

BRIDGE NO.: 104-1801 STRUCTURE INSPECTION REPORT

TYPE OF REPORT: REGULAR

BRIDGE NAME: BELMONT BRIDGE

DIRECTION: NORTH (MARKET ST.) TO SOUTH (GARRETT ST.)

ROUTE NO.: ROUTE 20 / AVON STREET



CITY OF CHARLOTTESVILLE
DEPARTMENT OF NEIGHBORHOOD
DEVELOPMENT SERVICES



MMM  **DESIGN
GROUP**
ARCHITECTS + ENGINEERS + PLANNERS

INSPECTION DATE: SEPTEMBER 2010

STRUCTURE INSPECTION REPORT – COVER PHOTOS

Agency ID: 1041801-00000000020087

Date of Inspection: 09/02/2010



ROADWAY LOOKING NORTH



ROADWAY LOOKING SOUTH

STRUCTURE INSPECTION REPORT – COVER PHOTOS

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WEST ELEVATION



EAST ELEVATION

STRUCTURE INSPECTION REPORT SUMMARY SHEET OF RATING CALCULATIONS

Agency ID: 1041801-00000000020087 **Date of Inspection:** 09/02/2010

City of Charlottesville
 Bridge No. 1801
 Rte. 20 (9th Street) over CSX Railway and Water Street

In-Depth Bridge Inspection &
 Load Rating Analysis
 December 2007



SUMMARY SHEET OF RATING CALCULATIONS

Rte.: 20

Over: CSX Railway and Water Street

City: Charlottesville

Method: Load Factor

Str. No.: 1801

Rated by: TRV **Date:** 12/07

Checked by: PDQ **Date:** 12/07

POSTING RATING - VIRGINIA'S LEGAL LOADS (at Midway between Inventory and Operating)

Single Unit Truck	<u>44.8</u>	Tons	- Controlling Member	<u>Span G, Beam L</u>
Truck and Semi-Trailer	<u>59.8</u>	Tons	- Controlling Member	<u>Span G, Beam L</u>

NBIS RATINGS

HS20 - at Inventory	<u>31.9</u>	Tons	- Controlling Member	<u>Span G, Beam L</u>
HS20 - at Operating	<u>53.2</u>	Tons	- Controlling Member	<u>Span G, Beam L</u>
HS20 - Rating Load	<u>42.5</u>	Tons		

Note: The rating is the gross tonnage on an HS20 vehicle

BLANKET PERMIT RATING (at Operating)

90,000 # vehicle	<u>65.7</u>	Tons	- Controlling Member	<u>Span G, Beam L</u>
115,000 # vehicle	<u>76.7</u>	Tons	- Controlling Member	<u>Span G, Beam L</u>

STRUCTURE INSPECTION REPORT – SUMMARY

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COMPONENT RATINGS

36 TRAFFIC SAFETY FEATURES	
1. Bridge Railing	0
2. Transition	0
3. Approach Guardrail	0
4. Approach Guardrail Terminal	0

58 DECK		4
1. Wearing Surface		G
2. Deck Structural Condition		F
3. Curbs		P
4. Median		F
5. Sidewalks		P
6. Parapet		G
7. Railing		F
8. Drains		-
9. Lighting		F
10. Utilities		G
11. Expansion Joints		P

59 SUPERSTRUCTURE		5
1. Bearing Devices		P
2. Stringers		-
3A. Girders or Beams, General		F
3B. Diaphragms or Cross Frames		F
3C. Bracing		-
4. Floor Beams		-
5A. Trusses, General		-
5B. Portals		-
5C. Bracing		-
6. Paint		P
Year Painted	1986	
7. Machinery (Movable Span)		-

60 SUBSTRUCTURE		5
1. Abutments		
1A. Wings		G
1B. Backwalls		F
1C. Bearing Seats		F
1D. Breastwalls		G
1E. Weep Holes		-
1F. Footings		*
1G. Piles		*
1H. Erosion/Scour/Undermining		G
1I. Settlement		G
2. Piers or Bents		
2A. Caps		F
2B. Bearing Seats		F
2C. Columns, Stem or Wall		G
2D. Footings		*
2E. Piles		-
2F. Bracing		-
2G. Erosion/Scour/Undermining		G
2H. Settlement		G
3. Pile Bents		
3A. Caps		-
3B. Bearing Seats		-
3C. Piles		-
3D. Bracing		-

61 CHANNEL & SLOPE PROTECTION		F
1. Channel Scour		-
2. Embankment Erosion		G
3. Drift		-
4. Vegetation		G
5. Fender Systems		-
6. Spur Dikes & Jetties		-
7. Rip Rap or Slope Protection		F
8. Adequacy of Opening		-

Attachments

- Photos
- Location Map
- Fatigue Prone Detail
- VDOT Bridge Condition Code Key
- Vertical Clearance
- Summary sheet of Rating Calculations
- Component Detail Sheets

FIELD POSTING		N/A
R12-1		-
R12-5 Type 3		-
R12-5 Type 3S2		-
1. Legibility		-
2. Visibility		-

*Not Visible

See attached VDOT Bridge Condition Code Key for rating descriptions.

STRUCTURE INSPECTION REPORT – COMMENTARY

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Cnty/City: Charlottesville **Feature Intersected:** CSX Railroad & Water Street
Main Route: 20 (9th Street) **Facility Carried:** 9th Street/Belmont Bridge
Location: 9th Street over CSX Railroad, Water Street and City Parking
Lead Inspector: Daniel Hyer, EIT, NHI Certified Inspector
Additional Inspector(s): Benjamin Hays, SE, NHI Certified Inspector

Signature of Lead Inspector		
Signature of Reviewer		

DESCRIPTION	Seven Span Concrete Deck, Steel Beams on Concrete Substructure. 452'-5" Long Total.
ORIENTATION	Abutment A – South (Monticello Ave. Side) to Abutment B – North (Market Street Side) Bridge Components are numbered from the West. See attached Location Map.
MISCELLANEOUS (Structure specific items that cannot be included in another section.)	<u>Structure Location Coordinates</u> Latitude: +38.028542 Longitude: -78.476569 <u>Vertical Clearance</u> Minimum bridge under clearance was checked. The minimum vertical clearance over Avon St. has been lowered due to security camera control box attached to the underside of the east exterior beam. See attached Vertical Clearance Sheet. <u>Inspection Interval</u> 12 months Note: Areas listed in bold and italics throughout the body of the Commentary Section represent areas of increased deficiencies or new problem areas noted since the previous inspection.
SPECIAL REQUIREMENTS (Special Equipment needed or Special Inspections required such as: Fracture Critical, Underwater, Fatigue Prone, Scour Critical, Moveable Bridge, Segmental Concrete, Pin and Hanger, etc.)	<u>Access Equipment</u> The superstructure was accessed with a bucket van. See Photo #1 <u>Fatigue Prone Details</u> This structure contains the following fatigue prone details Category D or higher: <ul style="list-style-type: none"> • End welds along beam bottom flange cover plates. • Diaphragm connection plates welded to beams webs. (Structure does not carry the required 500 trucks/day required for "hands-on" inspection.) See attached Fatigue Prone Detail Sheet for locations.
WORK DONE	<ul style="list-style-type: none"> • Entire Deck has been covered with approximately 2" of new asphalt overlay.

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STRUCTURAL ANALYSIS	<p>Load Rating was performed December 2007.</p> <p>See attached Summary Sheet of Rating Calculations.</p>
OVERALL CONDITION	POOR
RECOMMENDATIONS	<p>The following deficiencies should receive <u>special</u> attention and take priority over routine maintenance work:</p> <ol style="list-style-type: none"> 1. Repair security lights in Spans A and C. 2. Repair spalled / delaminated concrete on east (NBL) sidewalk immediately or block pedestrian access to the sidewalk. 3. Replace light pole base plate cover to protect wiring (southern most lightpole on east side of bridge) <p>The following deficiencies should receive <u>special</u> attention and take priority over routine maintenance work:</p> <ol style="list-style-type: none"> 1. Clean and paint structural steel. 2. Clean and reseal deck expansion joints. 3. Replace concrete deck. 4. Install guardrail to conform to current standards. 5. Repair spalled/delaminated concrete Pier 5 cap. 6. Repair all spalled/delaminated concrete on east (NBL) curb. 7. Seal gap at top of slope protection, Abutment A. 8. Reseal joint between bottom of columns and slope protection, Pier 6. <p>The following deficiencies should be addressed in the course of <u>routine</u> maintenance:</p> <ol style="list-style-type: none"> 1. Remove debris from abutment and pier bearing seats.
<p>DECK</p> <p style="padding-left: 20px;"><u>Wearing Surface</u></p> <p style="padding-left: 20px;"><u>Deck Structural Condition</u></p>	<p style="text-align: right;">GENERAL CONDITION RATING [4]</p> <p>Good (<i>Asphalt overlay</i>)</p> <ul style="list-style-type: none"> • The entire deck has been overlaid with 2" of asphalt. See Photo #2 <p>Fair</p> <p><i>Topside</i></p> <ul style="list-style-type: none"> • Not visible below wearing surface except at the concrete-armored expansion joints over each abutment where moderate spalling and cracking is evident. Also see MMM Report, Appendix C, dated August 2003 for findings of Deck Condition. • Edge spalling along deck joints typically 12" long x 3" wide x 1" deep. • Several edge spalls have been patched with asphalt in the past. <p><i>Bottom of Deck</i></p> <ul style="list-style-type: none"> • Map cracking, moisture seepage, efflorescence (typical throughout) and smoke staining (over tracks). • Plywood forms on soffit at the repaired areas sidewalk remain. • Delamination and spalling evident at isolated locations throughout. • Abutment A, Bay 1; 2-1/2' long x 6" wide x 1" deep spall with exposed reinforcing. • Span 3, Bay 7; heavy efflorescence formations up to 12" long. • Span 4, Bay 4; 100 SF delamination <p><i>Median Overhangs</i></p> <ul style="list-style-type: none"> • Cover spalls throughout with exposed reinforcing (reinforcing chairs) spaced approximately 6" on center. • Span 4, Bay 4, efflorescence at midspan.

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	<p>See attached Component Detail Sheet.</p> <p><u>Curbs</u> Poor</p> <ul style="list-style-type: none"> • Heavy spalling and delamination over approximately 20 LF with exposed reinforcing in Span e of the northbound curb. See Photo #3 • Isolated areas of delamination and spalling noted throughout the remainder of the curbs. • Span B SB Lane 30 LF damaged curb (Patch failure) <p><u>Median</u> Fair</p> <ul style="list-style-type: none"> • Areas of cracking and spalling above the deck throughout and extensive wire reinforcing exposed and rusting below the deck. • Minor areas of vegetation growing along both sides of median at isolated locations. • 8 SF of median missing. See Photo #4 <p><u>Sidewalks</u> Poor</p> <ul style="list-style-type: none"> • Delamination, spalling, transverse cracking and areas of scaling (20-25%) with exposed reinforcing, primarily on the east (NBL) side. • Areas of previous patching at random locations throughout. • Minor areas of vegetation growing from sidewalk in spalled areas at isolated locations throughout. • Full depth spall 6" wide over pier 3, up to half width of sidewalk, rebar is exposed. See Photo #5 • Span E, 20 SF spalled concrete. Tripping hazard. • Settlement of sidewalk at Abutment A, up to 2" <p><u>Parapet</u> Good</p> <ul style="list-style-type: none"> • Minor areas of scale at isolated locations throughout. <p><u>Railing</u> Fair</p> <ul style="list-style-type: none"> • Areas of minor scale at isolated locations throughout. • Collision damage remnants SB rail Span E. See Photo #6 • Spall at railing along SB lane midpoint of span E; 4" diameter. <p><u>Lighting</u> Fair</p> <p><i>Span a, underside of deck</i></p> <ul style="list-style-type: none"> • Two light covers broken and filled with debris; both bulbs are out. Lack of illumination in Span A allows Abutment A to also be a dark area which could become a security issue allowing several dark areas adjacent to parking. <p><i>Span a, topside</i></p> <ul style="list-style-type: none"> • Electric cover at the base of light pole has only 1 bolt securing cover. <p><i>Span c, underside of deck</i></p> <ul style="list-style-type: none"> • West light operates on and off intermittently. <p><u>Utilities</u> Good</p> <p><i>Span f</i></p> <ul style="list-style-type: none"> • Utility support bracket is not attached and utility is sagging. <p><i>Security Camera</i></p> <ul style="list-style-type: none"> • Security camera added to one light pole on the east side of structure in Span E. • Light pole at abutment A along Northbound Traffic is completely missing access hatch at base of light pole and "hot" wires are visible. <p><u>Expansion Joints</u> Poor</p> <ul style="list-style-type: none"> • Joints are deteriorated full length typical throughout and recessed up to 5".
<p>SUPERSTRUCTURE</p>	<p>GENERAL CONDITION RATING [5]</p>

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Bearings Devices**GIRDERS, BEAMS OR
SLABS****Poor**

- Areas of surface rust and rust scale typical throughout with up to 1/16" loss of section at isolated locations throughout. Several bearings are covered with a thick overlay of gunite overspray from recent pier cap repairs. See Photo #7

Fair

- Steel beam ends have moderate to heavy corrosion and exhibit section loss (0-10%). See Photo #8
- Smoke staining over tracks is accelerating corrosion and specifically bottom flange cover plates and welds show light to moderate corrosion.
- Ends of beams are covered with gunite overspray from previous cap repairs.

Specific conditions of rust scale and section loss along the beams are as follows:

*Span a (1)*Abutment A

- Beam 2, 1/16" loss of section on bottom of bottom flange, extending up to 1' out from bearing x full flange width.
- Beam 6, up to 1/16" loss of section on top of bottom flange along web, 4' long x up to 3" wide.

Pier 1

- Beam 7, Web; 36" long x 2" high x 1/16" loss of section. **Bottom Flange; 36" long, x 6" wide x 1/16" loss.**
- **Beam 8, Web 8" long x 3" high x 1/16" loss.**
- Beam 9, Bottom Flange; 96" long x full width of flange x 1/32" loss of section. **Web; 18" long x 3" high x 1/16" loss**
- Beam 10, Top Flange; Peeling paint and rust scale 48" long x 2" wide x 1/32" loss of section.

*Span b (2)*Pier 1

- Beam 2, Bottom Flange; 12" long x full width x 1/32" loss of section.
- Beam 10, Bottom Flange; **18" long (6" increase)** x full width x 1/32" loss of section.

Pier 2

- Beam 2, Bottom Flange; 12" long x 6" wide x 1/16" loss of section.
- Beam 1, Web; 5' long x 10" high rust scale with up to **1/16" (1/32" increase)** loss of section. 6' long x 8" wide surface rust along bottom flange.
- Beam 6, Web; 24" long x 3" high x 1/32" loss of section.
- Beam 7, Web; 18" long x 6" high x 1/32" loss of section.
-

*Span c (3)*Pier 2

- Beam 5, Web; 18" long x 5" high x 1/32" loss of section.
- Beam 9, Web; 36" long x 6" high x 1/32" loss of section. End of Beam; full height x 6" wide x 1/32" loss of section.

Pier 3

- Beam 2; Bottom Flange; 18" long x 10" wide x 1/32" loss of section. **Bearing stiffener, south face, 24" tall x 6" wide x 1/32" loss of section.**
- Beam 6, Web; 12" long x 4" high x 1/32" loss of section.

*Span d (4)*Pier 3

- Beam 1, Top Flange; 36" long x **5" wide (increase of 1")** x 1/32" loss of section. **Web; 24" x 4" x 1/32" loss of section**
- Beam 2, Web; 24" long x 4" high x 1/16" loss of section.
- Beam 11, Web; 18" long x 5" high x 1/16" loss of section. Bottom Flange; 24' from Pier 3; **264" (24" increase)** long x full width x 1/16" loss of section.
- **Gunite spray is coming off Beam 12**

Pier 4

- Beams 1 and 2, Bottom Flange; 48" long x 6" wide x 1/32" loss of section.

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<p>Bearing Seats</p> <p>Walls</p> <p>Columns</p> <p>Footings</p> <p>Erosion/Scour/ Undermining</p> <p>Settlement</p>	<p>repaired; all delaminations and spalls chipped back to sound concrete and repaired. Repairs are sound. See Photo #10, #11</p> <p><i>Pier 3</i></p> <ul style="list-style-type: none"> • North Face 2 SF of delamination at repaired area under Beam 7. <p><i>Pier 4</i></p> <ul style="list-style-type: none"> • South face under Beam 9; Spall 18"x4" long with exposed rebar (previously noted as: 6 SF of delamination.) • Bay 9 horizontal crack 1/8" wide x 6' long. Spall 18"x4' long (south face) • Utility lines in front of cap prevent close-up inspection. • Below beam #2 crack & delamination on south face • Below Beam #11; spall 12" wide x 18" high with exposed rebar (south face) • Below Beam #12; spall 12" wide x 12" high with exposed rebar (north face) • Below Beam #11 1' diameter spall x 1" deep, 4 SF delamination <p><i>Pier 5</i></p> <ul style="list-style-type: none"> • Cracks up to 1/8" up to 3' long and areas of delamination throughout. <p><i>Pier 6</i></p> <ul style="list-style-type: none"> • Bay 10; 3 SF spall, excessive debris due to failed expansion joint material • Bay 4; 1 SF delamination <p>Fair</p> <ul style="list-style-type: none"> • Minor areas of debris accumulation at isolated locations. • Previous areas of spall have been repaired. • Cracks up to 1/8" present. See Photo #11 <p>Good</p> <ul style="list-style-type: none"> • Minor hairline to 1/32" wide vertical cracks along the crash wall. <p>Good</p> <ul style="list-style-type: none"> • No noteworthy deficiencies. <p><i>Not Visible. No indication of poor performance.</i></p> <p>Good</p> <ul style="list-style-type: none"> • No noteworthy deficiencies. <p>Good</p> <ul style="list-style-type: none"> • No noteworthy deficiencies.
<p>CHANNEL AND SLOPE PROTECTION</p> <p><u>Embankment Erosion</u></p> <p><u>Vegetation</u></p> <p><u>Slope Protection</u></p>	<p style="text-align: right;">GENERAL CONDITION RATING [F]</p> <p>Good</p> <p><i>Abutment A</i></p> <ul style="list-style-type: none"> • West side embankment erosion 20' long x 5' wide x up to 1' deep. Erosion appears to have stabilized. <p>Good</p> <ul style="list-style-type: none"> • Isolated areas of vegetative growth on slope protection. <p>Fair</p> <ul style="list-style-type: none"> • Full length separation crack at top of slope protection at Abutment A and settled up to 1"; crack is open up to 2" wide. Crack is allowing water to infiltrate and undermine slope protection up to 6" under at Bay 2. See Photo #12
<p>FIELD POSTING</p>	<p><i>This structure is NOT posted.</i></p>
<p>OTHER APPROACH PAVEMENT</p>	<p>Fair</p>

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**TRAFFIC SAFETY
FEATURES**

Bridge Railing

0 – Inspected feature does not meet current acceptable standards.

Transitions

0 – Inspected feature does not meet current acceptable standards.

Approach Guardrail

0 – Inspected feature does not meet current acceptable standards.

Approach Guardrail
Terminal

0 – Inspected feature does not meet current acceptable standards.

OBJECT MARKERS

None.

- North approach repaved.
- South approach repaved 6' long x full width.
- Approach sidewalks on both sides at south end have settled approximately 1"

STRUCTURE INSPECTION REPORT – PHOTOS

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Photo #1

MMM Inspector accessing Superstructure by means of a bucket van.



Photo #2

Looking north at SB traffic lanes. New 2" asphalt overlay has been applied.

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Photo #3

Looking east at curb along NB travel lane. Severe spalling and delamination damage to sidewalk poses danger to pedestrian and vehicular traffic.



Photo #4

Looking west at median damage. Approximately 8 SF of median is has broken off.

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Photo #5

Looking west at sidewalk along NB travel lanes. Sidewalk has spalled completely through deck. Damage is extensive and requires attention. Sidewalk currently poses a tripping hazard to pedestrians.



Photo #6

Looking west at railing along SB traffic lanes. Remnants of collision damage remain.

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Photo #7

Looking typical beam bearing area rust and section loss.



Photo #8

Looking north along west face of Beam 1 over Pier 2. Rust and section loss damage is typical throughout.

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Photo #9

Looking at a typical diaphragm; showing heavy corrosion with minor to moderate section loss up to 1/8" due to leaking construction and expansion joints



Photo #10

Looking north at cap of Pier 4; delamination and spalling with exposed reinforcing throughout pier caps.

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Photo #11

Looking at a pier cap below a beam bearing; cracking and rust staining throughout pier caps.



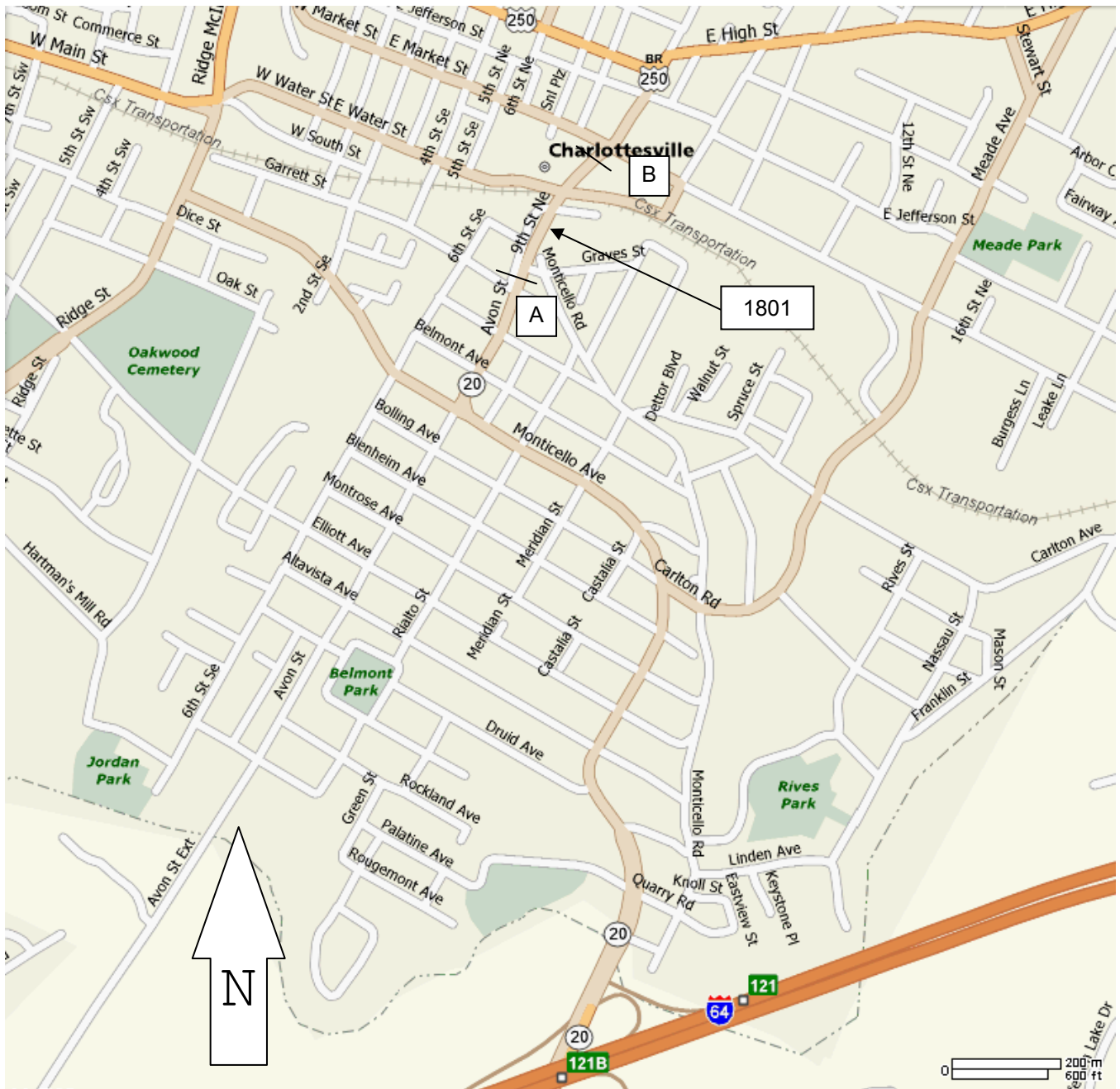
Photo #12

Looking west at Abutment A settlement; Full length separation crack at top of slope protection

STRUCTURE INSPECTION REPORT – LOCATION MAP

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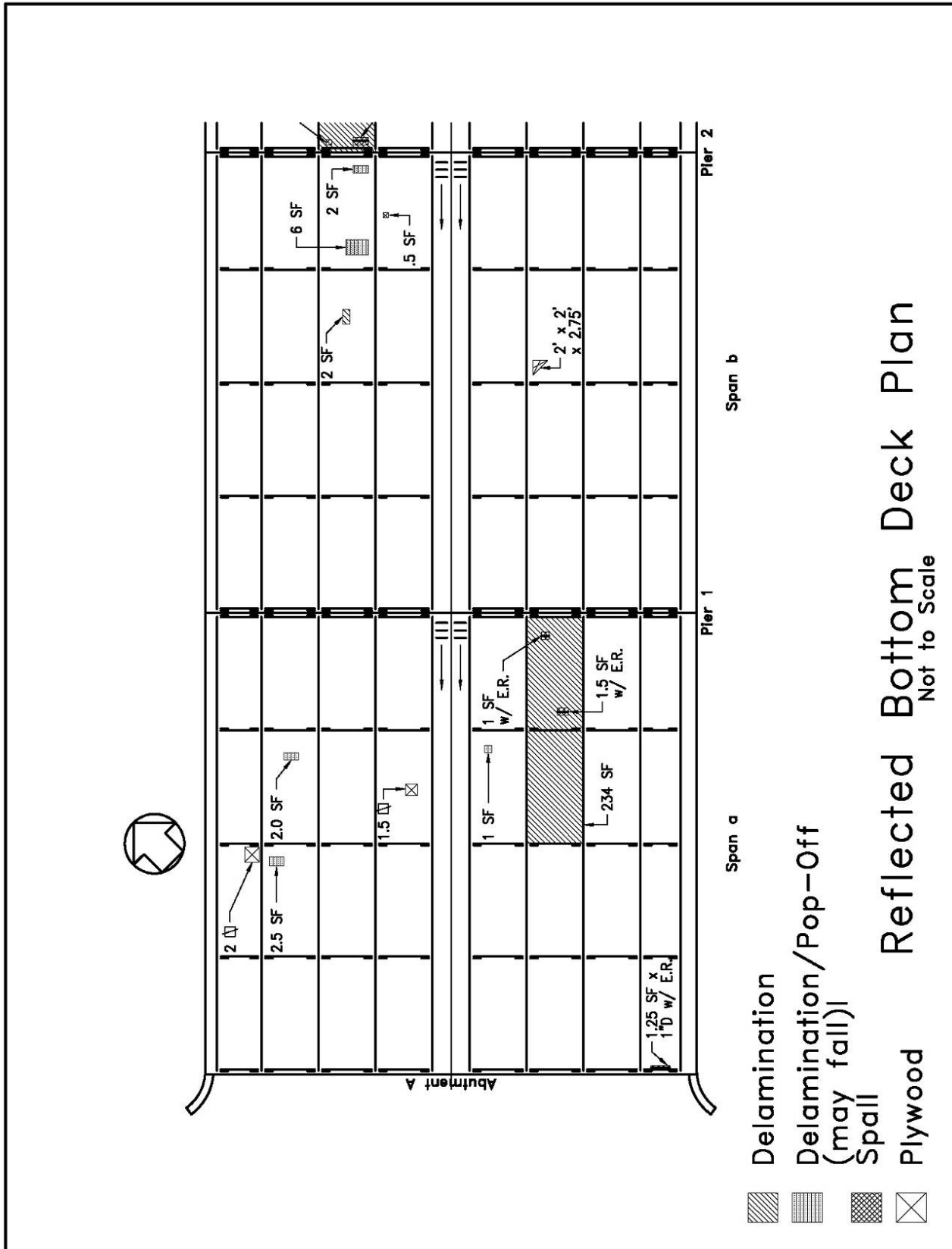
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STRUCTURE INSPECTION REPORT – COMPONENT DETAIL SHEET

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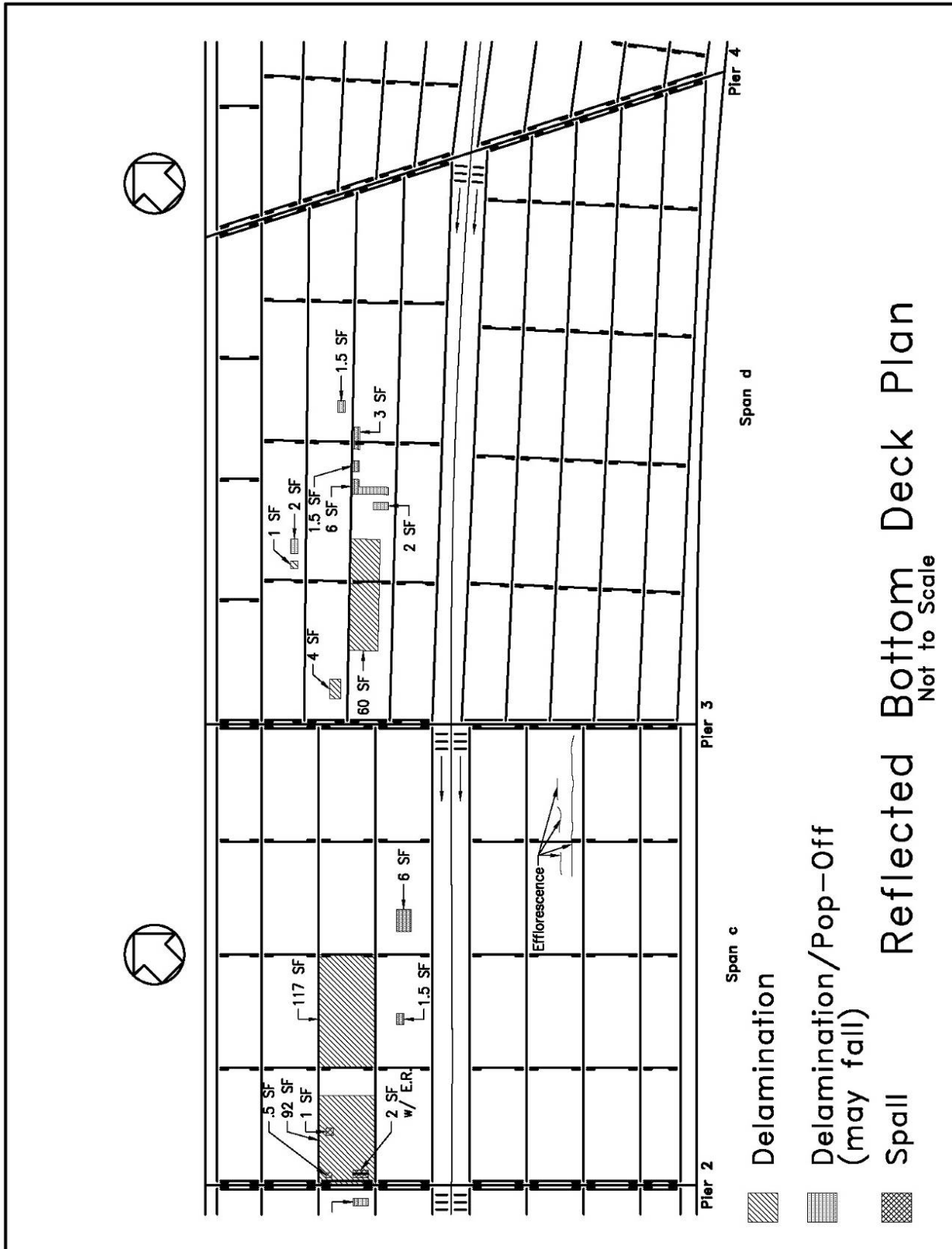
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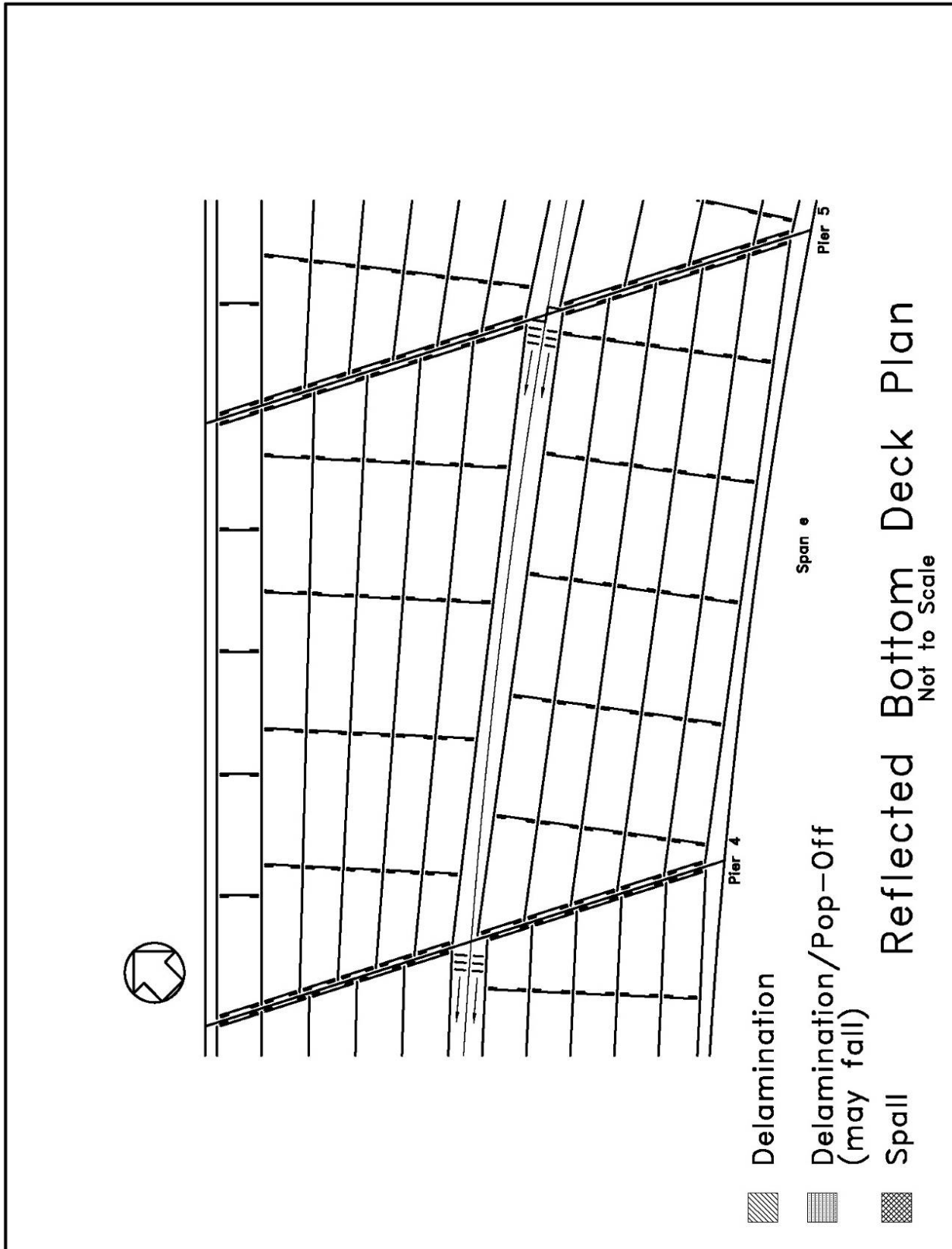
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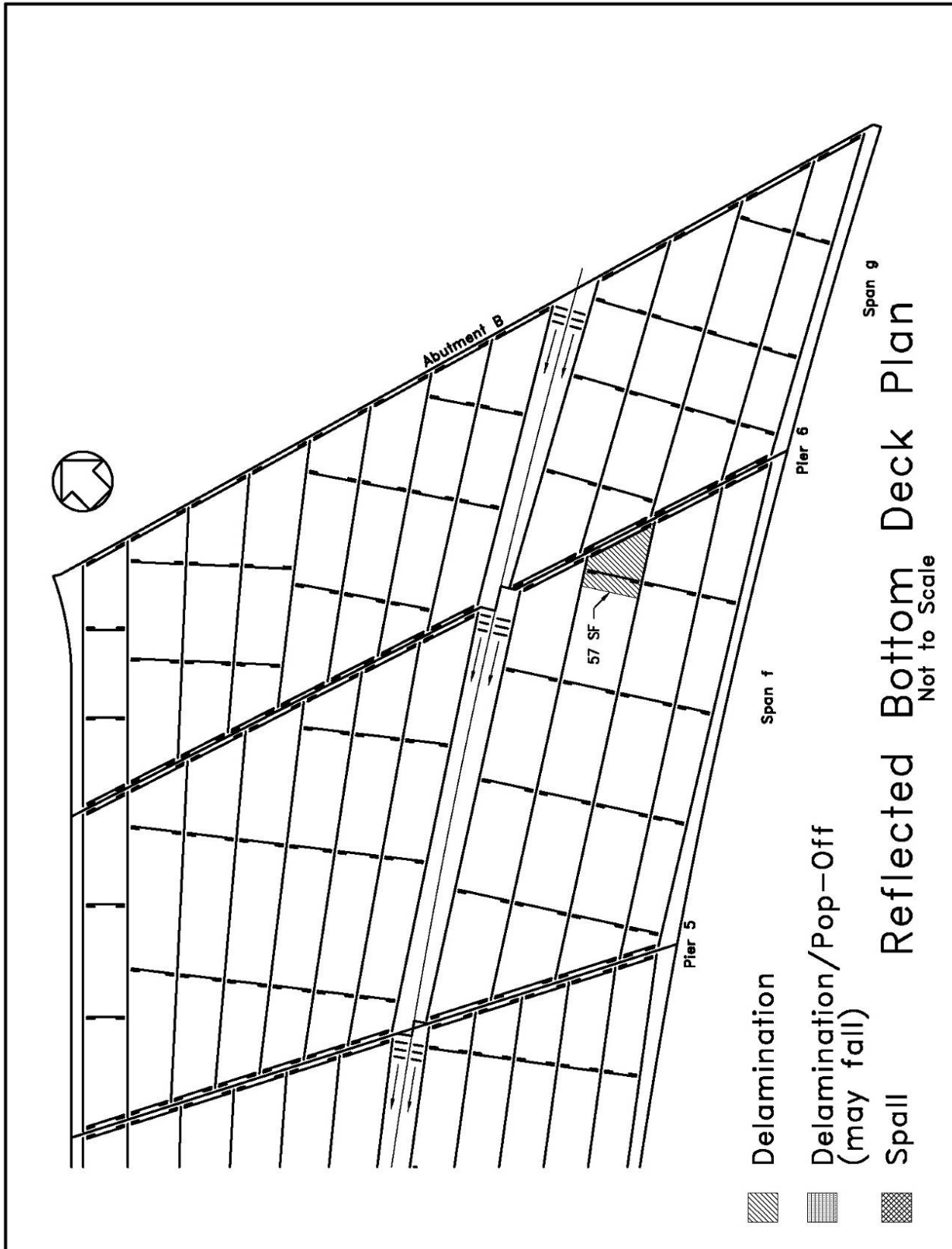
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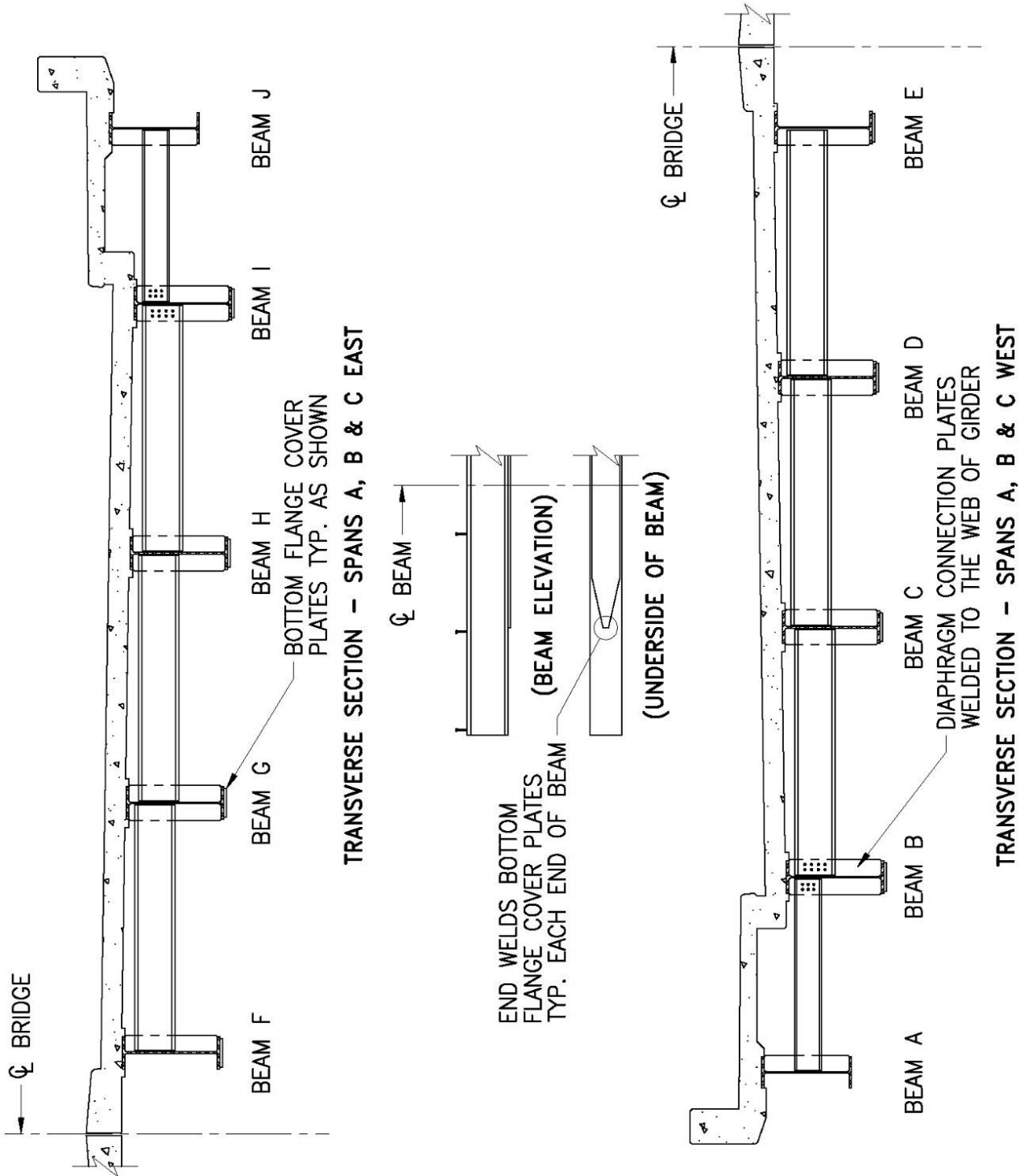


STRUCTURE INSPECTION REPORT – FATIGUE PRONE DETAIL

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FATIGUE PRONE DETAIL SKETCH



STRUCTURE#: 104-1801
CITY: CHARLOTTESVILLE

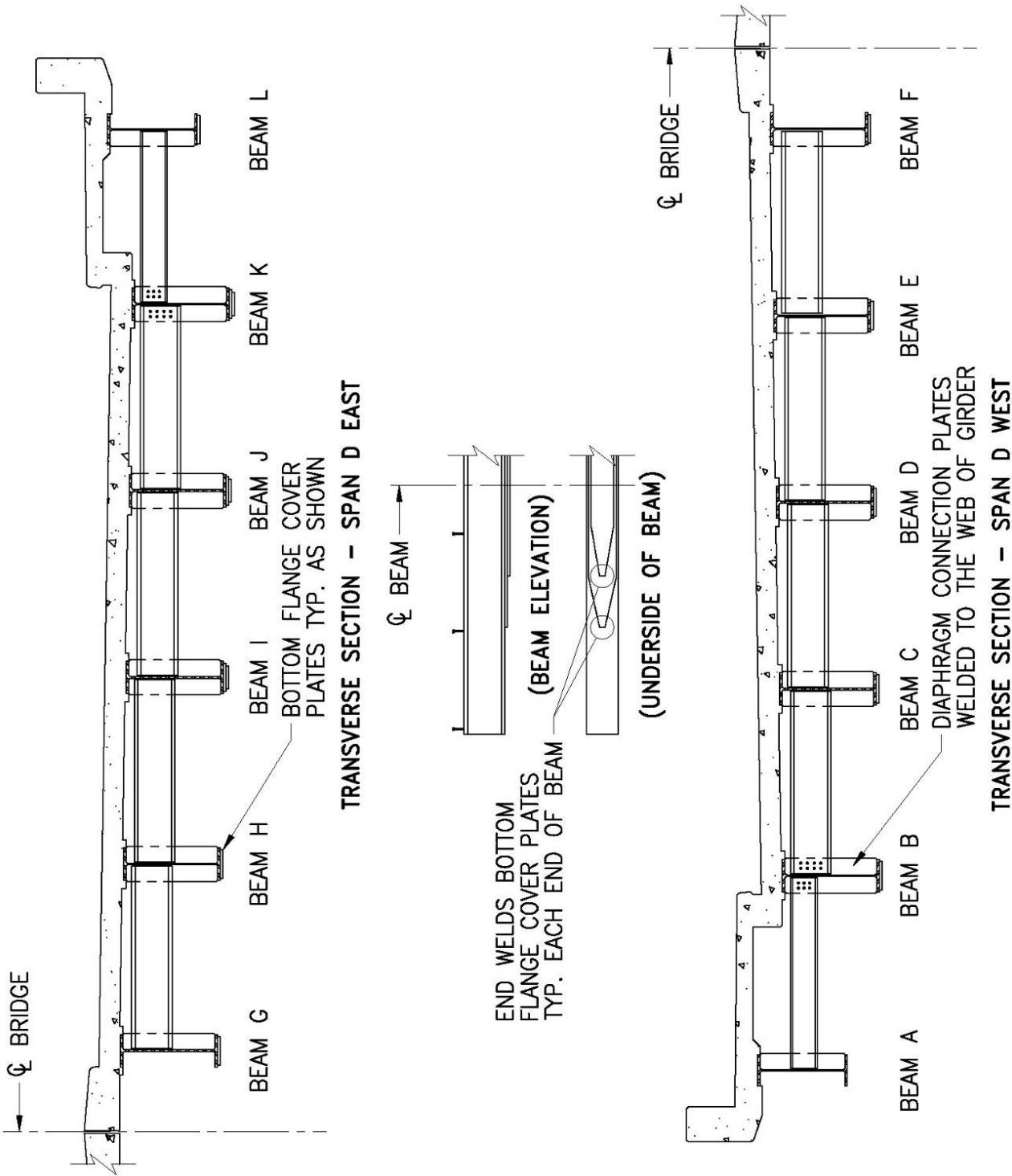
LOCATION: 9TH STREET OVER CSX

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FATIGUE PRONE DETAIL SKETCH



STRUCTURE#: 104-1801
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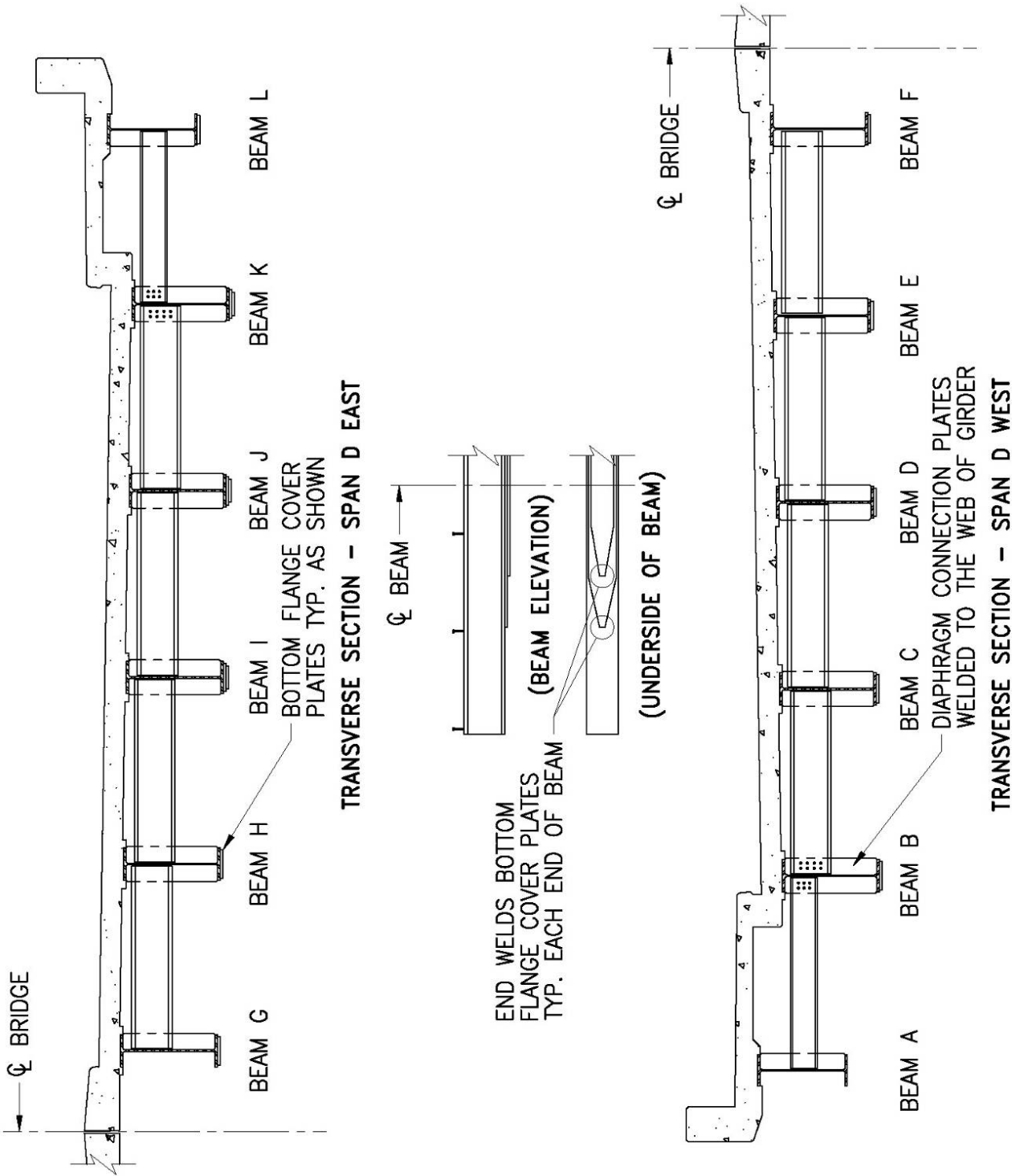
LOCATION: 9TH STREET OVER CSX

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FATIGUE PRONE DETAIL SKETCH



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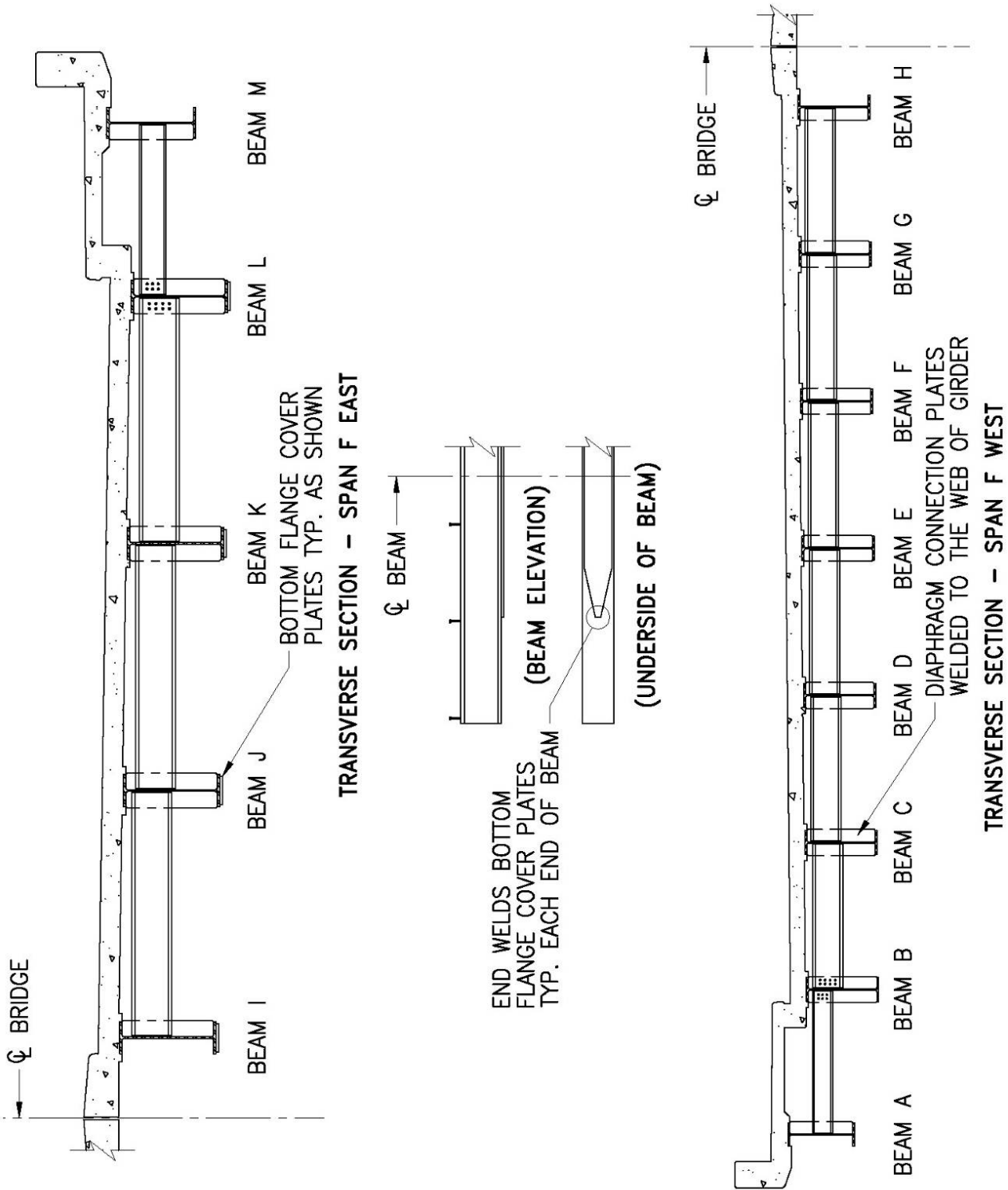
LOCATION: 9TH STREET OVER CSX

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FATIGUE PRONE DETAIL SKETCH



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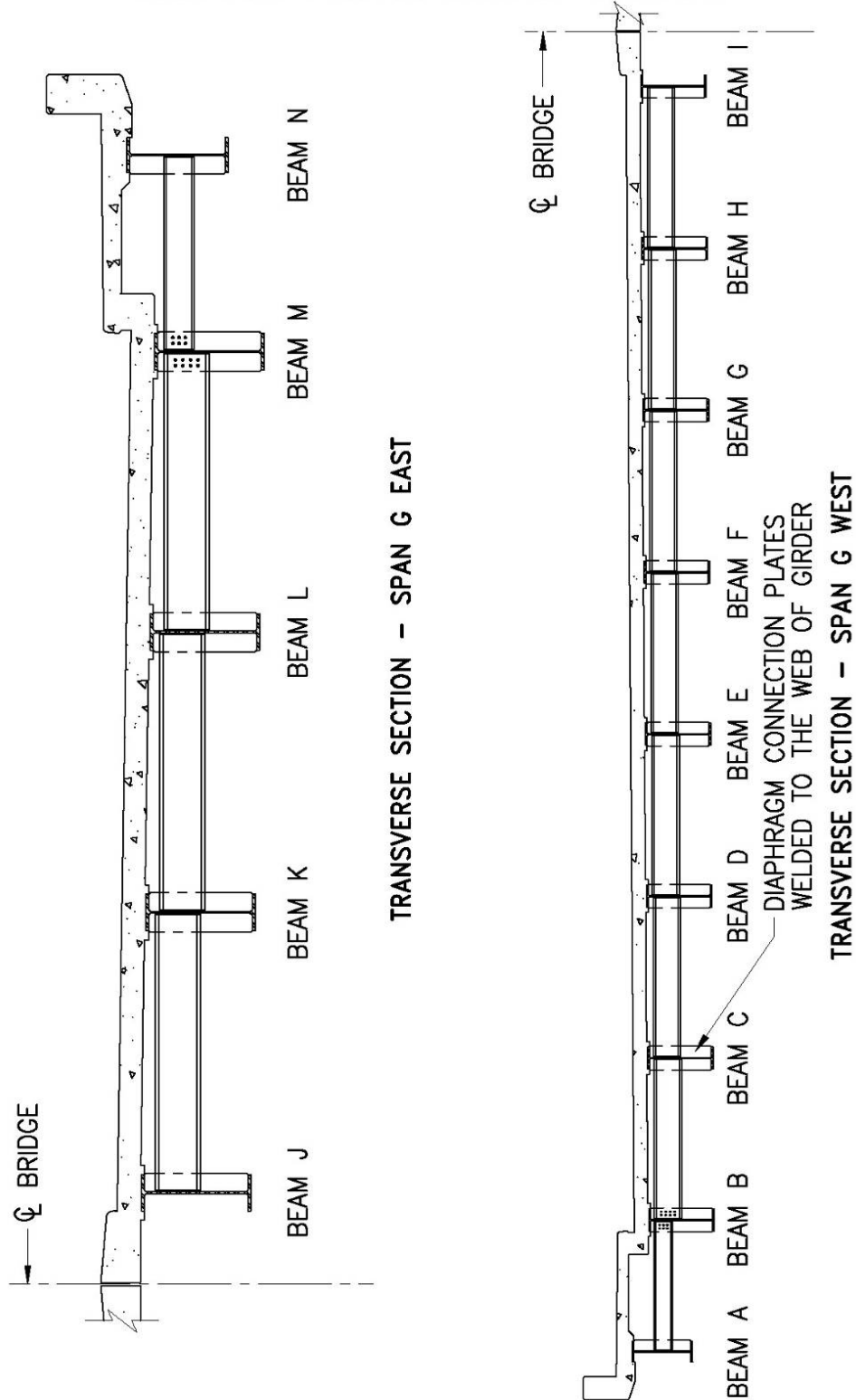
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FATIGUE PRONE DETAIL SKETCH



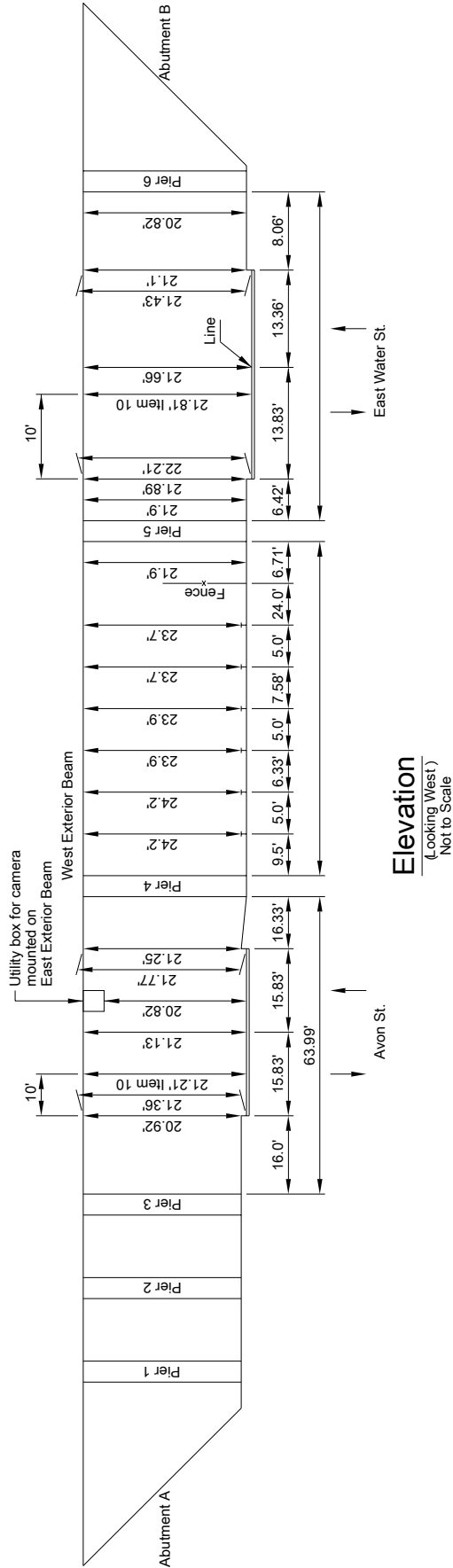
STRUCTURE#: 104-1801
CITY: CHARLOTTESVILLE

LOCATION: 9TH STREET OVER CSX

STRUCTURE INSPECTION REPORT – VERTICAL CLEARANCE

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STRUCTURE INSPECTION REPORT – VDOT BRIDGE CONDITION CODE KEY

Agency ID: 1041801-00000000020087

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Bridge Condition Code key

<u>Code</u>	<u>Description</u>
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION No problems noted.
7	GOOD CONDITION Some minor problems.
6	SATISFACTORY CONDITION Structural elements show some minor deterioration.
5	FAIR CONDITION All primary structural elements are sound but may have some minor section loss (due to corrosion), cracking, spalling (deterioration of concrete surface) or scour (erosion of soil)
4	POOR CONDITION Advanced section loss, deterioration, spalling or scour.
3	SERIOUS CONDITION Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL CONDITION Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE CONDITION Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	FAILED CONDITION Out of service - beyond corrective action.