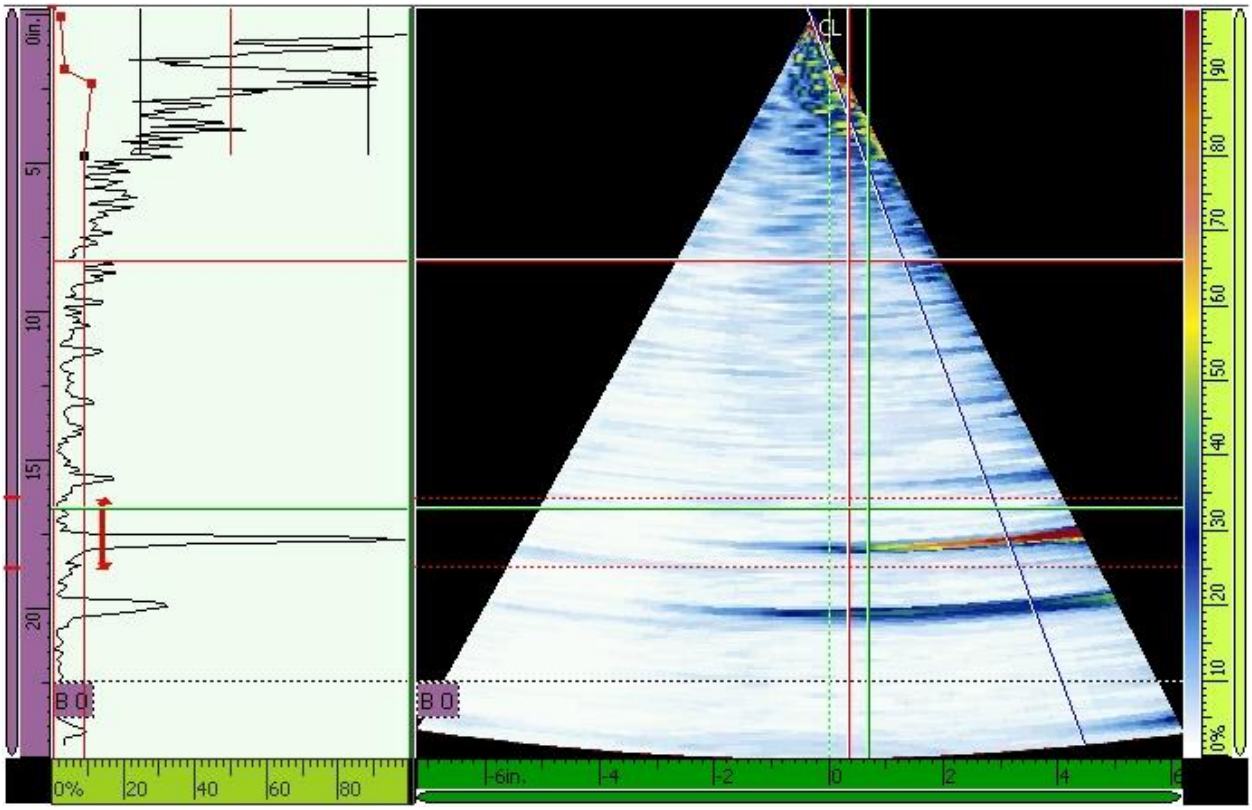
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	11.00º	98.8	17.661	3.121	17.991	8.429	0.333	8.435	---
	2	0.000	0.000	PA 1	15.00º	27.4	15.587	3.865	16.136	8.429	0.333	8.435	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	11.00º	98.8 %	17.661 in	3.121 in	17.991 in	8.429 in	0.333 in	8.435 in	--- in

Comments

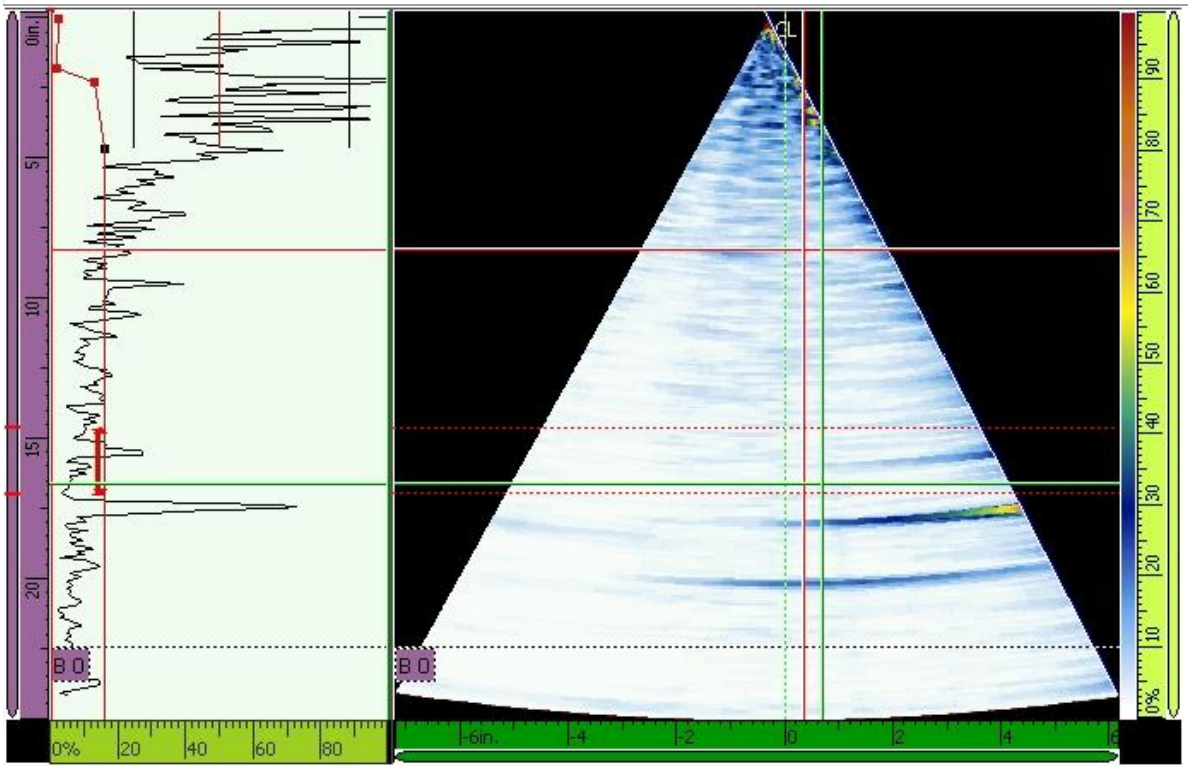
Indication One represents the backwall response from the pin and is showing the backwall along with the rear shoulder of the pin.


0in.
5
10
15
20
B 0
0%
20
40
60
80
CL
B 0
-6in.
-4
-2
0
2
4
90
80
70
60
50
40
30
20
10
0%

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	15.00º	27.4 %	15.587 in	3.865 in	16.136 in	8.429 in	0.333 in	8.435 in	--- in

Comments

Indication Two represents a linear indication showing wear at approximately the 6 o'clock to 9 o'clock position. The reference level is just breaking the DRL but not exceeding the SSL. Indication is noted for reference and future evaluation.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB

Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	
Contractor	HRV, Inc.
Date	6/11/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 12	OmniPC - 4.4R5	Tower D North LNE Face A.opd	2020 / 06 / 12	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower D North LNE Face A	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-5.52 mm	635.38 mm	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	5903.3 m/s	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.00 mm	0.00 mm	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	303.14 mm	101.43 mm	40.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	5903.3 m/s
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Law Configuration**	**Beam Skew**
-16.00º	15.00º	1.00º	1000.00 mm	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	571.50 mm

Scan Area

Scan Start	Scan Length	Scan Resolution
0.00 mm	203.20 mm	1.00 mm
Synchro.	**Max. scan speed**	
Encoder	60.06 mm/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	12.00 step/mm	Normal

Table

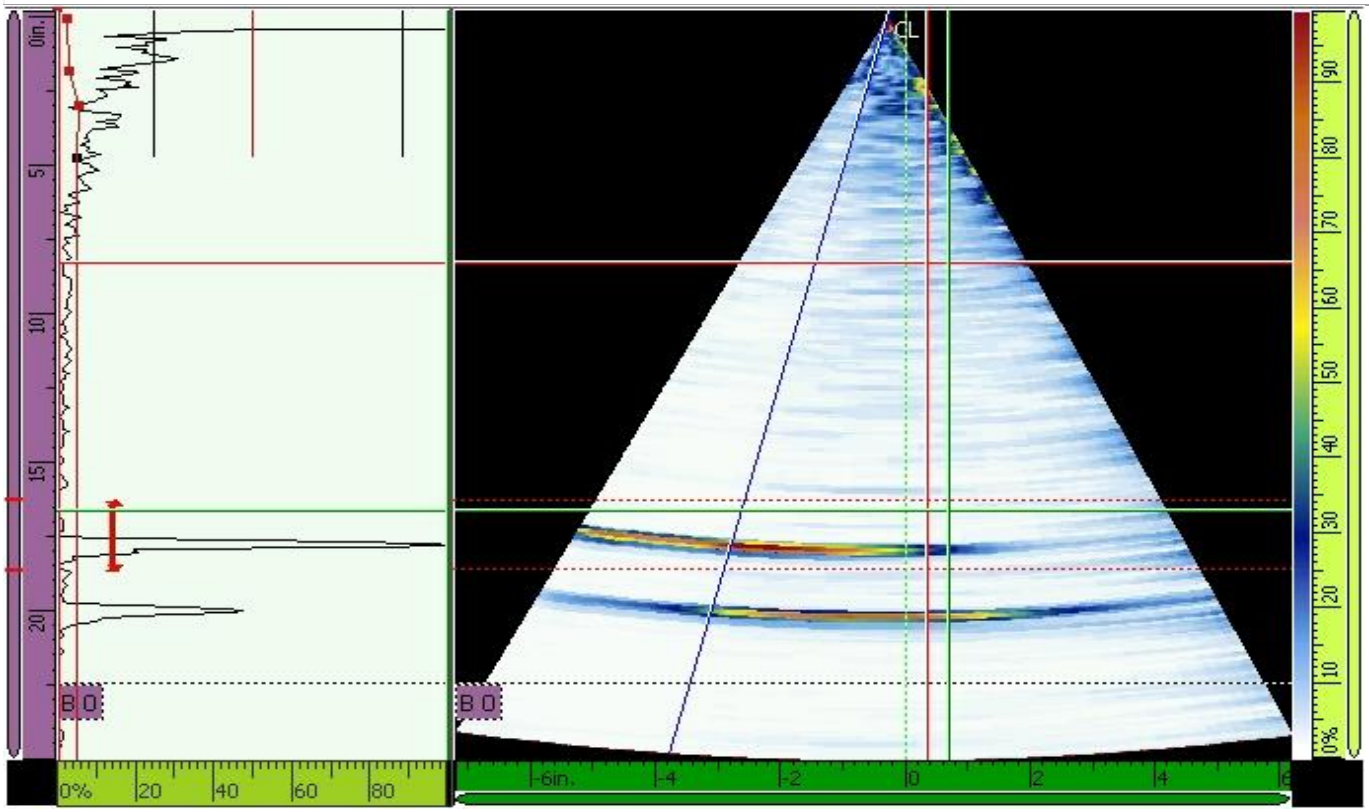
Ref.	Indication #	Scan (mm)	Index (mm)	Group	Channel	A% (%)	DA^ (mm)	PA^ (mm)	SA^ (mm)	U(m-r) (mm)	I(m-r) (mm)	I•U(m-r) (mm)	S(m-r) (mm)
-	1	0.00	0.00	PA 1	8.00º	101.8	452.15	-71.46	456.59	214.09	8.47	214.26	---
	2	0.00	0.00	PA 1	15.00º	109.6	388.57	96.21	402.28	214.09	8.47	214.26	---
	3	0.00	0.00	PA 1	15.00º	118.4	317.87	77.26	329.08	214.09	8.47	214.26	---

	4	0.00	0.00	PA 1	15.00º	250.0	351.80	86.35	364.21	214.09	8.47	214.26	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.00 mm	0.00 mm	PA 1	8.00º	101.8 %	452.15 mm	-71.46 mm	456.59 mm	214.09 mm	8.47 mm	214.26 mm	--- mm

Comments

Indication one is showing a screen with no indications and responses from the backwall of the pin.

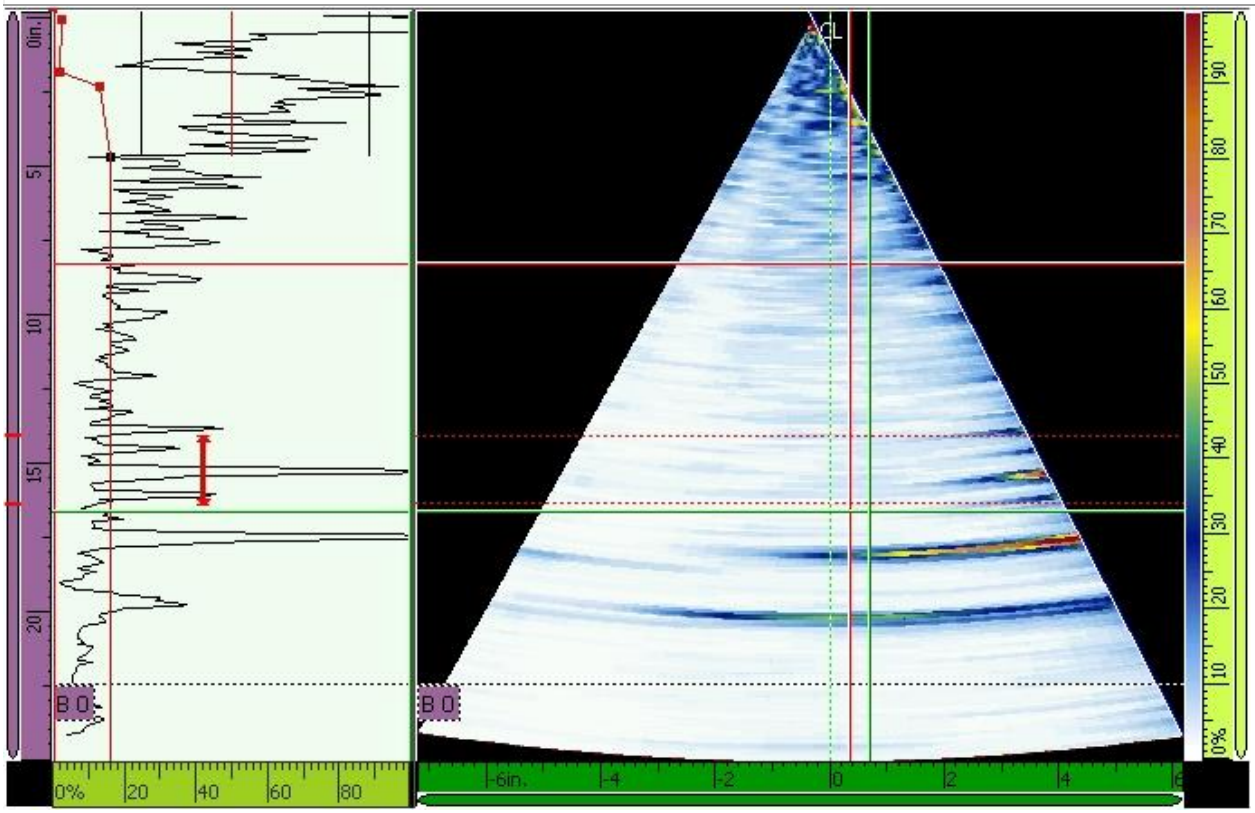


Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)

-	2	0.00 mm	0.00 mm	PA 1	15.00º	109.6 %	388.57 mm	96.21 mm	402.28 mm	214.09 mm	8.47 mm	214.26 mm	--- mm

Comments

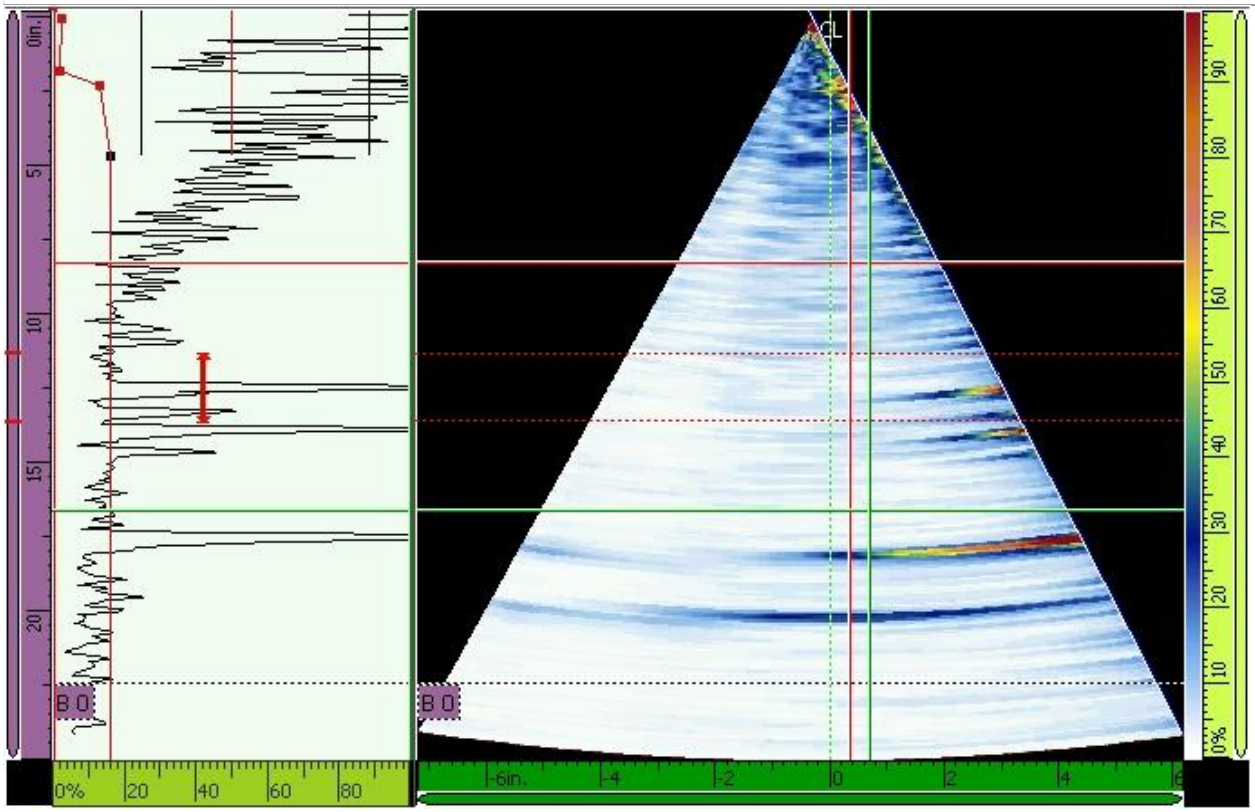
Indication two is located at 11 o'clock to 12 o'clock position, is in excess of ARL and is showing wear along the barrel face of the pin.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.00 mm	0.00 mm	PA 1	15.00º	118.4 %	317.87 mm	77.26 mm	329.08 mm	214.09 mm	8.47 mm	214.26 mm	--- mm

Comments

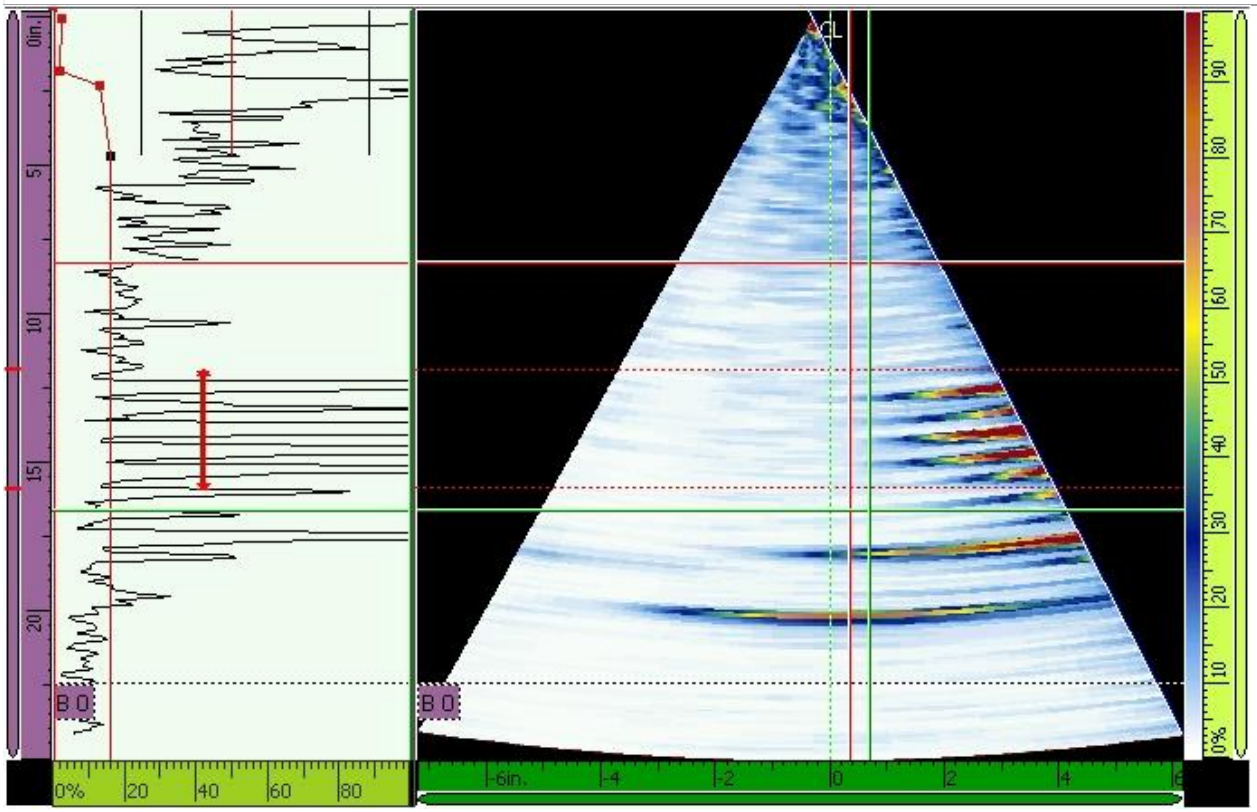
Indication 3 is located at 9 o'clock to 10 o'clock position, is in excess of ARL and is showing wear along the barrel face.



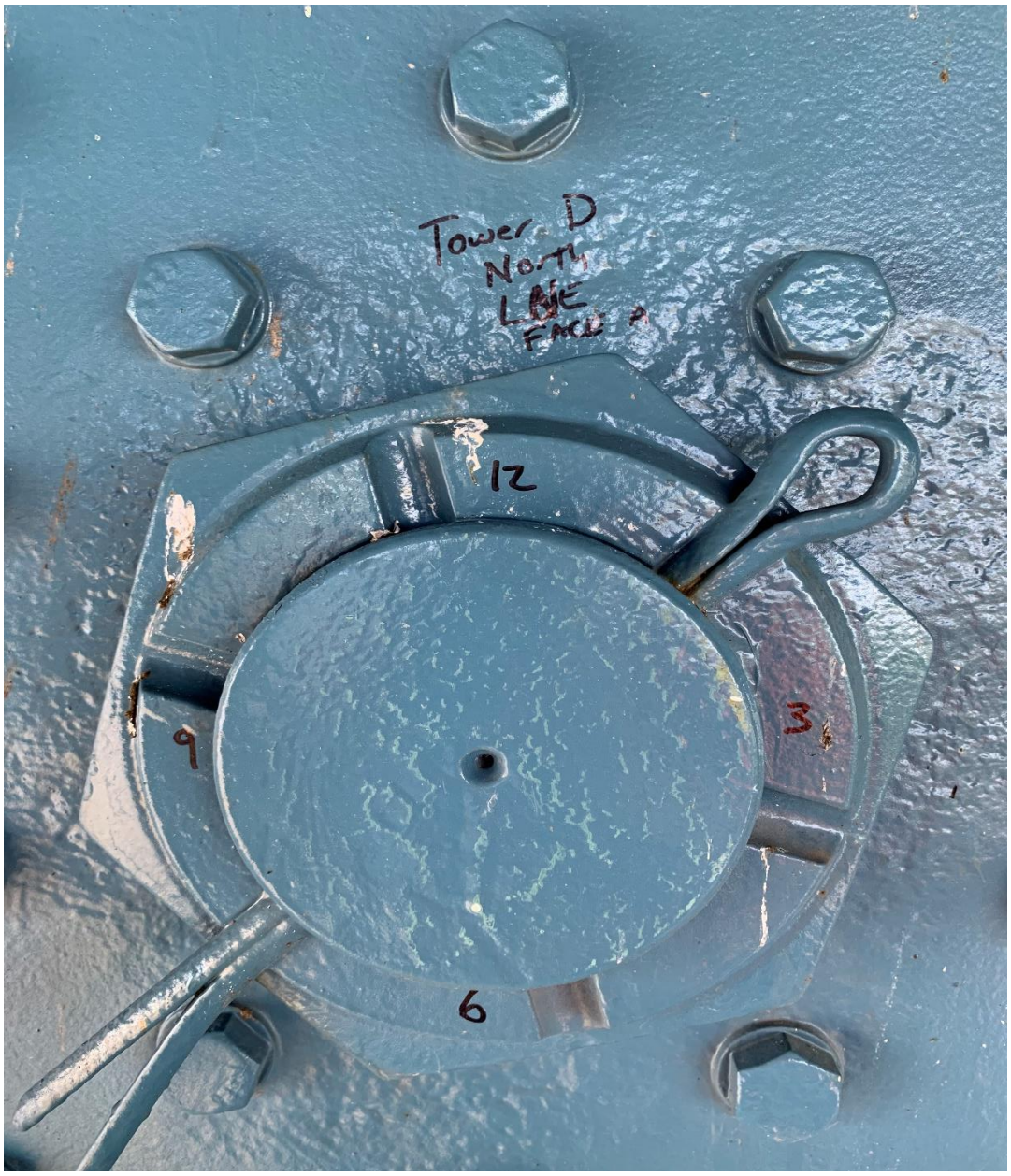
Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	4	0.00 mm	0.00 mm	PA 1	15.00º	250.0 %	351.80 mm	86.35 mm	364.21 mm	214.09 mm	8.47 mm	214.26 mm	--- mm

Comments

Multiple indications of scoring along the barrel wall of the pin shaft. Amplitude in excess of ARL, Indications are located at 3 o'clock to 4 o'clock.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB



Technician Name	Mr. Shawn Barrett ASNT Level III UT PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	_6/12/2020_

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 12	OmniPC - 4.4R5	Tower D North LNW Face A.opd	2020 / 06 / 12	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower D North Lower Northwest Face A	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-5.52 mm	635.38 mm	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	5903.3 m/s	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.00 mm	0.00 mm	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	298.00 mm	59.53 mm	30.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	5903.3 m/s
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Law Configuration**	**Beam Skew**
-16.00º	15.00º	1.00º	1000.00 mm	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	571.50 mm

Scan Area

Scan Start	Scan Length	Scan Resolution
0.00 mm	203.20 mm	1.00 mm
Synchro.	**Max. scan speed**	
Encoder	60.06 mm/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	12.00 step/mm	Normal

Table

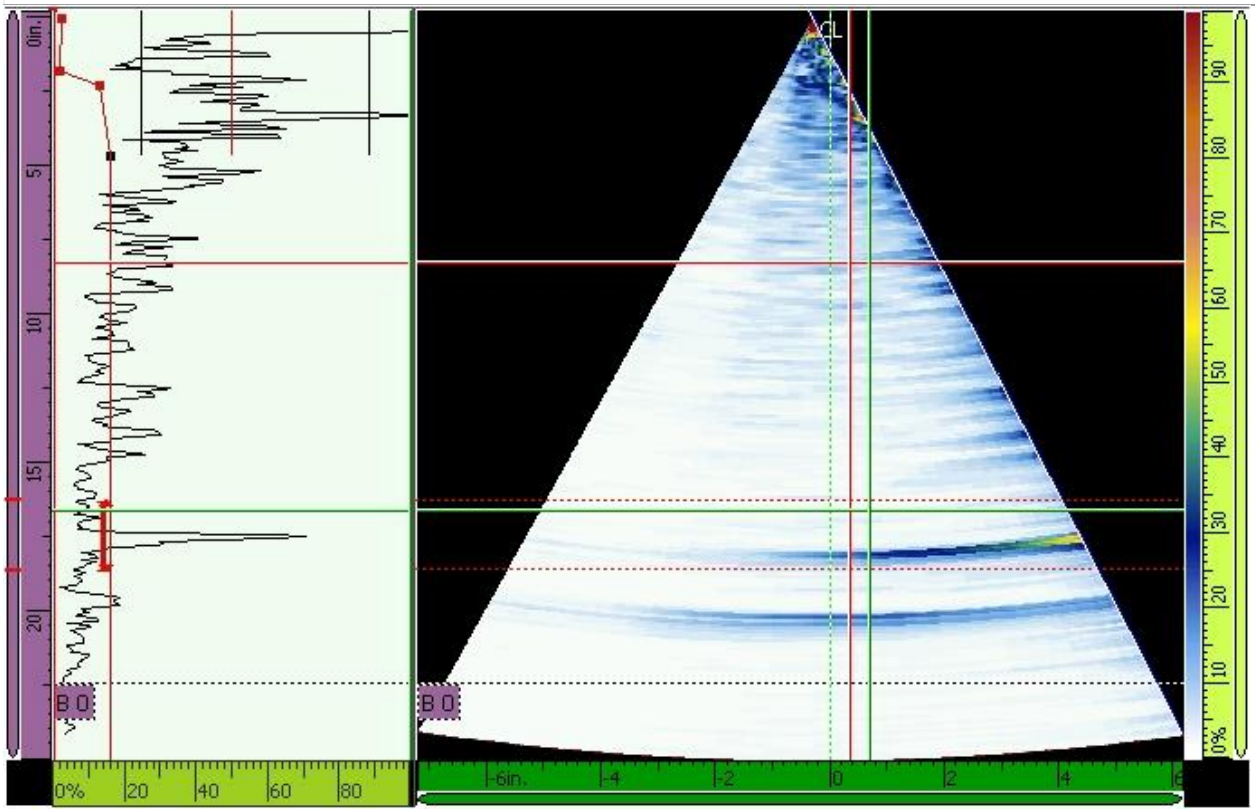
Ref.	Indication #	Scan (mm)	Index (mm)	Group	Channel	A% (%)	DA^ (mm)	PA^ (mm)	SA^ (mm)	U(m-r) (mm)	I(m-r) (mm)	I•U(m-r) (mm)	S(m-r) (mm)
-	1	0.00	0.00	PA 1	15.00º	71.4	445.31	111.41	461.02	214.09	8.47	214.26	---
	2	0.00	0.00	PA 1	15.00º	111.6	316.04	76.77	327.19	379.20	8.47	379.30	---

	3	0.00	0.00	PA 1	15.00°	54.8	315.16	76.54	326.28	379.20	8.47	379.30	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.00 mm	0.00 mm	PA 1	15.00°	71.4 %	445.31 mm	111.41 mm	461.02 mm	214.09 mm	8.47 mm	214.26 mm	--- mm

Comments

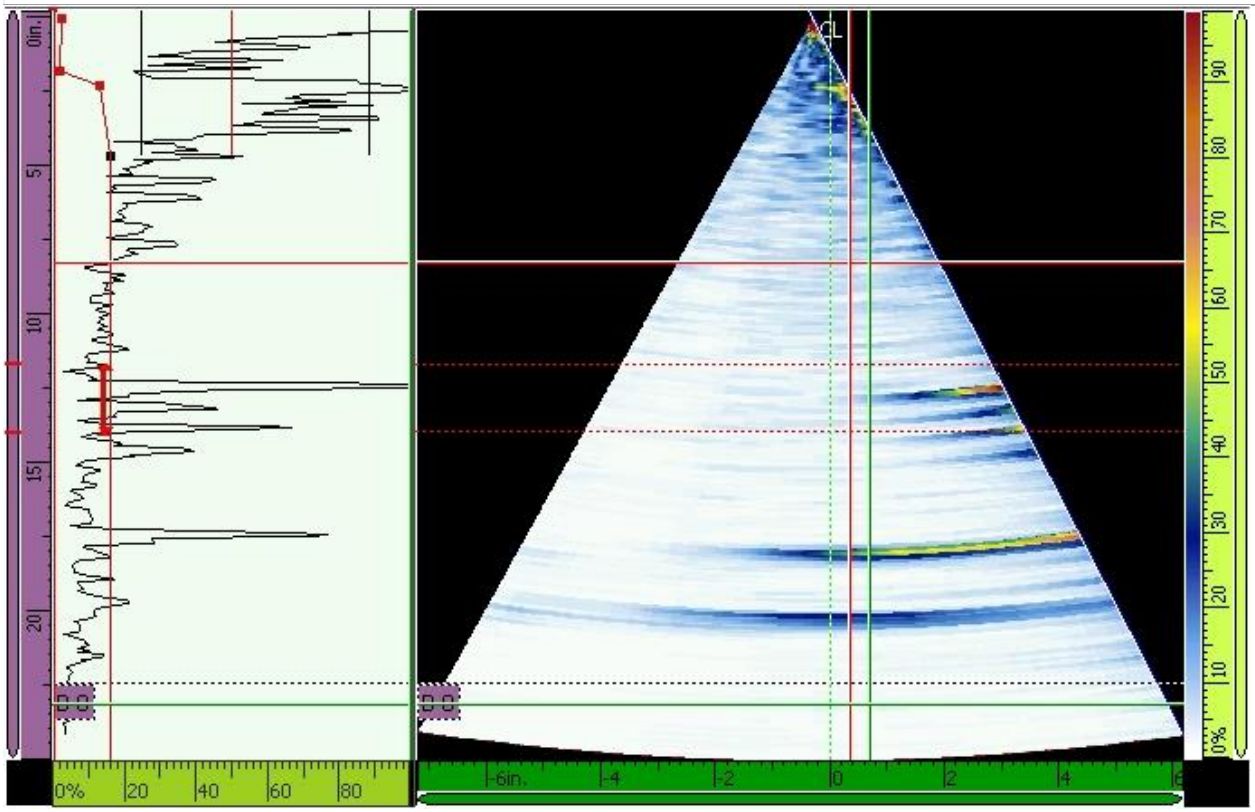
Indication shows a backwall reflection. The 15 degree angle shows discontinuities along the edge of the barrel of the pin that are below the DRL.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.00 mm	0.00 mm	PA 1	15.00°	111.6 %	316.04 mm	76.77 mm	327.19 mm	379.20 mm	8.47 mm	379.30 mm	--- mm

Comments

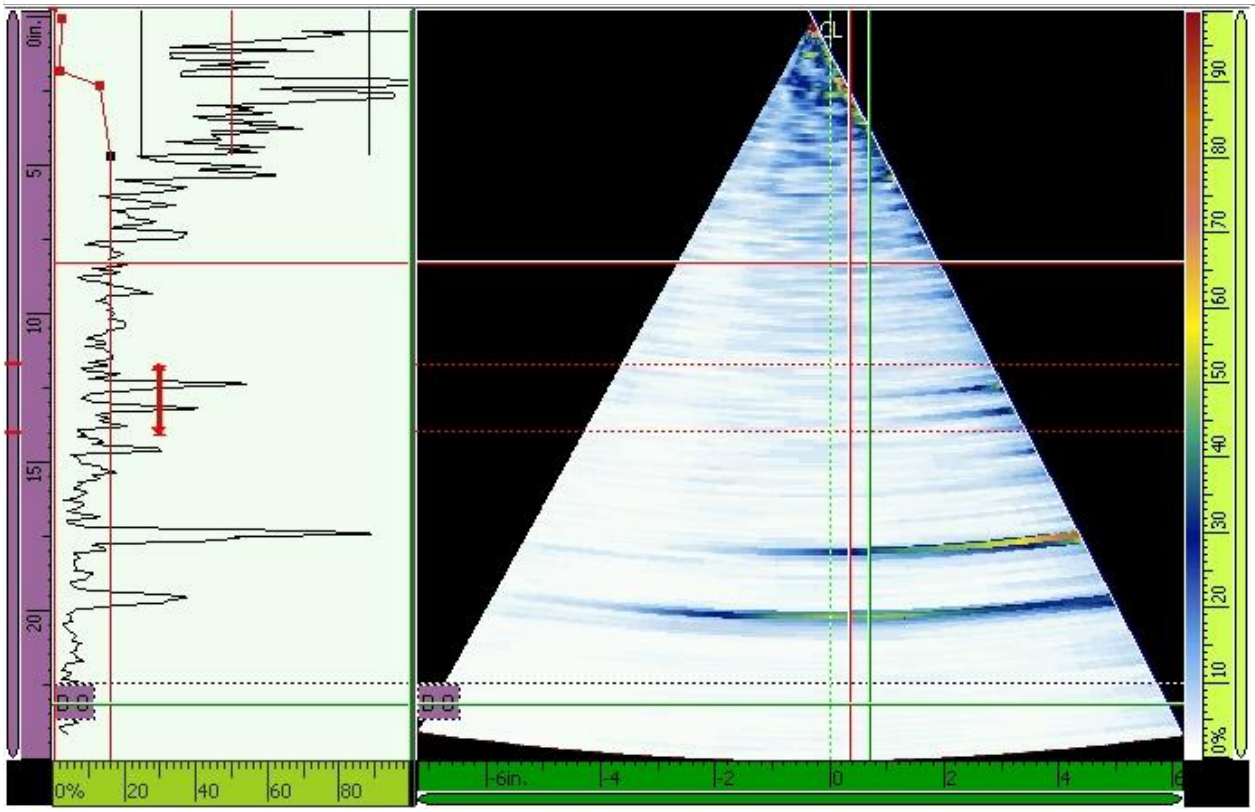
Indication two is a discontinuity indication is along the barrel face of the pin. The amplitude exceeds the ARL. The indication is located from the 2 o'clock to the 4 o'clock position.



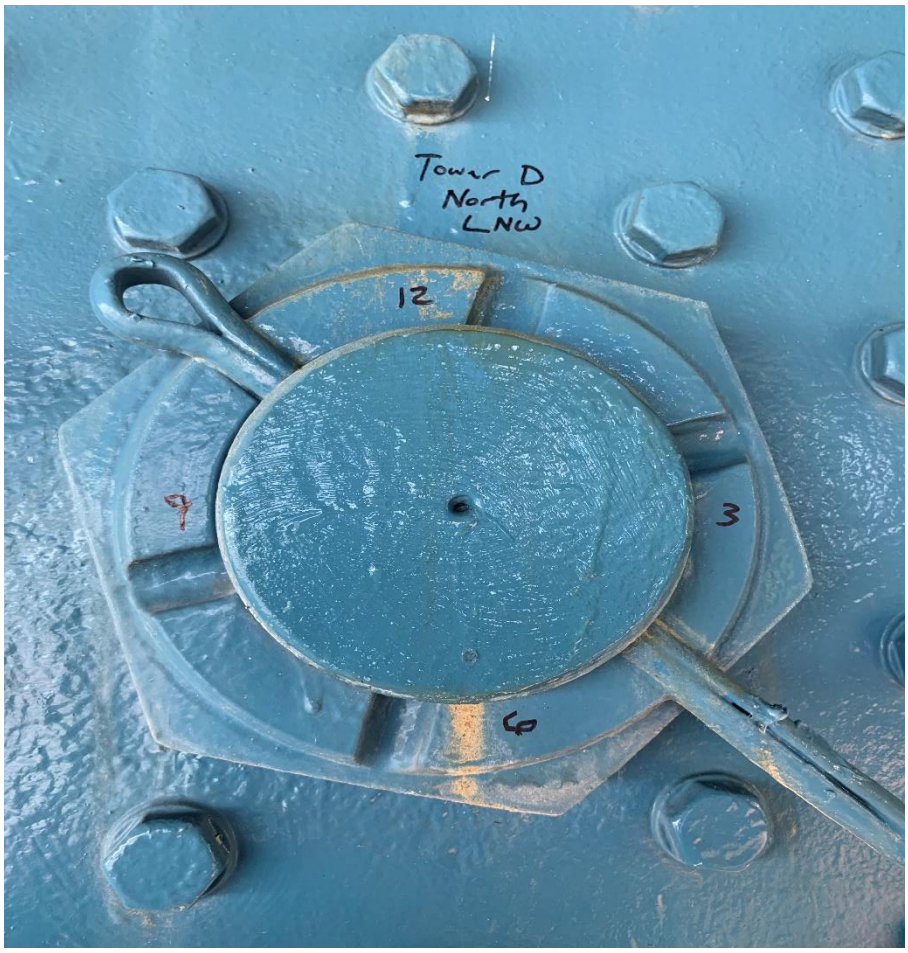
Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.00 mm	0.00 mm	PA 1	15.00º	54.8 %	315.16 mm	76.54 mm	326.28 mm	379.20 mm	8.47 mm	379.30 mm	--- mm

Comments

Indication three shows a discontinuity along the barrel face of the pin. The amplitude exceeds the SSL. The indication is located from the 6 o'clock to the 7 o'clock position.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB



Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/12/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 12	OmniPC - 4.4R5	tower d north une face a.opd	2020 / 06 / 12	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower D North Upper Northeast Face A	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-5.52 mm	635.38 mm	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	5903.3 m/s	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.00 mm	0.00 mm	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	294.17 mm	59.53 mm	15.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	5903.3 m/s
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Law Configuration**	**Beam Skew**
-16.00º	15.00º	1.00º	1000.00 mm	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	571.50 mm

Scan Area

Scan Start	Scan Length	Scan Resolution
0.00 mm	203.20 mm	1.00 mm
Synchro.	**Max. scan speed**	
Encoder	60.06 mm/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	12.00 step/mm	Normal

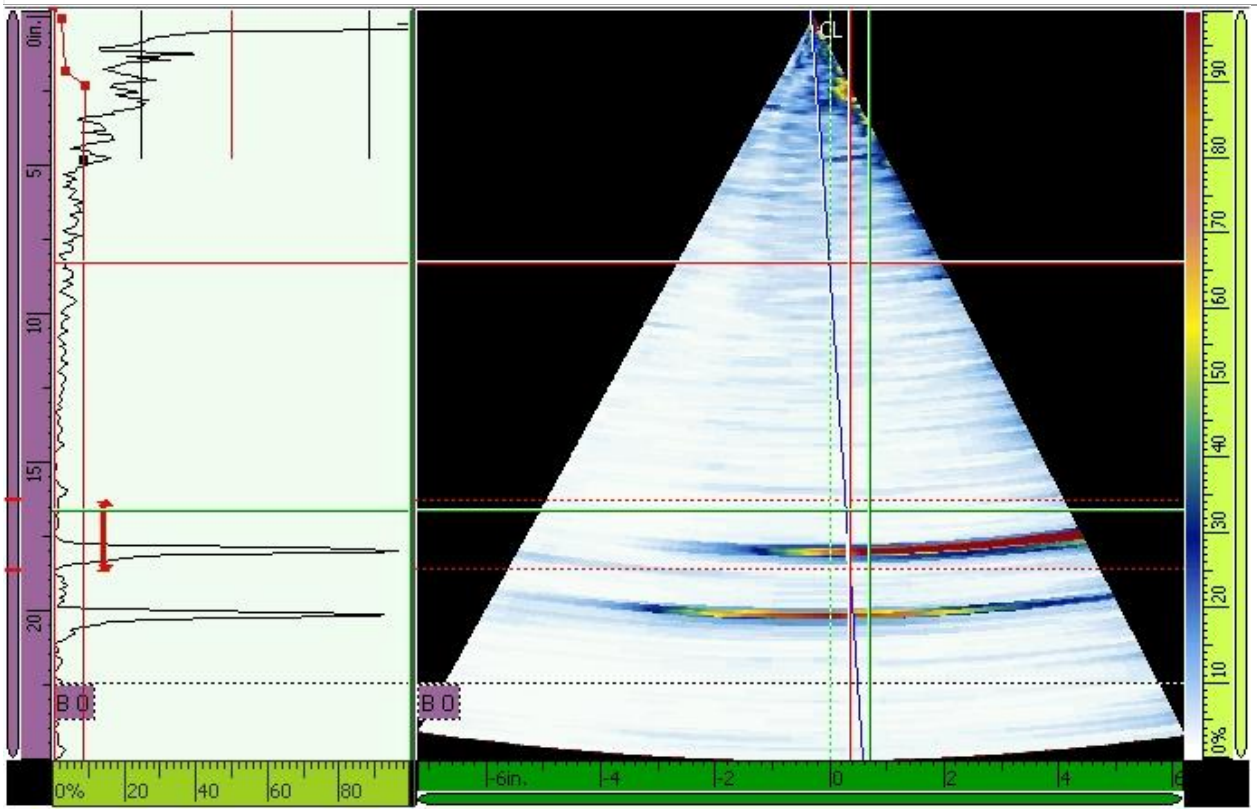
Table

Ref.	Indication #	Scan (mm)	Index (mm)	Group	Channel	A% (%)	DA^ (mm)	PA^ (mm)	SA^ (mm)	U(m-r) (mm)	I(m-r) (mm)	I•U(m-r) (mm)	S(m-r) (mm)
-	1	0.00	0.00	PA 1	2.00º	96.9	457.11	8.05	457.39	214.09	8.47	214.26	---
	2	0.00	0.00	PA 1	15.00º	36.2	323.85	78.87	335.28	214.09	8.47	214.26	---
	3	0.00	0.00	PA 1	15.00º	37.2	322.60	78.53	333.98	214.09	8.47	214.26	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.00 mm	0.00 mm	PA 1	2.00°	96.9 %	457.11 mm	8.05 mm	457.39 mm	214.09 mm	8.47 mm	214.26 mm	--- mm

Comments

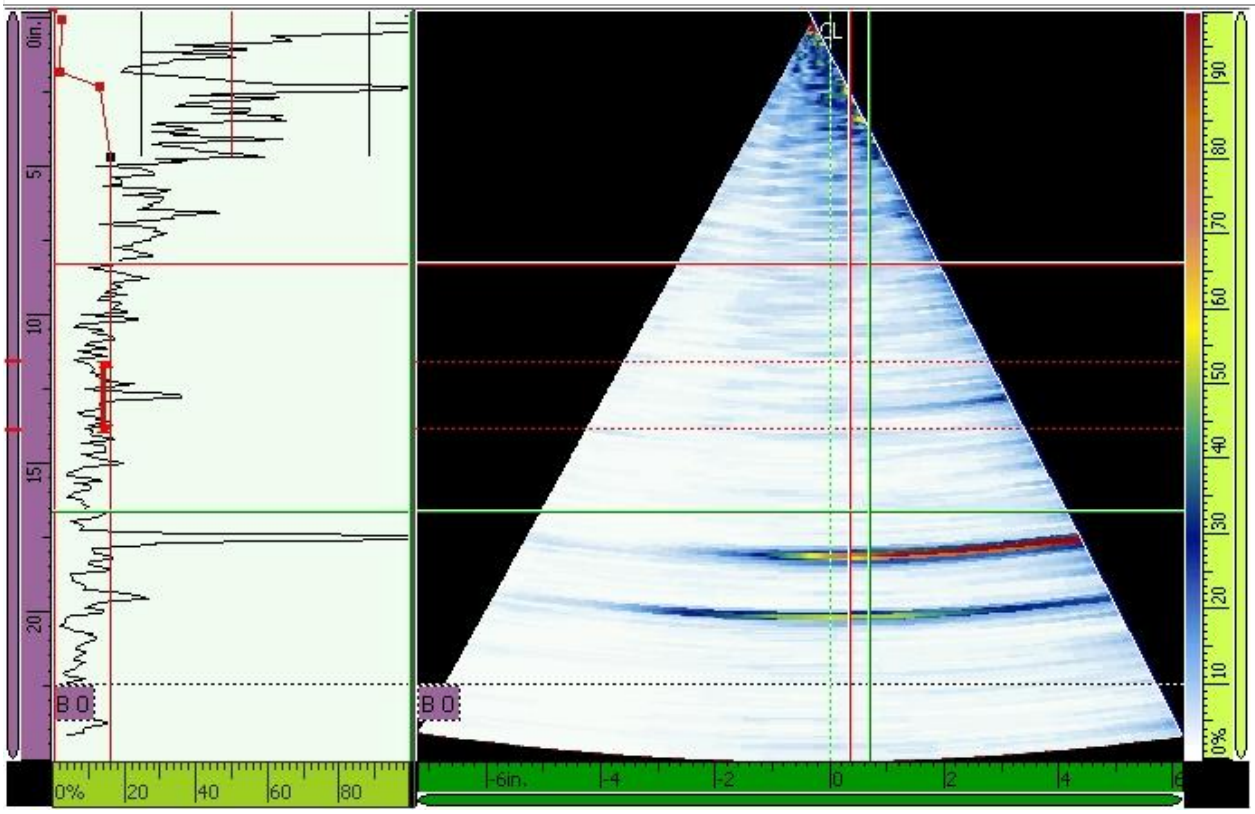
Presentation One is to show a clear backwall reflection.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.00 mm	0.00 mm	PA 1	15.00°	36.2 %	323.85 mm	78.87 mm	335.28 mm	214.09 mm	8.47 mm	214.26 mm	--- mm

Comments

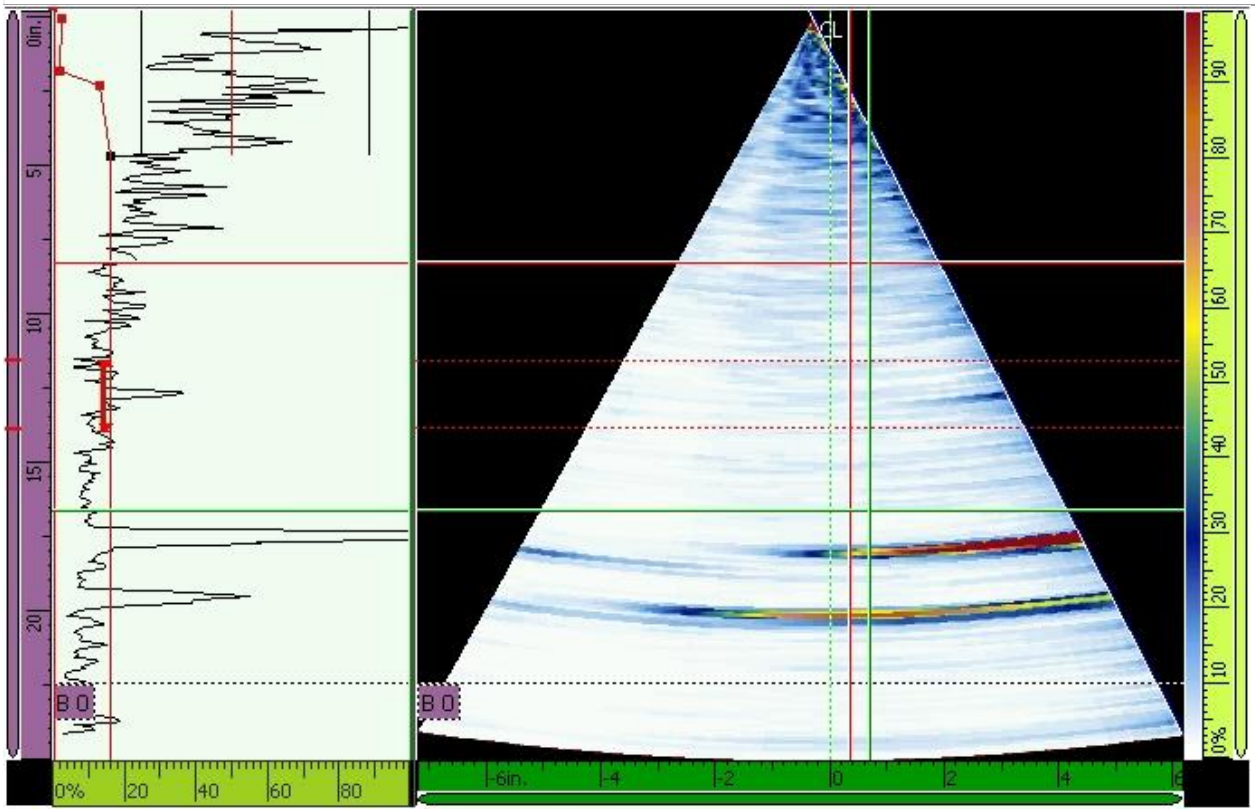
Indication two is above the DRL and below the SSL. The indication is located from the 6 o'clock to 7 o'clock position.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.00 mm	0.00 mm	PA 1	15.00°	37.2 %	322.60 mm	78.53 mm	333.98 mm	214.09 mm	8.47 mm	214.26 mm	--- mm

Comments

Indication three is above the DRL and below the SSL. The indication is located at the 2 o'clock position.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB

Technician Name	Mr. Shawn Barrett ASNT Level III 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/12/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 12	MXU - 4.4R4	A24_probe_6-09-2020.ops	2020 / 06 / 12	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower D North Upper Northwest Face A	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.225 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	18.882 in	2.344 in	15.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	0.232 in./µs

Start Angle	Stop Angle	Angle Resolution	Focus Depth	Law Configuration	Beam Skew
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in

Synchro.	Max. scan speed
Encoder	2.365 in/s

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan 1		Quadrature	304.801 step/in	Normal

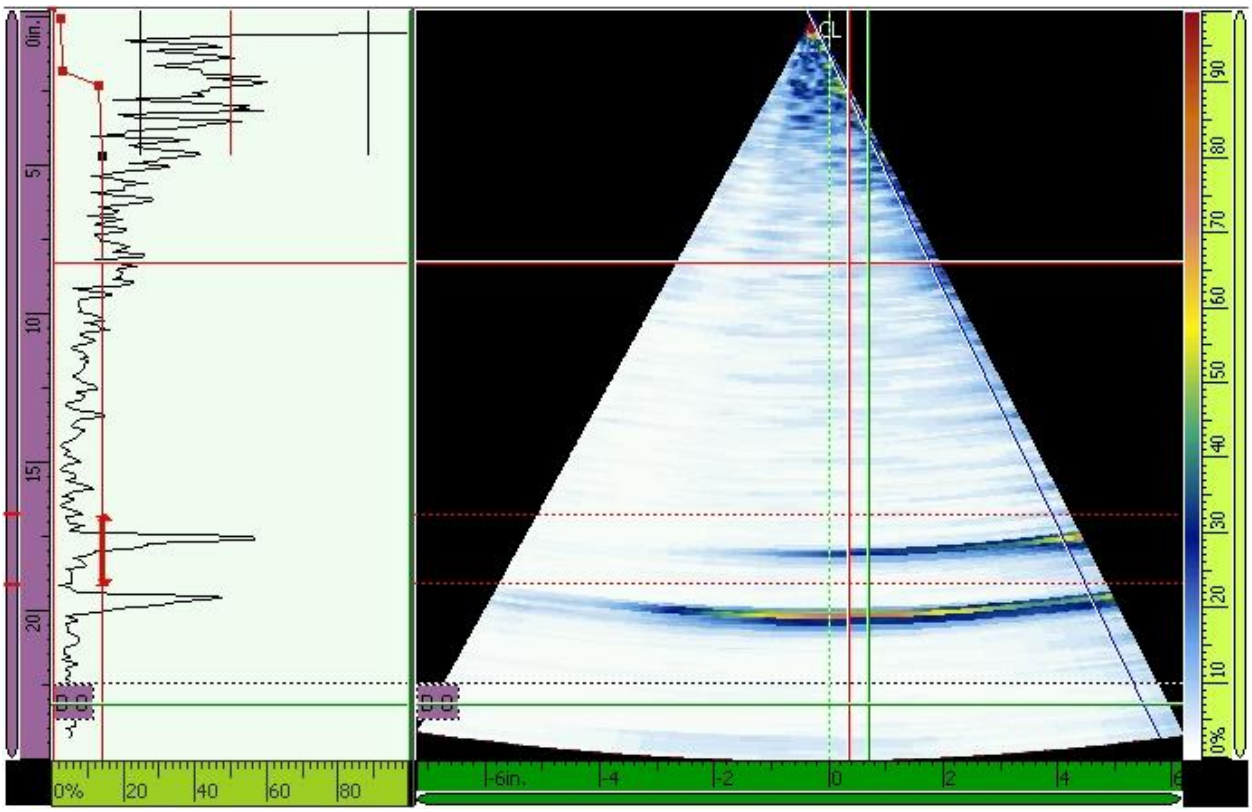
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	14.00º	56.8	17.576	4.071	18.114	14.929	0.333	14.933	---
	2	0.000	0.000	PA 1	2.00º	45.0	20.151	0.392	20.163	14.929	0.333	14.933	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	14.00º	56.8 %	17.576 in	4.071 in	18.114 in	14.929 in	0.333 in	14.933 in	--- in

Comments

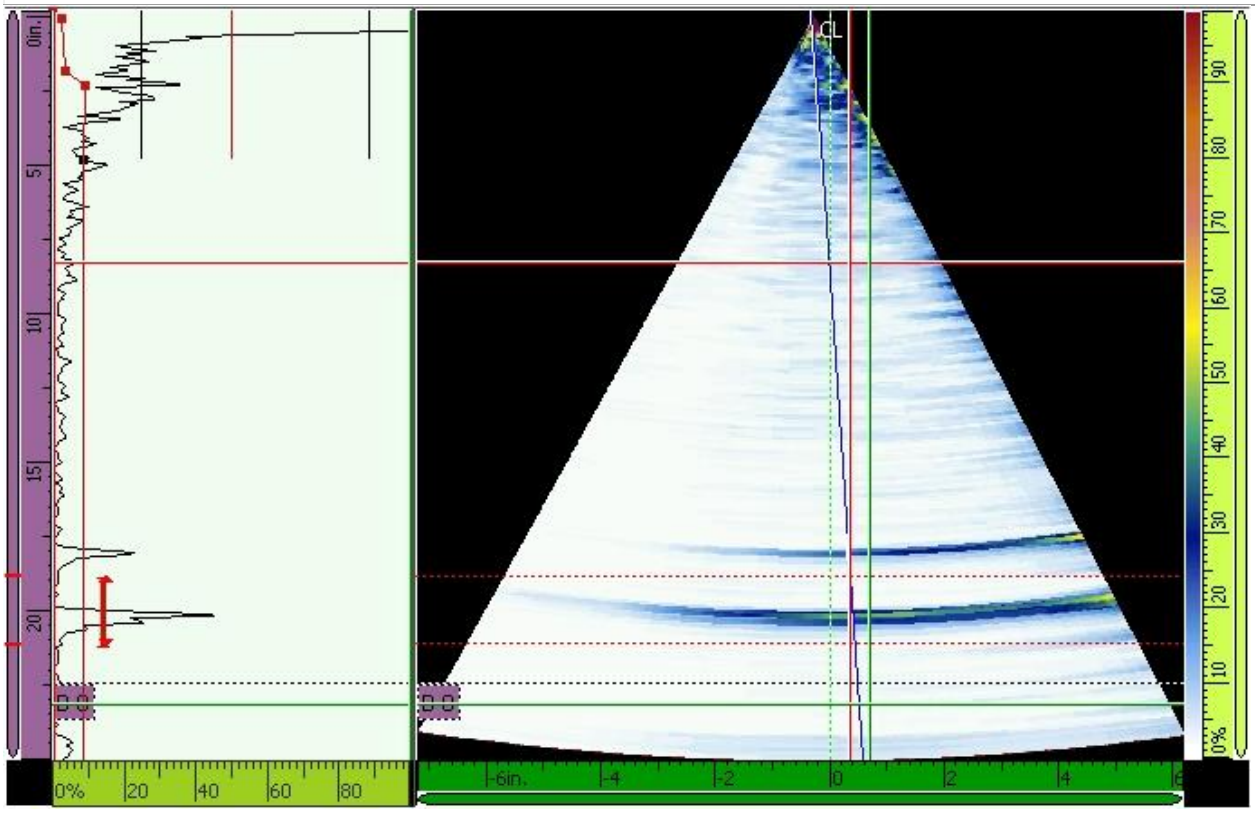
Presentation is to show a clear backwall with no discontinuities detected during this inspection.


0in.
5
10
15
20
0%
20
40
60
80
-6in.
-4
-2
0
2
4
CL
90
80
70
60
50
40
30
20
10
0%

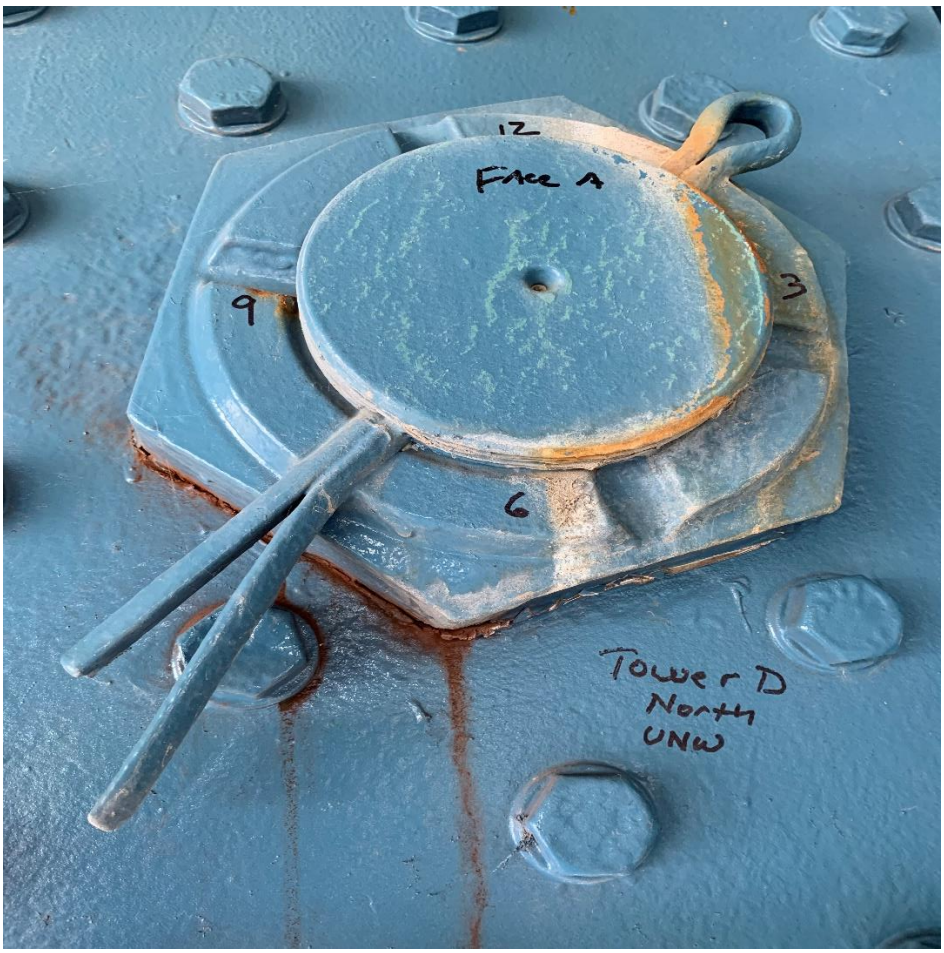
Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	2.00º	45.0 %	20.151 in	0.392 in	20.163 in	14.929 in	0.333 in	14.933 in	--- in

Comments

Presentation shows a clear backwall response with no discontinuities detected during this inspection.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB



Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/12/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 15	OmniPC - 4.4R5	tower d south lse face b.opd	2020 / 06 / 12	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower D South Lower Southeast Face B	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.217 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	11.332 in	2.344 in	35.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Law Configuration**	**Beam Skew**
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.365 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

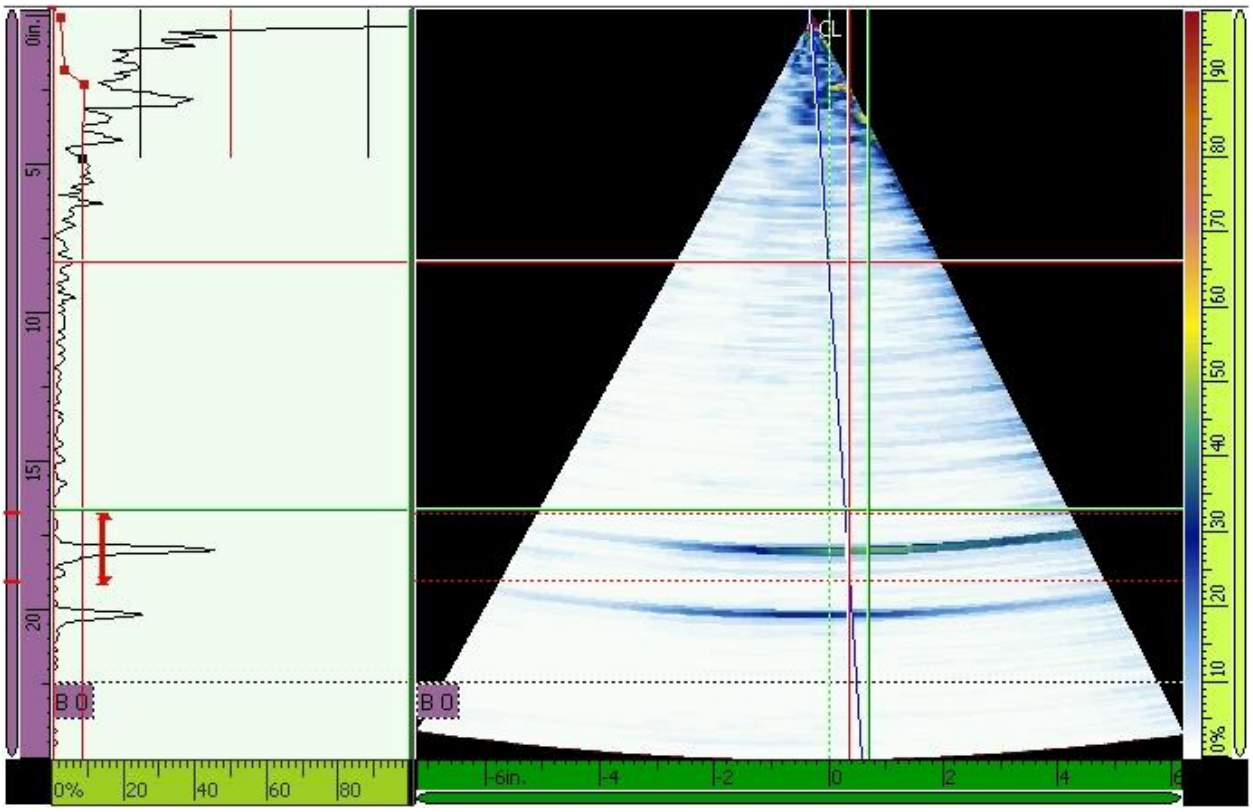
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	2.00º	46.0	17.998	0.317	18.009	8.429	0.333	8.435	---
	2	0.000	0.000	PA 1	15.00º	40.1	12.251	2.971	12.683	8.429	0.333	8.435	---
	3	0.000	0.000	PA 1	15.00º	247.6	12.243	2.969	12.675	8.429	0.333	8.435	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	2.00º	46.0 %	17.998 in	0.317 in	18.009 in	8.429 in	0.333 in	8.435 in	--- in

Comments

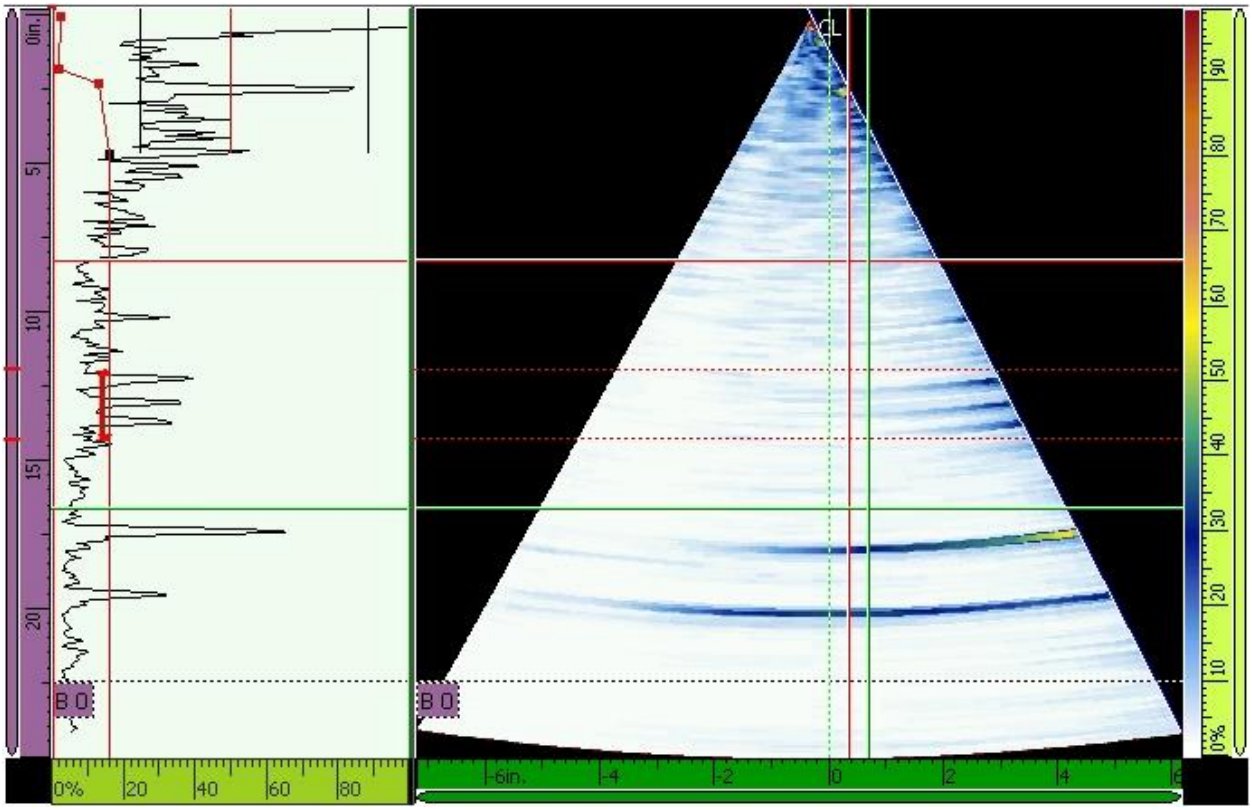
Image One is to show a backwall free of indications for reference purposes.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	15.00º	40.1 %	12.251 in	2.971 in	12.683 in	8.429 in	0.333 in	8.435 in	--- in

Comments

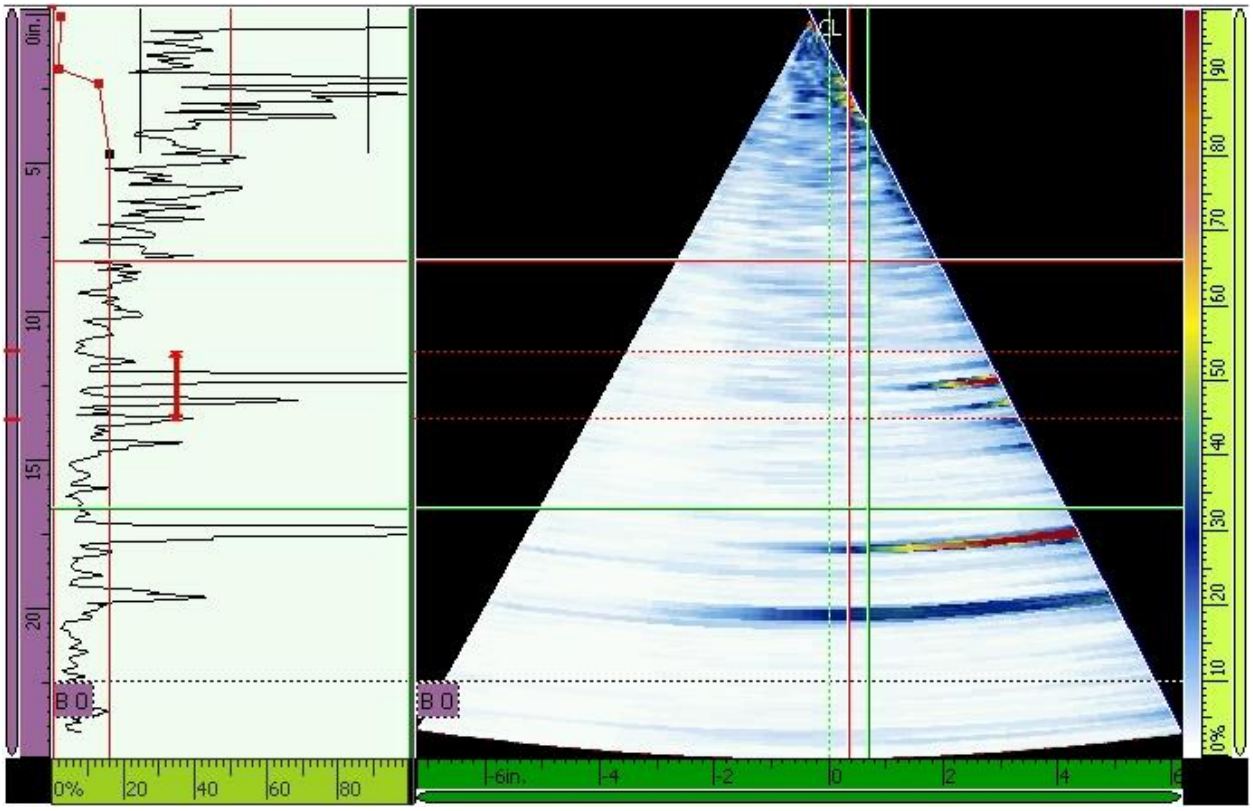
Indication Two is between the DRL and SSL. The indication is located from the 3 o'clock to 5 o'clock position.



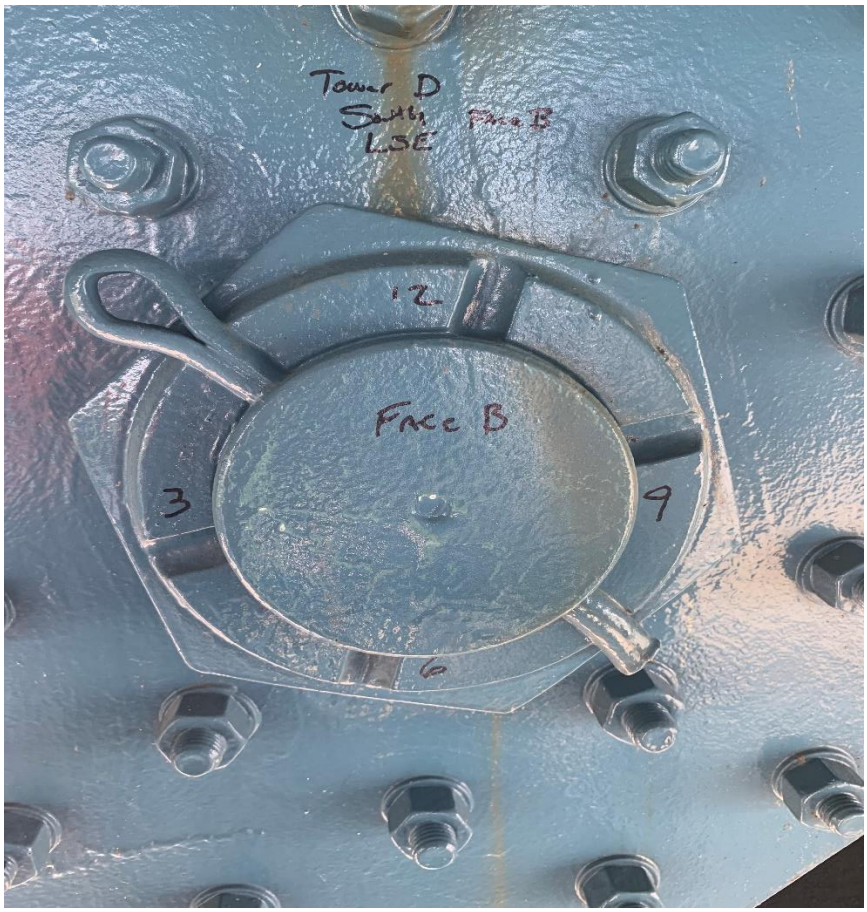
Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.000 in	0.000 in	PA 1	15.00°	247.6 %	12.243 in	2.969 in	12.675 in	8.429 in	0.333 in	8.435 in	--- in

Comments

Indication Three 248% of Full Screen Height. The indication is located from the 8 o'clock to 11 o'clock position.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB



Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/12/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 15	OmniPC - 4.4R5	Tower D South LSW Face B.opd	2020 / 06 / 12	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower D South Lower Southwest Face B	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.217 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	11.682 in	2.344 in	40.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Law Configuration**	**Beam Skew**
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.365 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Table

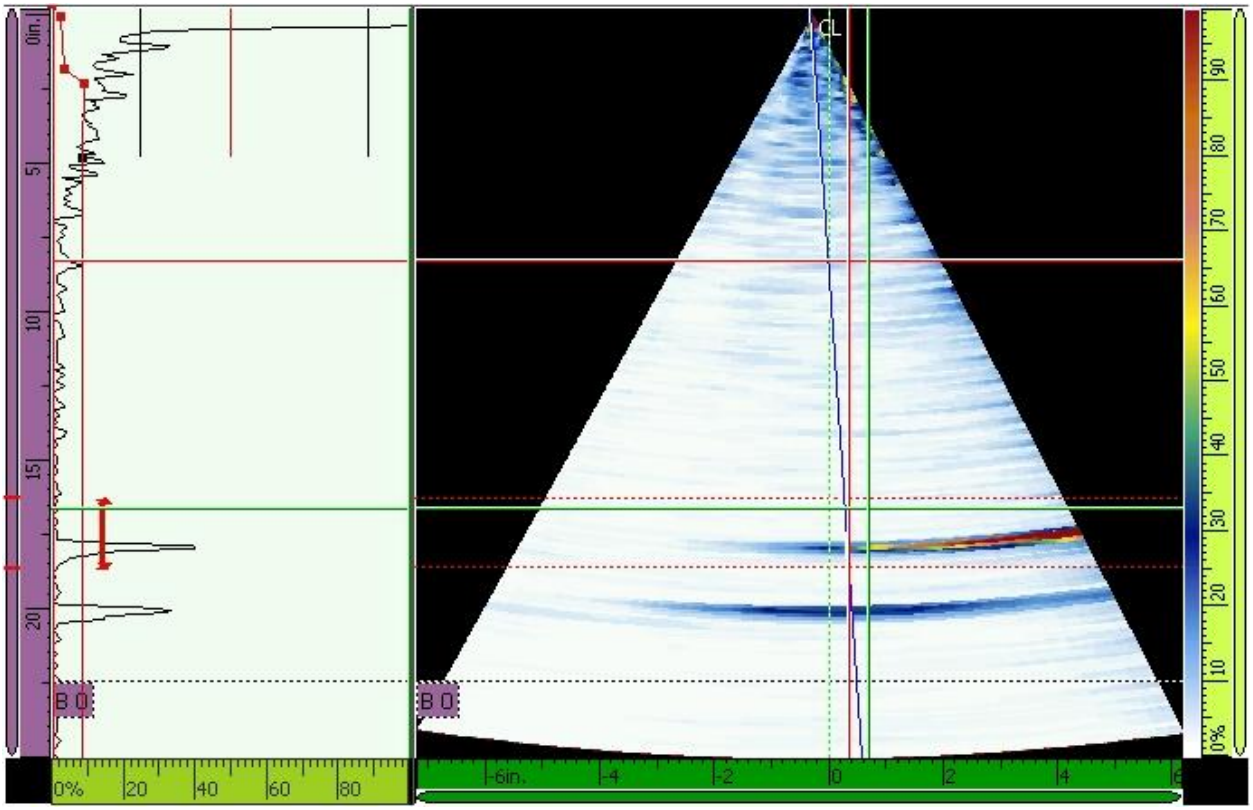
Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	2.00º	40.1	17.949	0.315	17.960	8.429	0.333	8.435	---
	2	0.000	0.000	PA 1	15.00º	84.2	13.159	3.214	13.623	8.429	0.333	8.435	---

	3	0.000	0.000	PA 1	15.00º	48.0	12.246	2.970	12.678	8.429	0.333	8.435	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	2.00º	40.1 %	17.949 in	0.315 in	17.960 in	8.429 in	0.333 in	8.435 in	--- in

Comments

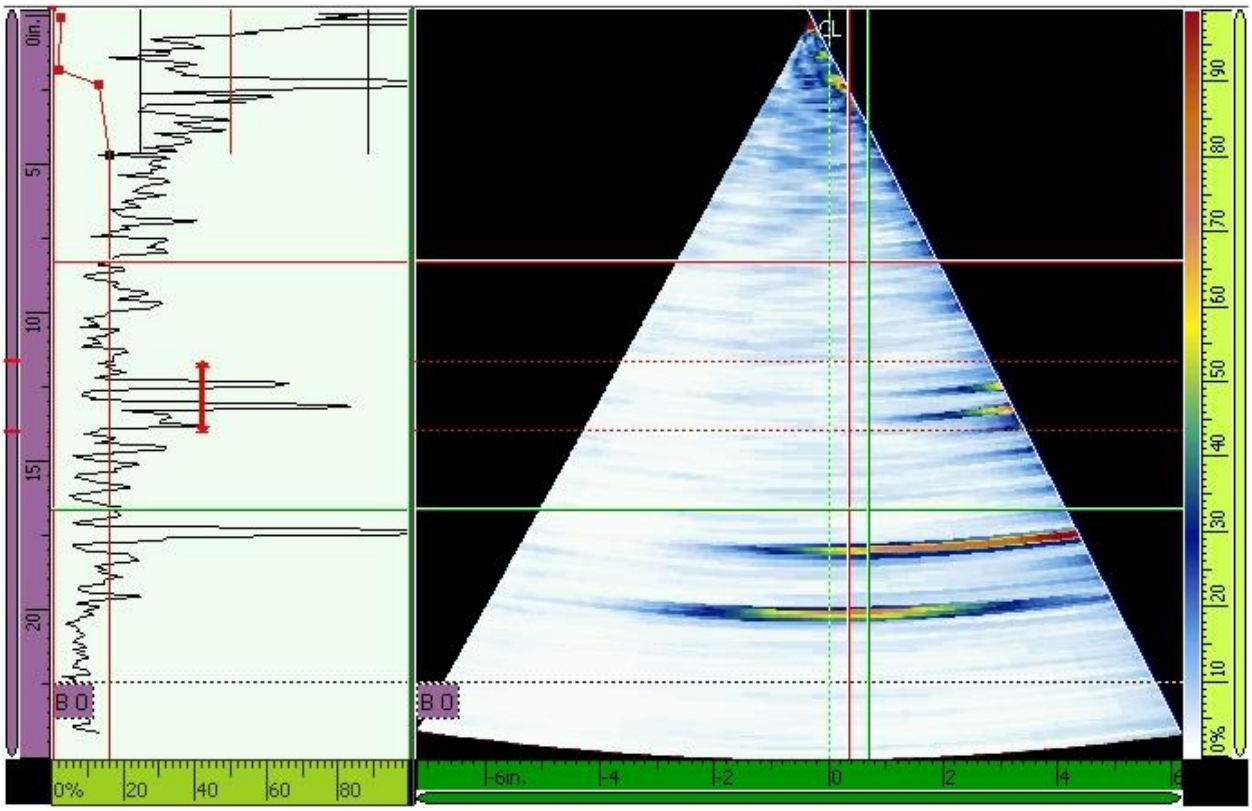
Indication One is to show a backwall free of discontinuities.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	15.00º	84.2 %	13.159 in	3.214 in	13.623 in	8.429 in	0.333 in	8.435 in	--- in

Comments

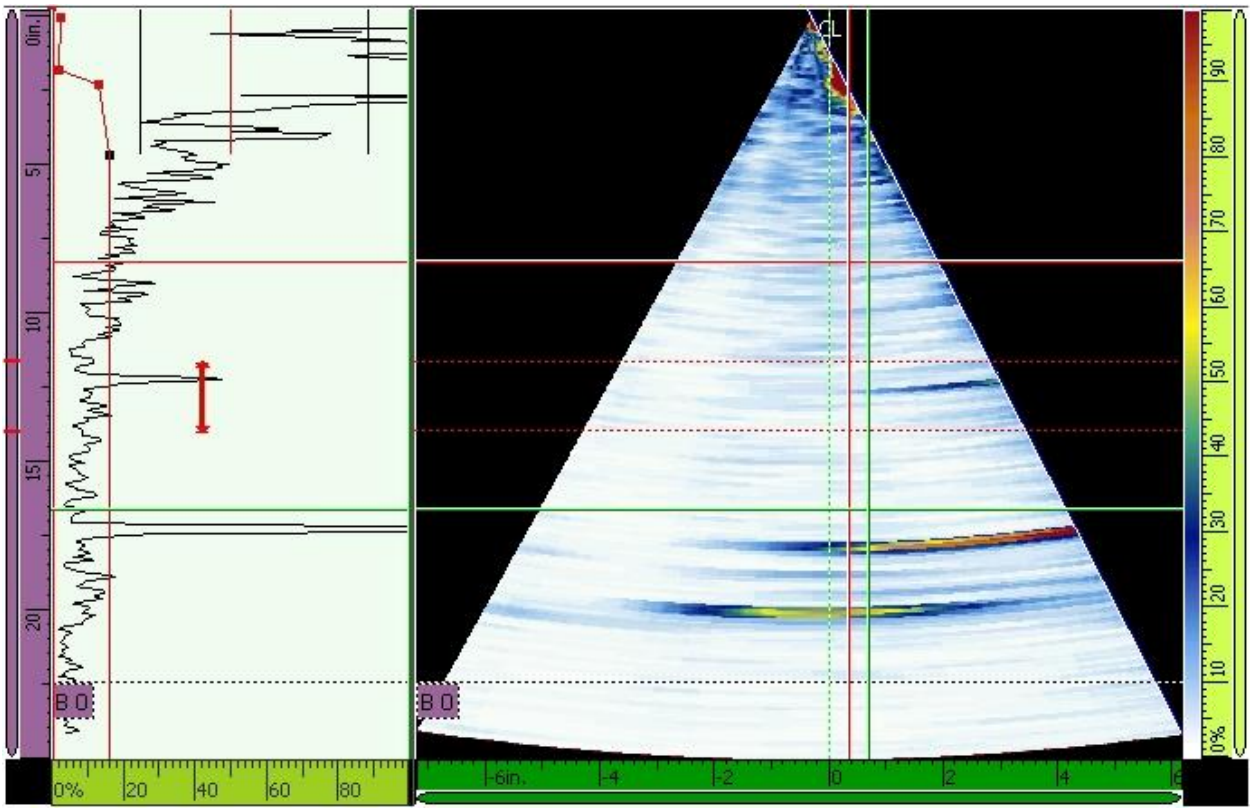
Indication Two is between the SSL and ARL. This indication is located from the 9 o'clock to 6 o'clock position.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.000 in	0.000 in	PA 1	15.00º	48.0 %	12.246 in	2.970 in	12.678 in	8.429 in	0.333 in	8.435 in	--- in

Comments

Indication Three is between the SSL and the DRL. The indication is located at the 3 o'clock position on the pin.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB

Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/12/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 15	OmniPC - 4.4R5	tower d south use face b.opd	2020 / 06 / 12	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower D South Upper Southeast Face B	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.217 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	11.082 in	2.344 in	25.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Law Configuration**	**Beam Skew**
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.365 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

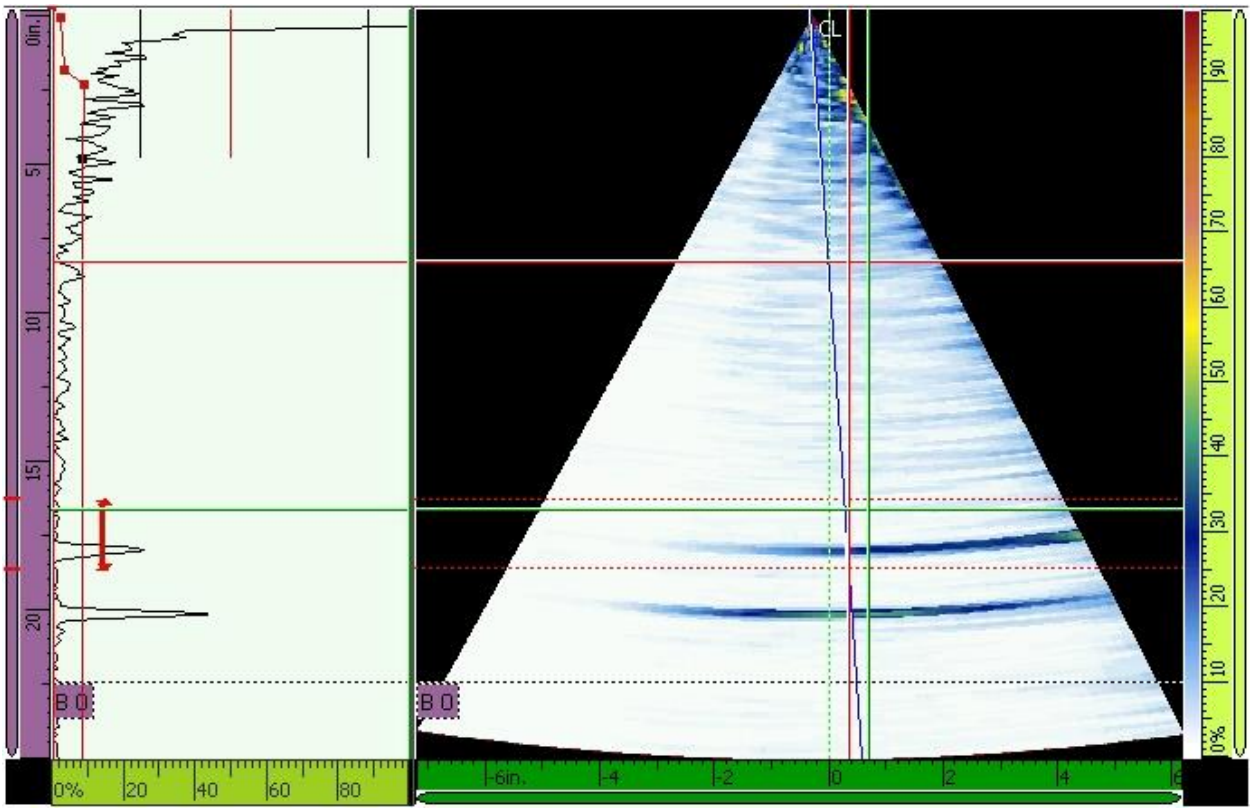
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	2.00º	26.4	17.979	0.316	17.990	8.429	0.333	8.435	---
	2	0.000	0.000	PA 1	15.00º	50.9	12.317	2.989	12.751	8.429	0.333	8.435	---
	3	0.000	0.000	PA 1	15.00º	32.3	12.410	3.014	12.848	8.429	0.333	8.435	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	2.00°	26.4 %	17.979 in	0.316 in	17.990 in	8.429 in	0.333 in	8.435 in	--- in

Comments

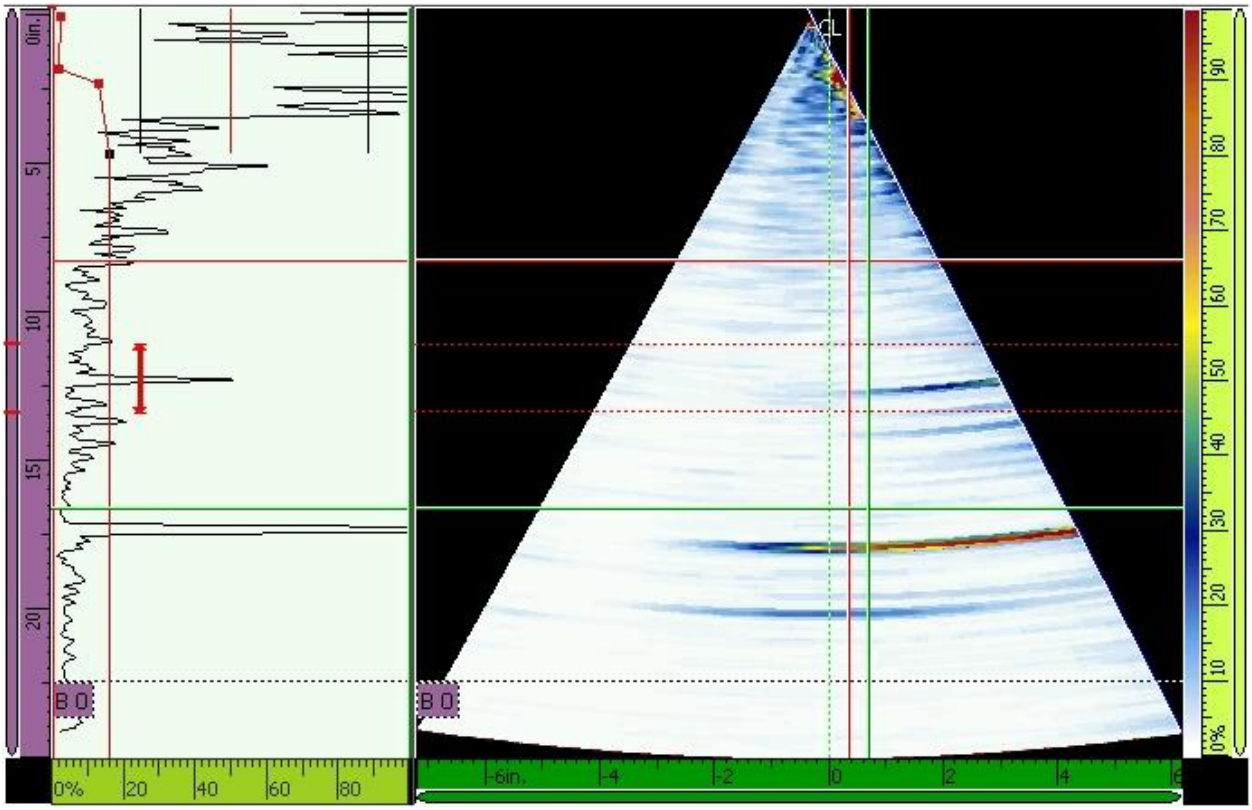
This view is presented to show a backwall free of indications.



Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	15.00°	50.9 %	12.317 in	2.989 in	12.751 in	8.429 in	0.333 in	8.435 in	--- in

Comments

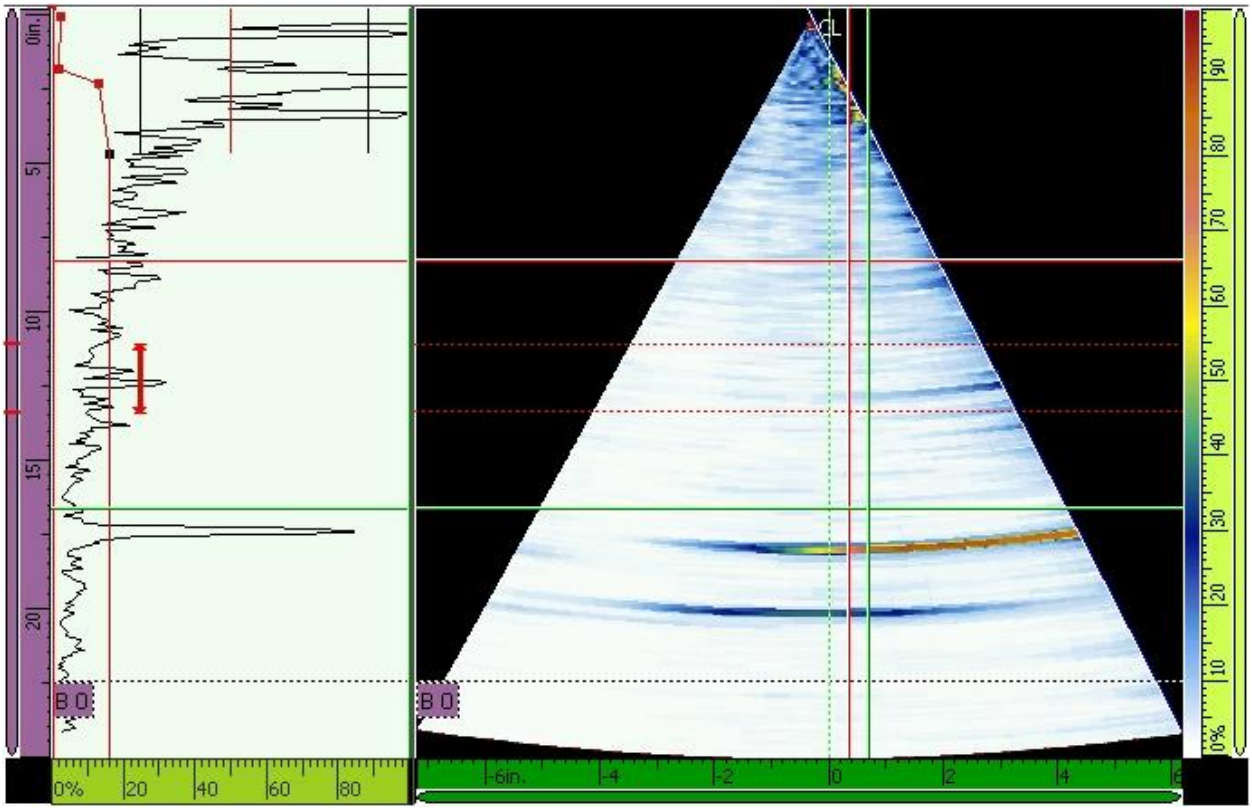
This indication is breaking the SSL by 0.9%, placing it between the SSL and the ARL. The indication is located from the 8 o'clock to 9 o'clock position.



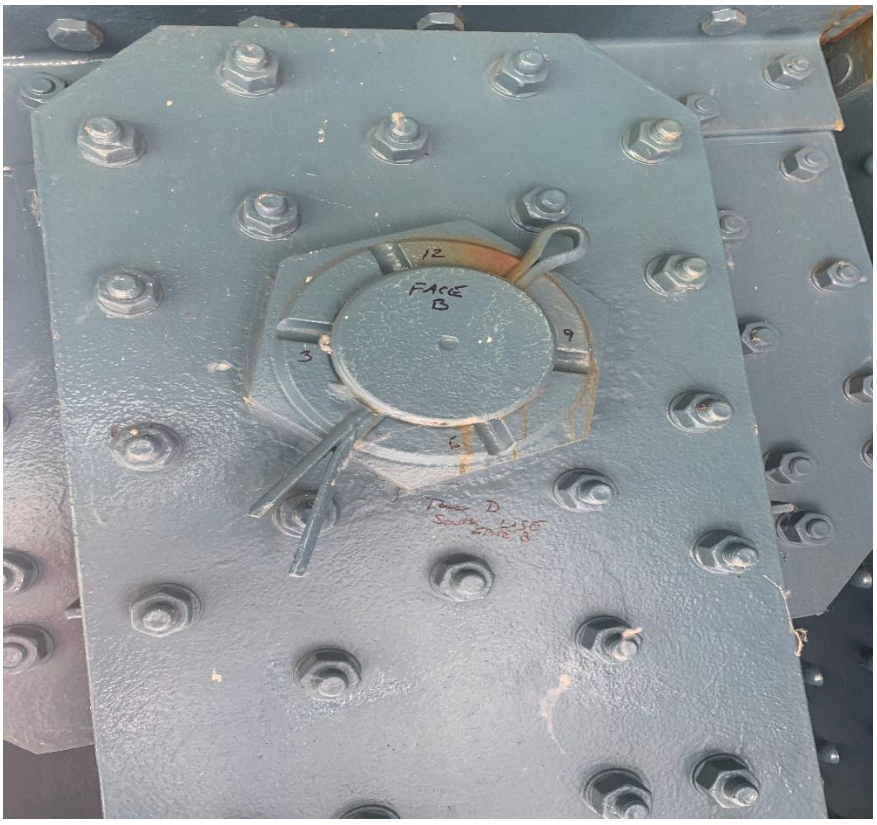
Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	3	0.000 in	0.000 in	PA 1	15.00°	32.3 %	12.410 in	3.014 in	12.848 in	8.429 in	0.333 in	8.435 in	--- in

Comments

This indication is in excess of the DRL but below the SSL. This indication is located from the 3 o'clock to 1 o'clock position.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB



Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/12/2020

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2020 / 06 / 15	OmniPC - 4.4R5	Tower D South USW Face B.opd	2020 / 06 / 12	MXU - 4.4R4	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan MX2	OMNI2-103658	OMNI-M2-PA1664	QC-008811	Tower D South Upper Southwest Face B	

PA 1

Setup

A:-16.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
2.9 µs	-0.217 in	25.015 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	68	On	0.00 µs	FW	Band-pass 2.3 MHz (1.0 - 3.5MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
80	24.47 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	250.00 ns
Scan Offset	**Index Offset**	**Probe Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	90.0º	2.5 ns	100 MHz	680.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	Off	Off	Off	Off	Off
A	12.532 in	2.344 in	15.00 %	Pulse	Max Peak
B	Off	Off	Off	Off	Off

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
16	1	16	1.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Law Configuration**	**Beam Skew**
-16.00º	15.00º	1.00º	39.370 in	Sectorial	180.00º

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	22.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.000 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.365 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

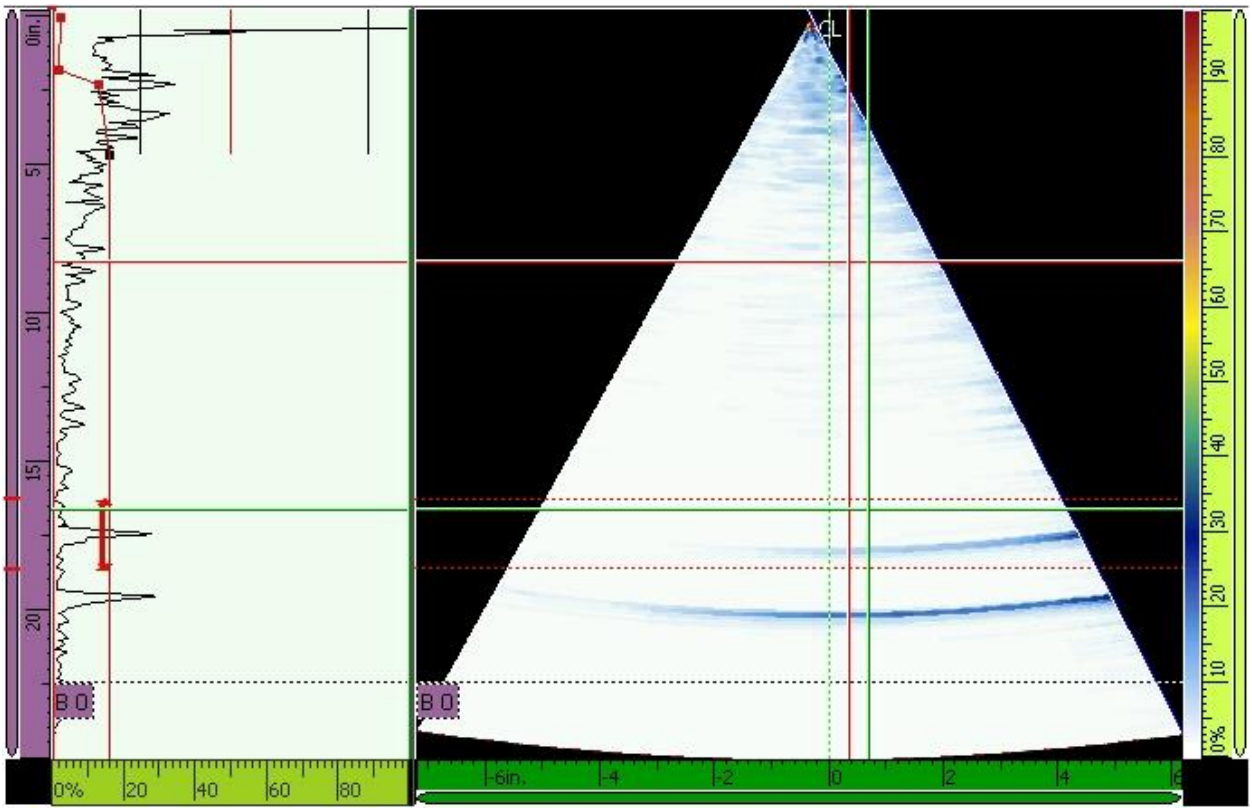
Table

Ref.	Indication #	Scan (in)	Index (in)	Group	Channel	A% (%)	DA^ (in)	PA^ (in)	SA^ (in)	U(m-r) (in)	I(m-r) (in)	I•U(m-r) (in)	S(m-r) (in)
-	1	0.000	0.000	PA 1	15.00º	28.4	17.468	4.369	18.084	8.429	0.333	8.435	---
	2	0.000	0.000	PA 1	15.00º	79.3	13.244	3.237	13.711	8.429	0.333	8.435	---

Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	1	0.000 in	0.000 in	PA 1	15.00°	28.4 %	17.468 in	4.369 in	18.084 in	8.429 in	0.333 in	8.435 in	--- in

Comments

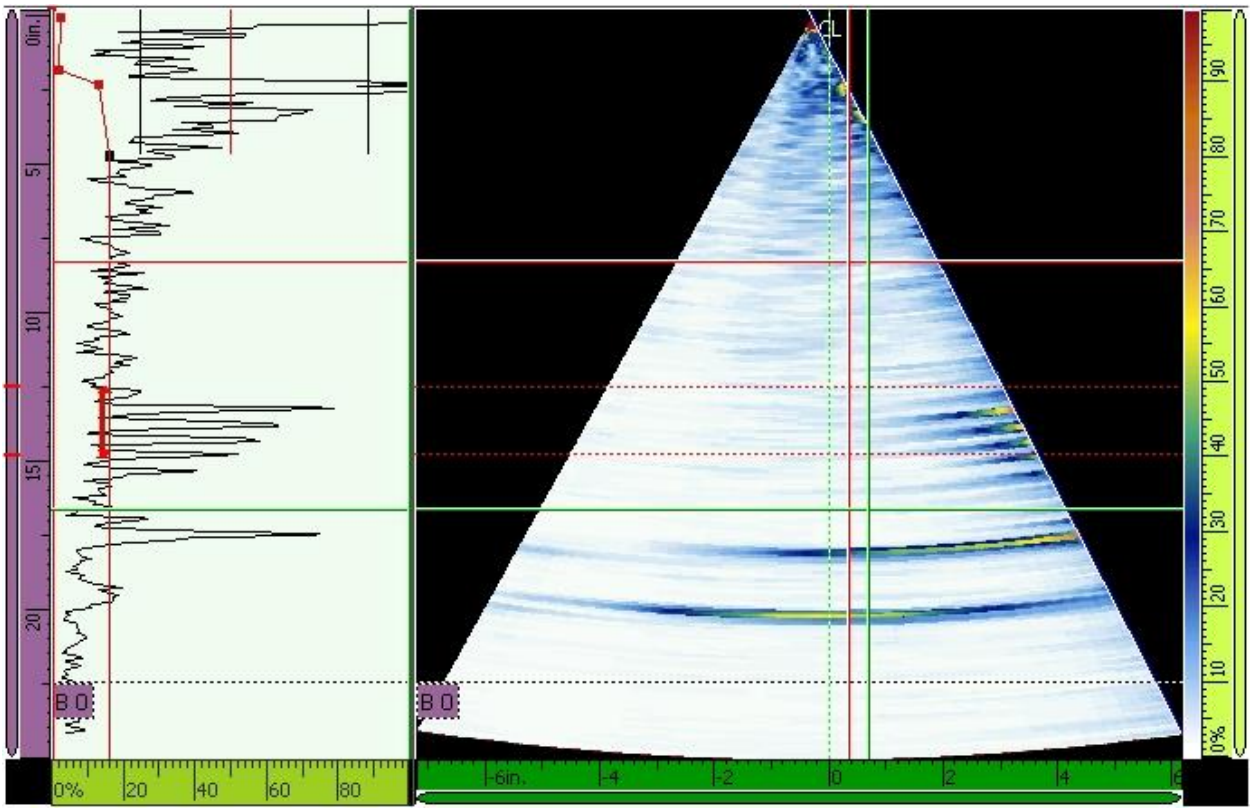
Indication One to show a clean backwall reference with no discontinuities present.



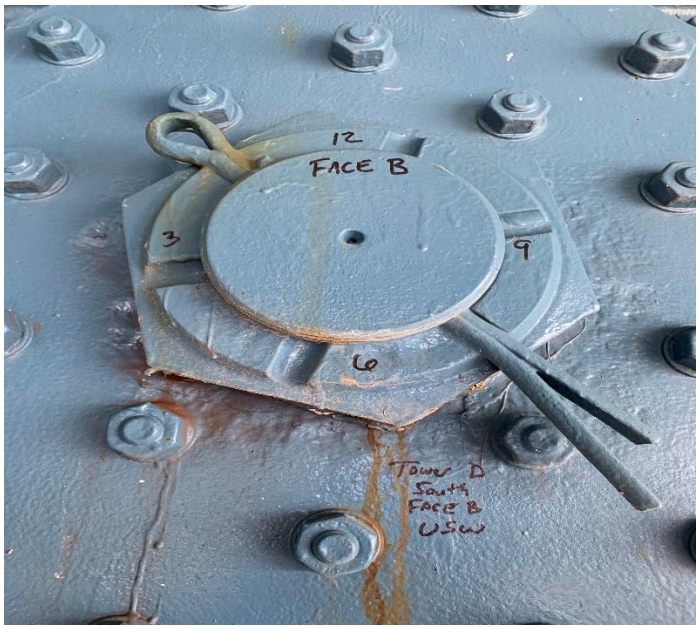
Ref.	Indication #	Scan	Index	Group	Channel	A%	DA^	PA^	SA^	U(m-r)	I(m-r)	I•U(m-r)	S(m-r)
-	2	0.000 in	0.000 in	PA 1	15.00°	79.3 %	13.244 in	3.237 in	13.711 in	8.429 in	0.333 in	8.435 in	--- in

Comments

Indication Two is higher than the SSL but below the ARL. This indication is located at the 9 o'clock position.



PID 108045 State Job 428312 ODOT District 2 Bowling Green, OH
County – Lucas Route – SR2 Section 18.62
City of Toledo, OH Built: 1931 ADT 18,050
Length – 3,218 LUC-2-1862
ARL – 89% = +5 dB
SSL – 50%
DRL – 25% = -6 dB



Technician Name	Mr. Shawn Barrett ASNT Level III UT 141473 PAUT Level II
Technician Signature	Shawn Barrett
Contractor	HRV, Inc.
Date	6/12/2020

APPENDIX E

Tower Pin Load Rating Results

Tower Pin Load Rating Calculations

Submitted to:

Ohio Department of Transportation, District 2
317 E Poe Rd
Bowling Green, OH 43402

LUC-2-1862

Tower Pin Load Rating Calculations

PID: 108045

Submitted by:

Gannett Fleming

*Excellence Delivered **As Promised***

October 2020

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Main Span Pin Load Rating Calculations

Assumptions

This calculation is completed for a typical tower link pin.
Shear, bearing on pin, and bending capacity of the pins will be load rated using ASD methodology.
An effective reduction in pin diameter of 1/8" is assumed for all pins due to wear. No corrosion is noted for any pins.
Loads are based on a Modjeski and Masters analysis dated 8/28/2020.
Pin threads are excluded from shear planes.
Bronze bushing is disregarded in shear, bearing, and bending capacities.

References

ODOT Bridge Design Manual, 2004 (BDM)
AASHTO Standard Specifications for Highway Bridges, 17th edition, 2002 (AASHTO Std.)
AASHTO Manual for Bridge Evaluation, 3rd edition, 2018, with interims through 2019 (MBE)
State Route 2 over Maumee River, Bridge No. LUC 2 1868, Link Pin Replacement As-Built Drawings, 1989 (As-Builts)

Pin Capacities

Pin Material:		ANSI 1045		As-Builts
Pin F_y =	1989 Pin Replacement	36	ksi	MBE Table 6B.5.2.1-1

	Inventory (ksi)	Operating (ksi)	
Allowable Shear Stress, C_v =	14.0	19.5	MBE Table 6B.5.2.1-1 & 2
Allowable Bearing Stress, C_{brg} =	14.0	19.5	MBE Table 6B.5.2.1-1 & 2
Allowable Tension due to Bending, C_b =	29.0	32.0	MBE Table 6B.5.2.1-1 & 2

Pin Diameter, D =	8	in	As-Builts
Reduction due to Wear:	0.125	in	assumed
Effective Diameter, D_e =	7.88	in	

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Main Span Pin Load Rating Calculations

Pin Loads

See "Tower Link Loads" calculated by Modjeski and Masters, 8/28/2020, for loads and discussion. Live loads are due to HS20 loading.

	Main Span Pin Loads, P			
Load Case	Max	Min		
Dead Load	0	-5	kip	DL
Dead Load and Temperature Rise	6	0	kip	DL + T_R
Dead Load and Temperature Fall	0	-13	kip	DL + T_F
Dead Load and Live Load	137	-128	kip	DL + LL
Dead Load, Temperature Rise, and Live Load	148	-117	kip	DL + T_R + LL
Dead Load, Temperature Fall, and Live Load	128	-136	kip	DL + T_F + LL

Note: Live load is assumed to be obtained by subtracting out Dead and Temperature loads from total load.

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Main Span Pin Load Rating Calculations

Pin Shear

Pin Shear Area, $A_v = 2\pi D_e^2/4 =$ 97.4 in^2 pin in double shear

	Pin Shear Stress, P/A_v			
Load Case	Max	Min		
Dead Load	0.00	-0.05	ksi	DL
Dead Load and Temperature Rise	0.06	0.00	ksi	DL + T_R
Dead Load and Temperature Fall	0.00	-0.13	ksi	DL + T_F
Dead Load and Live Load	1.41	-1.31	ksi	DL + LL
Dead Load, Temperature Rise, and Live Load	1.52	-1.20	ksi	DL + T_R + LL
Dead Load, Temperature Fall, and Live Load	1.31	-1.40	ksi	DL + T_F + LL

Rating Factor, RF = $(C_v - (DL + T)) / ((DL + T + LL) - (DL + T))$ MBE 6B.4.1

	Shear Rating Factors	
Load Case	RF_{INV}	RF_{OPR}
Max DL + LL	9.955	13.865
Min DL + LL	11.128	15.484
Max DL + T_R + LL	9.562	13.335
Min DL + T_R + LL	11.656	16.236
Max DL + T_F + LL	10.655	14.840
Min DL + T_F + LL	11.193	15.549
Controlling Shear Rating Factors	9.562	13.335

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Main Span Pin Load Rating Calculations

Pin Bearing

Side plates of total thickness 1 3/4" bear on either end of pin for total thickness of 3 1/2"
Center plates of total thickness 4" bear at center of pin at top pin and 4.08" at bottom pin

Controlling Bearing Thickness, t_{brg} = 3.50 in

Pin Bearing Area, $A_{brg} = D_e t_{brg}$ = 27.6 in^2

	Pin Bearing Stress, P/A_{brg}			
Load Case	Max	Min		
Dead Load	0.00	-0.18	ksi	DL
Dead Load and Temperature Rise	0.22	0.00	ksi	DL + T_R
Dead Load and Temperature Fall	0.00	-0.47	ksi	DL + T_F
Dead Load and Live Load	4.97	-4.64	ksi	DL + LL
Dead Load, Temperature Rise, and Live Load	5.37	-4.24	ksi	DL + T_R + LL
Dead Load, Temperature Fall, and Live Load	4.64	-4.93	ksi	DL + T_F + LL

Rating Factor, RF = $[C_{brg} - (DL + T)] / ((DL + T + LL) - (DL + T))$ MBE 6B.4.1

	Bearing Rating Factors	
Load Case	RF_{INV}	RF_{OPR}
Max DL + LL	2.817	3.923
Min DL + LL	3.178	4.410
Max DL + T_R + LL	2.675	3.743
Min DL + T_R + LL	3.298	4.594
Max DL + T_F + LL	3.015	4.199
Min DL + T_F + LL	3.243	4.475
Controlling Bearing Rating Factors	2.675	3.743

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Main Span Pin Load Rating Calculations

Pin Bending

Treat pin as simply supported beam spanning between side plates with distributed load at midspan.
Side plate total thickness 1 3/4" each side centered on 1 3/4" pin keys; assume span length is c-c of pin keys

L = 14.75" - 2(0.375" + 1.75"/2) = 12.25 in

Load Distribution Length:

Assume load is distributed through total thickness of center plates, top connection controls

b = 2(1") + 2*(0.75") + 0.5" = 4.00 in

Pin Section Modulus, $S = \pi D_e^3/32$ = 47.9 in^3

Bending Stress due to Load P:

M/S = P(L/4 - b/8)/S

	Pin Bending Stress, M/S			
Load Case	Max	Min		
Dead Load	0.00	-0.27	ksi	DL
Dead Load and Temperature Rise	0.32	0.00	ksi	DL + T_R
Dead Load and Temperature Fall	0.00	-0.69	ksi	DL + T_F
Dead Load and Live Load	7.32	-6.84	ksi	DL + LL
Dead Load, Temperature Rise, and Live Load	7.91	-6.25	ksi	DL + T_R + LL
Dead Load, Temperature Fall, and Live Load	6.84	-7.27	ksi	DL + T_F + LL

Rating Factor, RF = $[C_b - (DL + T)] / ((DL + T + LL) - (DL + T))$ MBE 6B.4.1

	Bending Rating Factors	
Load Case	RF_{INV}	RF_{OPR}
Max DL + LL	3.961	4.370
Min DL + LL	4.452	4.908
Max DL + T_R + LL	3.779	4.174
Min DL + T_R + LL	4.638	5.117
Max DL + T_F + LL	4.239	4.678
Min DL + T_F + LL	4.517	4.973
Controlling Bending Rating Factors	3.779	4.174

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Main Span Pin Load Rating Calculations

Tower Link Pin Load Rating Summary

	Main Span Tower Link Pin Load Rating Summary			
	INV	OPR	$HS20_{INV}$ (TON)	$HS20_{OPR}$ (TON)
Pin Shear	9.562	13.335	344	480
Bearing on Pin	2.675	3.743	96	134
Pin Bending	3.779	4.174	136	150

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Side Span Pin Load Rating Calculations

Assumptions

This calculation is completed for a typical tower link pin.
Shear, bearing on pin, and bending capacity of the pins will be load rated using ASD methodology.
An effective reduction in pin diameter of 1/8" is assumed for all pins due to wear. No corrosion is noted for any pins.
Loads are based on a Modjeski and Masters analysis dated 8/28/2020.
Pin threads are excluded from shear planes.
Bronze bushing is disregarded in shear, bearing, and bending capacities.

References

ODOT Bridge Design Manual, 2004 (BDM)
AASHTO Standard Specifications for Highway Bridges, 17th edition, 2002 (AASHTO Std.)
AASHTO Manual for Bridge Evaluation, 3rd edition, 2018, with interims through 2019 (MBE)
State Route 2 over Maumee River, Bridge No. LUC 2 1868, Link Pin Replacement As-Built Drawings, 1988 (As-Builts)

Pin Capacities

Pin Material:		ANSI 1045		As-Builts
Pin F_y =	1989 Pin Replacement	36	ksi	MBE Table 6B.5.2.1-1

	Inventory (ksi)	Operating (ksi)	
Allowable Shear Stress, C_v =	14.0	19.5	MBE Table 6B.5.2.1-1 & 2
Allowable Bearing Stress, C_{brg} =	14.0	19.5	MBE Table 6B.5.2.1-1 & 2
Allowable Tension due to Bending, C_b =	29.0	32.0	MBE Table 6B.5.2.1-1 & 2

Pin Diameter, D =	8	in	As-Builts
Reduction due to Wear:	0.125	in	assumed
Effective Diameter, D_e =	7.88	in	

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Side Span Pin Load Rating Calculations

Pin Loads

See "Tower Link Loads" calculated by Modjeski and Masters, 8/28/2020, for loads and discussion. Live loads are due to HS20 loading.

	Side Span Pin Loads, P			
Load Case	Max	Min		
Dead Load	4	0	kip	DL
Dead Load and Temperature Rise	0	-4	kip	DL + T_R
Dead Load and Temperature Fall	9	0	kip	DL + T_F
Dead Load and Live Load	137	-148	kip	DL + LL
Dead Load, Temperature Rise, and Live Load	129	-157	kip	DL + T_R + LL
Dead Load, Temperature Fall, and Live Load	143	-142	kip	DL + T_F + LL

Note: Live load is assumed to be obtained by subtracting out Dead and Temperature loads from total load.

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Side Span Pin Load Rating Calculations

Pin Shear

Pin Shear Area, $A_v = 2\pi D_e^2/4 =$ 97.4 in^2 pin in double shear

	Pin Shear Stress, P/A_v			
Load Case	Max	Min		
Dead Load	0.04	0.00	ksi	DL
Dead Load and Temperature Rise	0.00	-0.04	ksi	DL + T_R
Dead Load and Temperature Fall	0.09	0.00	ksi	DL + T_F
Dead Load and Live Load	1.41	-1.52	ksi	DL + LL
Dead Load, Temperature Rise, and Live Load	1.32	-1.61	ksi	DL + T_R + LL
Dead Load, Temperature Fall, and Live Load	1.47	-1.46	ksi	DL + T_F + LL

Rating Factor, RF = $(C_v - (DL + T)) / ((DL + T + LL) - (DL + T))$ MBE 6B.4.1

	Shear Rating Factors	
Load Case	RF_{INV}	RF_{OPR}
Max DL + LL	10.224	14.252
Min DL + LL	9.215	12.835
Max DL + T_R + LL	10.572	14.725
Min DL + T_R + LL	8.940	12.442
Max DL + T_F + LL	10.110	14.109
Min DL + T_F + LL	9.604	13.377
Controlling Shear Rating Factors	8.940	12.442

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Side Span Pin Load Rating Calculations

Pin Bearing

Side plates of total thickness 1 3/4" bear on either end of pin for total thickness of 3 1/2"
Center plates of total thickness 4" bear at center of pin at top pin and 4.08" at bottom pin

Controlling Bearing Thickness, t_{brg} = 3.50 in

Pin Bearing Area, $A_{brg} = D_e t_{brg}$ = 27.6 in^2

	Pin Bearing Stress, P/A_{brg}			
Load Case	Max	Min		
Dead Load	0.15	0.00	ksi	DL
Dead Load and Temperature Rise	0.00	-0.15	ksi	DL + T_R
Dead Load and Temperature Fall	0.33	0.00	ksi	DL + T_F
Dead Load and Live Load	4.97	-5.37	ksi	DL + LL
Dead Load, Temperature Rise, and Live Load	4.68	-5.70	ksi	DL + T_R + LL
Dead Load, Temperature Fall, and Live Load	5.19	-5.15	ksi	DL + T_F + LL

Rating Factor, RF = $[C_{brg} - (DL + T)] / ((DL + T + LL) - (DL + T))$ MBE 6B.4.1

	Bearing Rating Factors	
Load Case	RF_{INV}	RF_{OPR}
Max DL + LL	2.871	4.011
Min DL + LL	2.607	3.632
Max DL + T_R + LL	2.991	4.166
Min DL + T_R + LL	2.548	3.539
Max DL + T_F + LL	2.813	3.944
Min DL + T_F + LL	2.717	3.785
Controlling Bearing Rating Factors	2.548	3.539

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

Side Span Pin Load Rating Calculations

Pin Bending

Treat pin as simply supported beam spanning between side plates with distributed load at midspan.
Side plates total thickness 1 3/4" each side centered on 1 3/4" pin keys; assume span length is c-c of pin keys

L = 14.75" - 2(0.375" + 1.75"/2) = 12.25 in

Load Distribution Length:

Assume load is distributed through total thickness of center plates, top connection controls

b = 2(1") + 2*(0.75") + 0.5" = 4.00 in

Pin Section Modulus, $S = \pi D_e^3/32$ = 47.9 in^3

Bending Stress due to Load P:

M/S = P(L/4 - b/8)/S

	Pin Bending Stress, M/S			
Load Case	Max	Min		
Dead Load	0.21	0.00	ksi	DL
Dead Load and Temperature Rise	0.00	-0.21	ksi	DL + T_R
Dead Load and Temperature Fall	0.48	0.00	ksi	DL + T_F
Dead Load and Live Load	7.32	-7.91	ksi	DL + LL
Dead Load, Temperature Rise, and Live Load	6.89	-8.39	ksi	DL + T_R + LL
Dead Load, Temperature Fall, and Live Load	7.64	-7.59	ksi	DL + T_F + LL

Rating Factor, RF = $[C_b - (DL + T)] / ((DL + T + LL) - (DL + T))$ MBE 6B.4.1

	Bending Rating Factors	
Load Case	RF_{INV}	RF_{OPR}
Max DL + LL	4.050	4.472
Min DL + LL	3.666	4.046
Max DL + T_R + LL	4.206	4.641
Min DL + T_R + LL	3.573	3.939
Max DL + T_F + LL	3.982	4.401
Min DL + T_F + LL	3.821	4.216
Controlling Bending Rating Factors	3.573	3.939

Gannett Fleming

Project:	ODOT LUC-2-18.62 Bridge Inspections	**Job No.:**	66871
Subject:	Tower Link Pin Load Ratings	**Checked By:**	SYC
Designed by:	JCL	**Date:**	10/8/2020
Date:	9/30/2020		

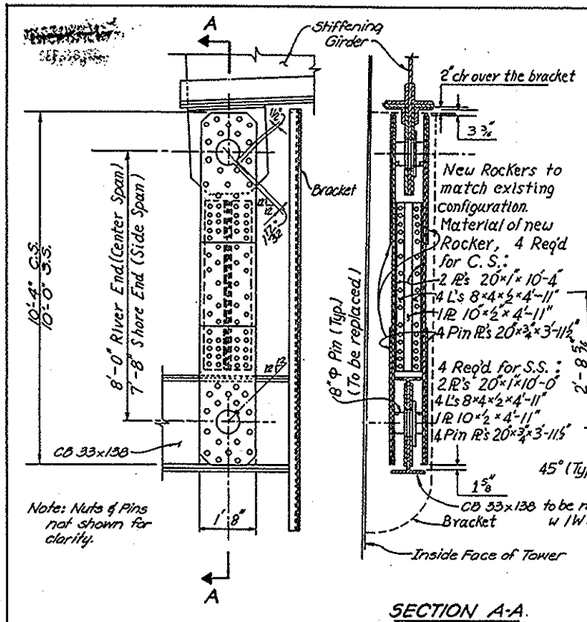
Side Span Pin Load Rating Calculations

Tower Link Pin Load Rating Summary

	Side Span Tower Link Pin Load Rating Summary			
	INV	OPR	$HS20_{INV}$ (TON)	$HS20_{OPR}$ (TON)
Pin Shear	8.940	12.442	321	447
Bearing on Pin	2.548	3.539	91	127
Pin Bending	3.573	3.939	128	141

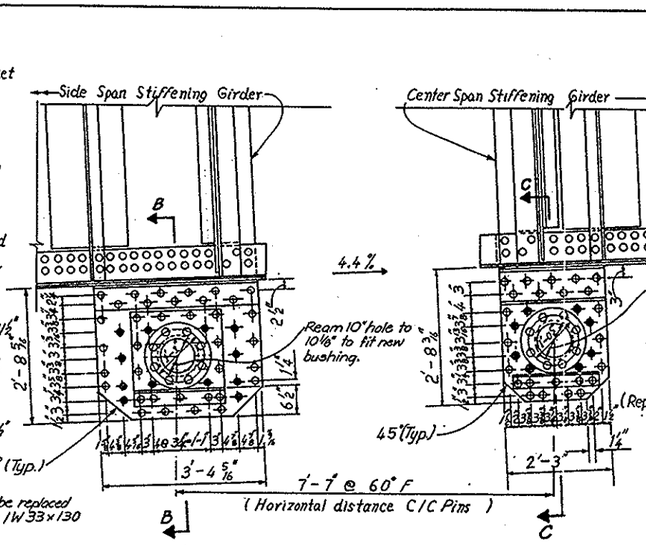
BR-29-88

FHWA REGION	STATE	PROJECT	TYPE FUNDS	20/21
5	OHIO			

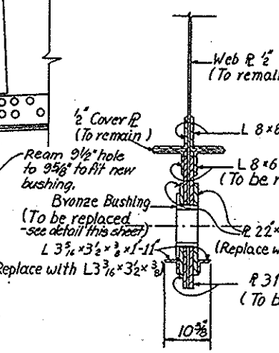


SECTION A-A

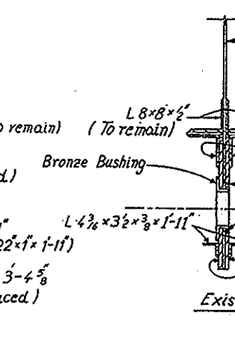
EXISTING AND PROPOSED PINNED ROCKER



ROCKER TOP LINK CONNECTION DETAIL

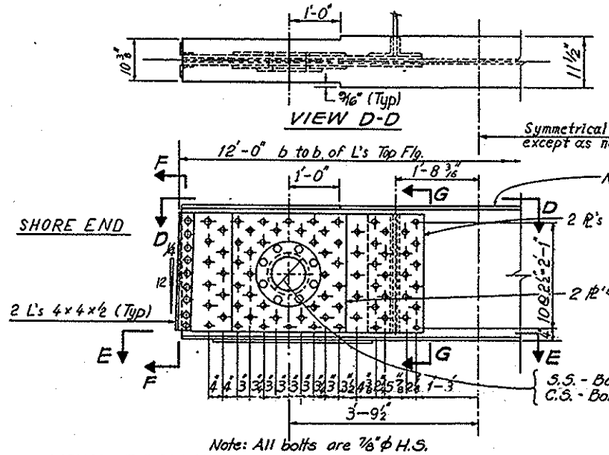


SECTION B-B

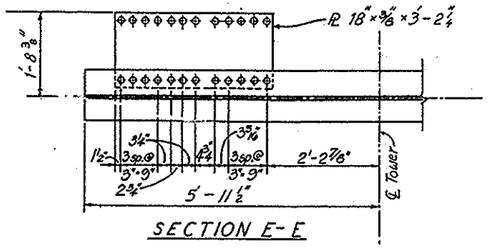


SECTION C-C

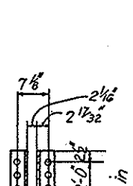
ALL MOVING CONTACT SURFACES SHALL BE LIBERALLY GREASED WITH AUTOMOTIVE TYPE MULTI-PURPOSE GREASE OR BALKAMP ANTI-SEIZE COMPOUND BEFORE ASSEMBLY.



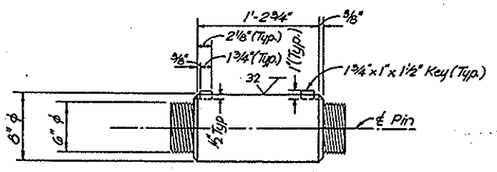
NEW ROCKER BOTTOM LINK CONNECTION DETAIL



SECTION E-E

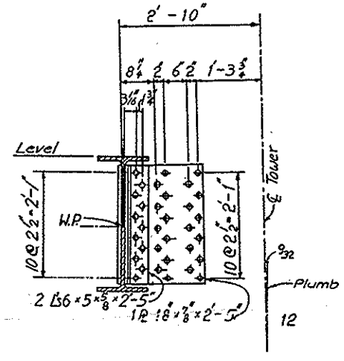


SECTION F-F

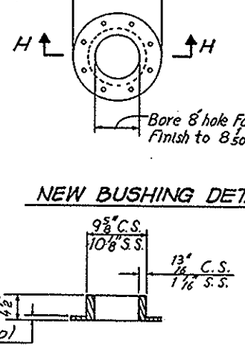


Pin Nuts: Use Recessed Pin Nut with ¾" ϕ Cotter Pin or locknut.

NEW PIN DETAIL



SECTION G-G



NEW BUSHING DETAIL

SECTION H-H

W.P. denotes Work Point.
C.S. denotes Center Span.
S.S. denotes Side Span.

NOTES

The intent is to replace Pinned Rocker Members per the original drawing except:

1. One additional set of plates has been added at River Side Connection: (top and bottom connection) to increase the bearing capacity.
2. The supplier of the Bronze Bushing Material shall provide certification as to the chemical and mechanical properties of the Bronze Bushing Material stating that said material conforms to ASTM-B-150 Alloy 2, such as that manufactured by AMPCO or OEMMCO.
3. New Pin material to be ANSI 1045 New pins should be accurately turned to gage; they shall be straight and smooth and entirely free from flaws.
4. All ⅞" rivets removed will be replaced by ⅞" ϕ High Strength Bolts unless noted otherwise. Ream shaded holes to 1⅛" ϕ. Replace these bolts and/or rivets with 1" ϕ High Strength Bolts.
5. The new bushing will be fastened using new ⅞" ϕ High Strength Bolts.
6. All the dimensions of the materials replaced and/or added shall be field verified by the contractor.
7. For further details regarding existing conditions, contractor shall refer to original drawings available for viewing at City of Toledo, Div. of Streets, Bridges & Harbor. Location: 1189 W. Central Ave, Toledo, Ohio, 43610.
8. This drawing shall be worked in conjunction with the original shop drawings.
9. All structural steel should be ASTM A36 unless specified otherwise; all High strength Bolts should be ASTM A325 unless specified otherwise.
10. For further information see General notes.

ENGINEERS ARCHITECTS PLANNERS
1001 MADISON AVE TOLEDO, OHIO

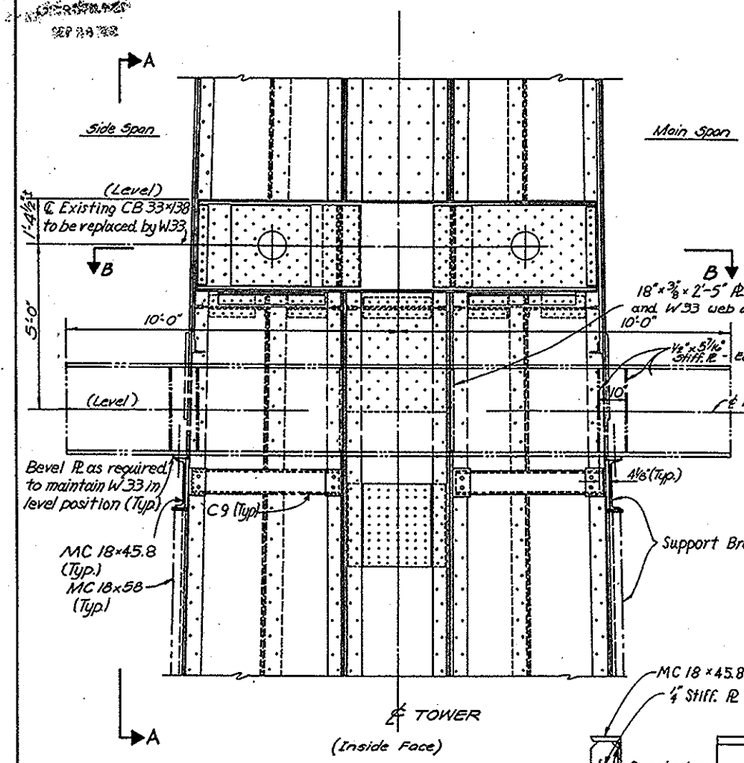
State Route 2 over Maumee River
Bridge Nº LUC-2-1868
PINNED ROCKER MEMBERS

Lucas County Toledo, Ohio

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	REVISED
NH	NH	—	BJH	MRT 10-18-88	NH/MRT 3-7-89

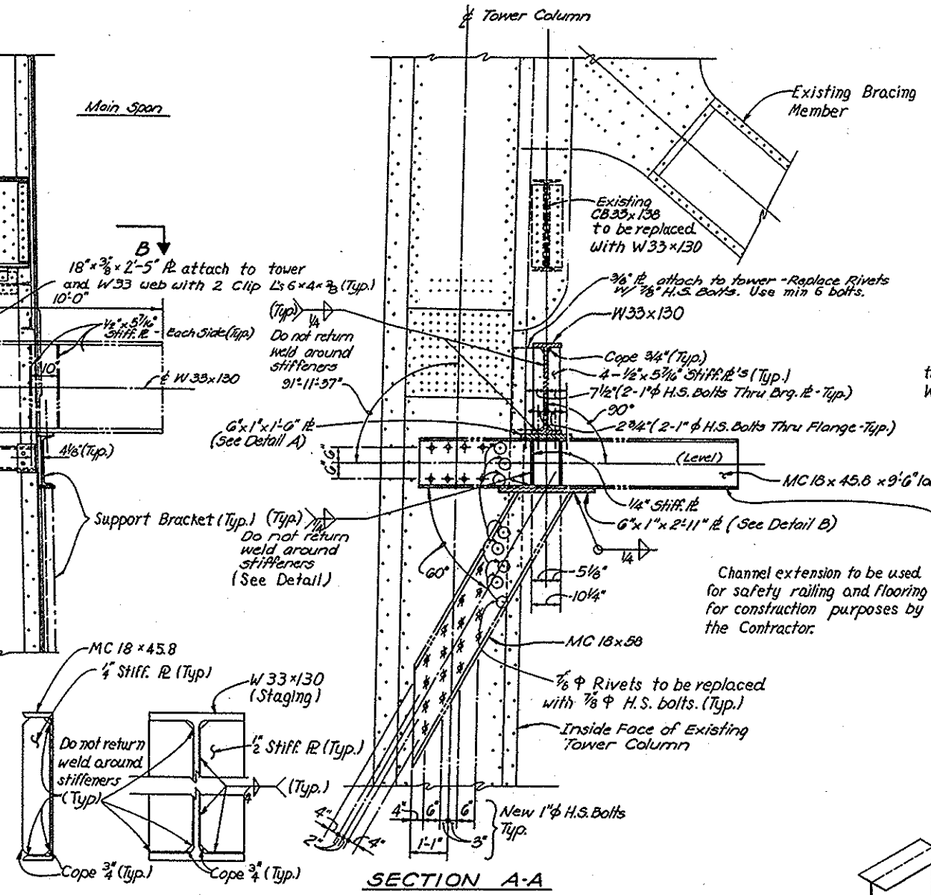
BR-29-88

FHWA REGION	STATE	PROJECT	TYPE FUNDS	21 / 21
5	OHIO			

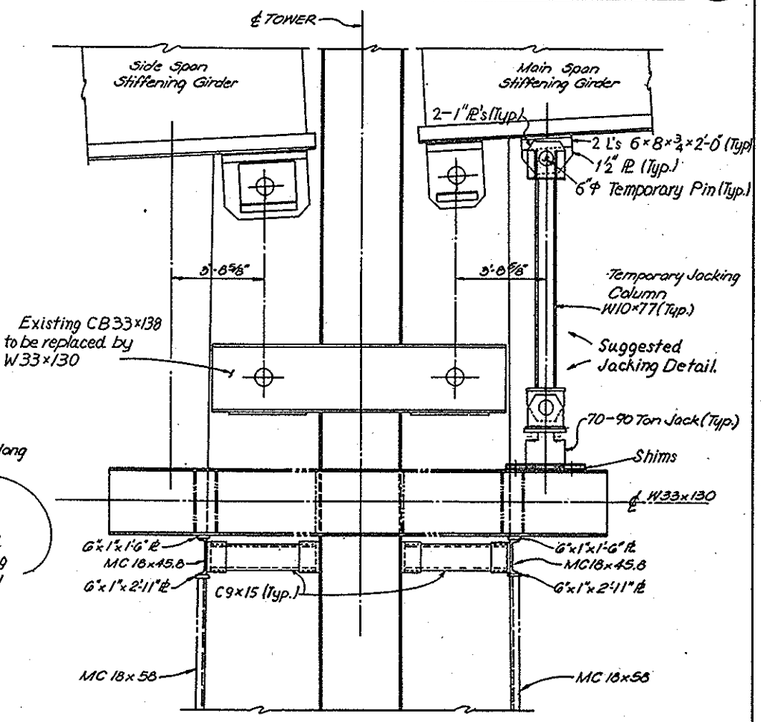


TYPICAL STAGING PLATFORM ATTACHMENT TO TOWER DETAIL

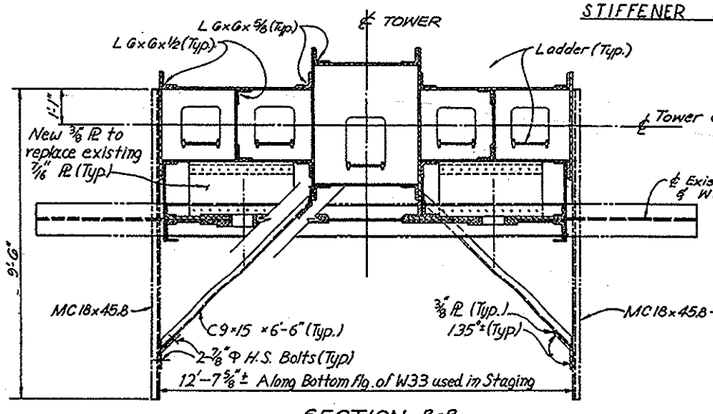
STIFFENER DETAILS



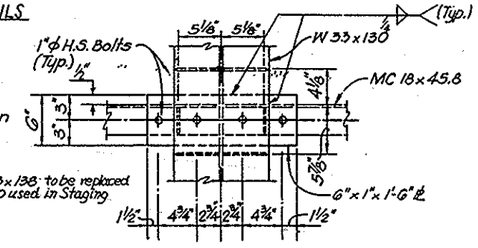
SECTION A-A



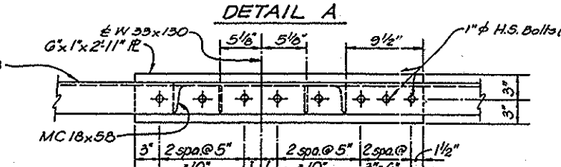
TYPICAL JACKING SUPPORT DETAIL



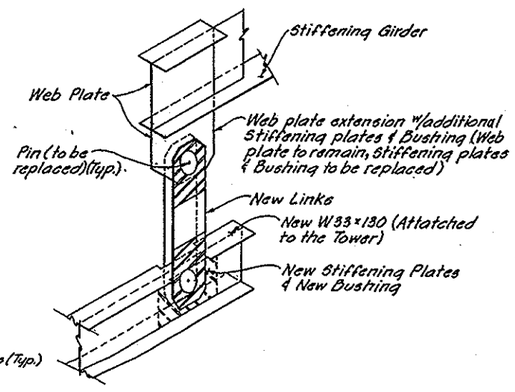
SECTION B-B



DETAIL A



DETAIL B



PINNED ROCKER ASSEMBLY
Not To Scale

NOTES

1. All new bolts for support brackets will be 1"ϕ H.S.Bolts. Only the location of the new 1"ϕ bolts is shown.
2. Those existing rivets that are removed during the installation of the staging platform will be replaced where possible with ⅞" ϕ H.S. Bolts. This will necessitate the field drilling of the new support brackets.
3. For the 1"ϕ bolts, subdrill holes to 1⅜" ϕ and ream to 1½". For the ⅞"ϕ bolts use existing holes without reaming them.
4. All 1"ϕ new bolts will be A325 with washers.
5. This drawing shall be worked in conjuction with sheet 20 of 21.

For further explanation and instruction see the General Notes.

ENGINEERS ARCHITECTS PLANNERS
1001 MADISON AVE TOLEDO, OHIO

State Route 2 over Maumee River
Bridge No. LUC 2 1868
PINNED ROCKER MEMBERS
STAGING DETAILS
Lucas County Toledo, Ohio

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	REVISED
NH	BW	—	BJH	MRT 10-18-88	

Tower Link Loads

The tower link loads were generated using an in-house program. Due to the nonlinear behavior inherent to suspension bridges, the loads will be given in the format as shown below.

The live load has been developed from the AASHTO Standard Specifications using the HS20 lane load plus concentrated point load. The impact factor was calculated conservatively assuming the load is spread over 200 ft feet and is applied to both the lane and point load. The live load distribution factor is based on the lever rule with 3 lanes loaded. The sidewalk load is also applied as a live load.

The temperature rise is assumed to be +70 degrees and the temperature fall is assumed to be -50 degrees.

Tower Link Unfactored Forces (kips)				
Load Combinations	Side Span		Main Span	
	Max	Min	Max	Min
Dead Load	4	0	0	-5
Dead Load and Temperature Rise	0	-4	6	0
Dead Load and Temperature Fall	9	0	0	-13
Dead Load and Live Load	137	-148	137	-128
Dead Load, Temperature Rise, and Live Load	129	-157	148	-117
Dead Load, Temperature Fall, and Live Load	143	-142	128	-136

APPENDIX F

Deck Efflorescence Material Testing Results

Inductive Coupled Plasma Test

Client:	**Gannett Fleming, Inc.**	CTL Project No:	**059359**
Project:	**Efflorescence sample**	CTL Project Mgr.:	**Jan Vosahlik**
		Analyst:	**Mehdi Khan**
Contact:	**Cole Marburger**	Approved:	**Sai Vaidya**
Submitter:	**Cole Marburger**	Date Analyzed:	**September 14, 2020**
Date Received:	**August 10, 2020**	Date Reported:	**September 14, 2020**

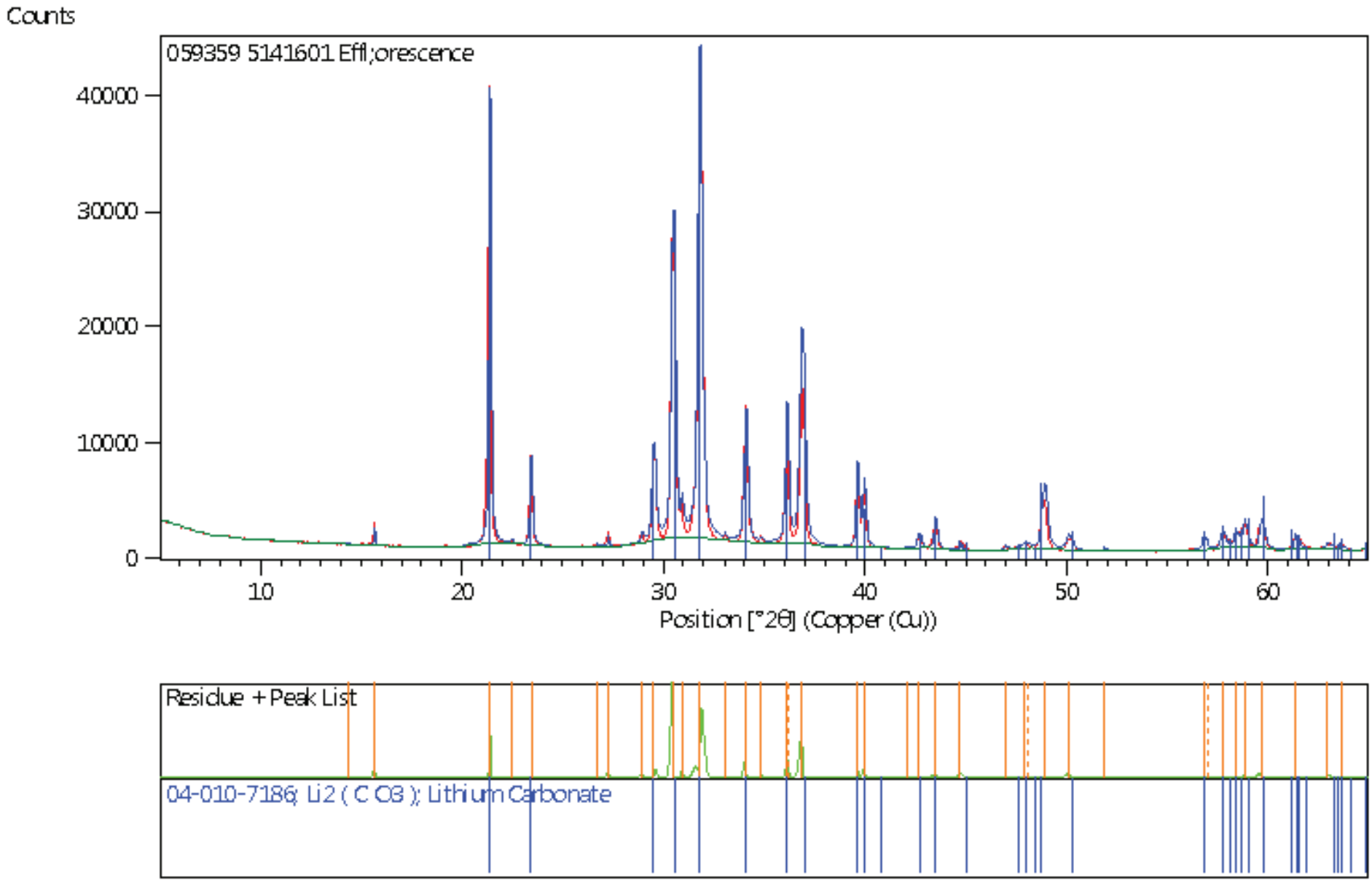
REPORT of ANALYSIS

Client's Sample ID:	Efflorescence
Material Type:	Unknown
CTL's Sample ID:	5141601
Test Method :	3010A METALS

Analyte	(mg/L)
Lithium (Li)	202000

Notes:
1. These analyses represent specifically the samples submitted.
2. Testing was conducted in accordance with referenced test method of EPA SW-846 Revision 5, 1998.
3. Mercury was analyzed by EPA Method 7473, Direct Mercury Analysis.
4. This report may not be reproduced except in its entirety.

X-Ray Diffractogram of Efflorescence Sample



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