2006 PHYSICAL CONDITION REPORT

I-71 NB BRIDGE OVER JENNINGS FREEWAY
&
SR 176 BRIDGE UNDER I-71

SFN 1805371
SFN 1805436

DECEMBER 2006 **CUYAHOGA COUNTY, OHIO**

PREPARED FOR:
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SR 176 BRIDGE UNDER I-71
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Appendix A – BR-86 Inspection Form

Appendix B – Structure Deficiency Maps

Appendix C – Beam Field Splice Misfabrication Example

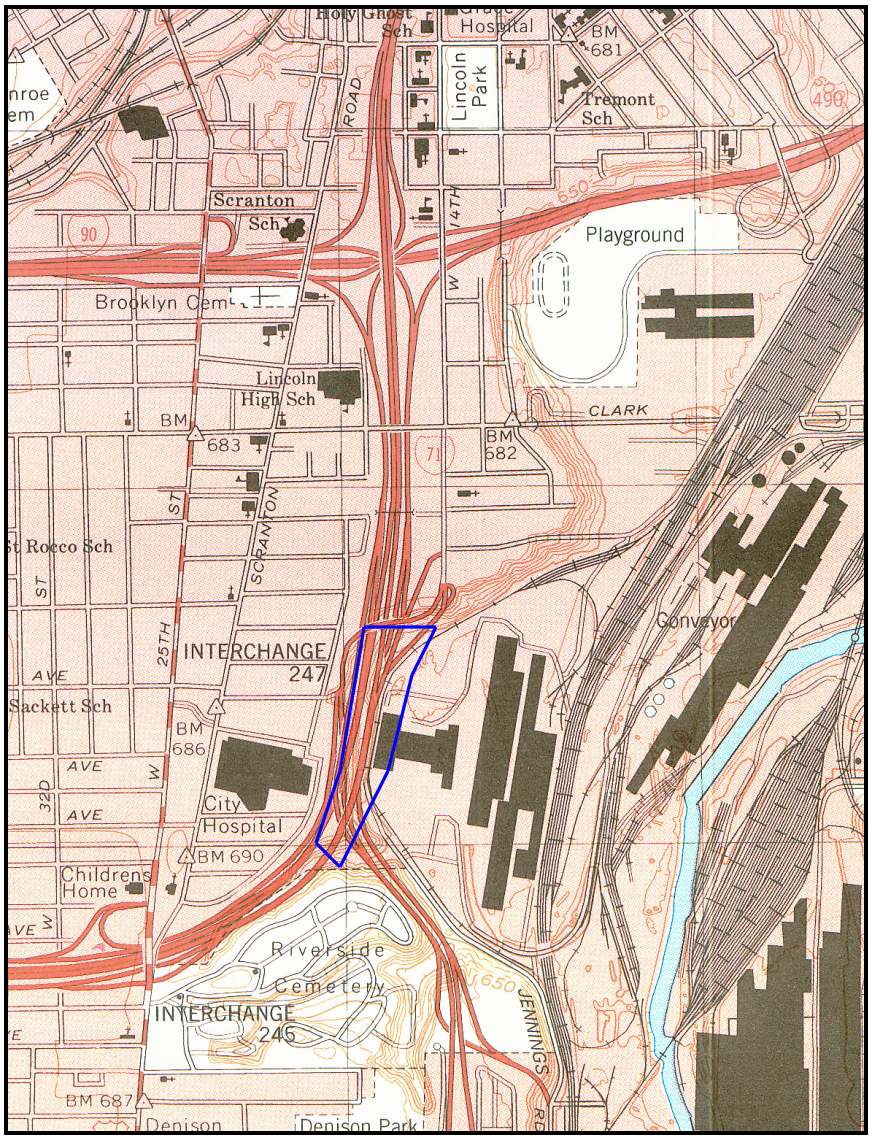


Figure 1 – Location Map, CUY-71-1791R & CUY-176-1334 (Outlined in Blue), Cleveland, Ohio

Introduction

CUY-71-1791R (SFN 1805371) and CUY-176-1334 (SFN 1805436) carry northbound I-71 and Northbound Jennings Freeway traffic respectively through the I-71 Jennings Freeway interchange in Cleveland, Ohio. Photos 1 and 2 show the Elevation and End Views. A General Plan and Elevation is shown on Figures 2, 3 and 4 and the framing plan drawing is shown on Figure 5. Figure 4 has typical cross sections of both structures while Table 1 describes the location and designations of the bridge units shown on Figures 2 through 5.

The I-71 Bridge (CUY-71-1791R) carries four lanes of northbound traffic along the rim of the Cuyahoga River Valley, passing between Metro General Hospital on the west and the Steelyard Commons commercial development (currently under construction) to the east. The bridge splits into a wye configuration at the north end. The west leg is designated "Northbound I-71" and the east leg is designated the "Northbound Outer Roadway" (NBOR). The two westerly lanes provide continuous flow of northbound I-71 traffic. The two easterly lanes provide exiting at West 14th Street via Ramp NBOR-14 and access to eastbound I-490 via Ramp NBOR. This structure is directly over the Jennings Freeway bridge and shares common substructure units the lower structure. The 2006 estimated average daily traffic (ADT) is 125,400 with 7% truck traffic.

The Jennings Freeway Bridge (CUY-176-1334R) carries three lanes of northbound traffic from I-480 under the I-71 Bridge. The bridge also splits into a wye configuration at the north end. The west leg is designated "Ramp J-NBOR" and the east leg is designated "Ramp J-14". The two westerly lanes provide access to northbound I-71 and to eastbound I-490 via Ramp J-NBOR. The east lane provides exiting at West 14th Street via Ramp J-14. The 2006 estimated ADT is 75,110 with 6% truck traffic.

On the I-71 structure, Spans 16 through 23AE are considered fracture critical due to the welded steel pier caps supporting the superstructure above. These pier caps were extensively retrofitted in the 1991 rehabilitation to remove many of the Category E and E´ fatigue prone details. The Jennings Freeway structure is not considered fracture critical because it has no steel pier caps and is a multiple beam structure.

Euthenics, Inc. performed an inspection of the Northbound I-71 and Northbound Jennings Freeway bridges between November 7th and November 14th, 2006. The inspection of the two bridges was performed using snooper vehicles and by ladders in areas of minimum clearance. United Rentals provided the traffic control and also the attenuator vehicle for the snooper. The superstructures of both bridges were inspected within arm's reach as allowed by the available time. As per the scope of services, the substructure was not inspected within arm's reach except in areas of obvious deterioration. Random sounding of the wearing surface and deck bottom were performed.

Copies of both BR-86 inspection forms are included in Appendix A. Aditionally, Appendix B contains the Structure Deficiency Maps for both structures.

Construction and Maintenance History

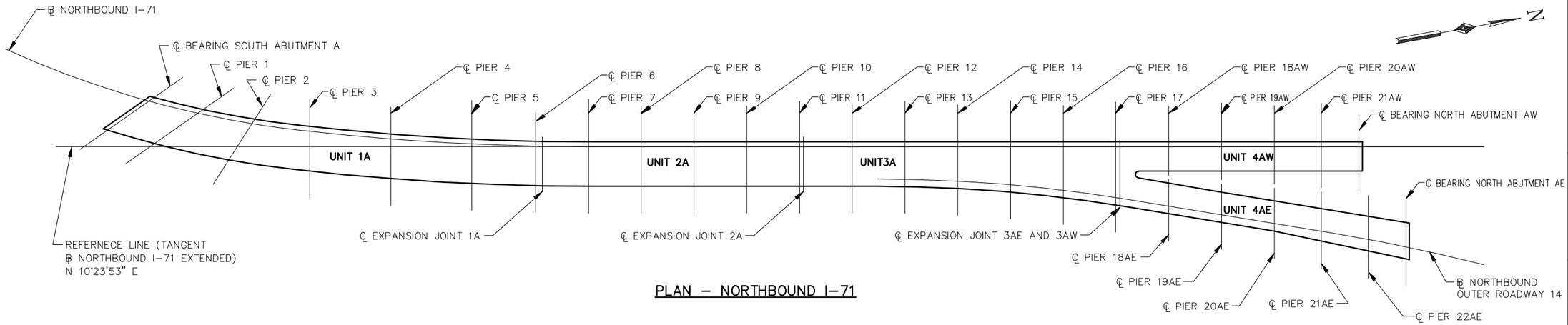
Construction of these bridges began in 1965 as part of the Ohio Department of Highways Project 79. Work was not completed until 1969 due to construction delays caused by slope failures that damaged several of the piers supporting both bridges. The original pile caps and pilings were isolated (separated) from the columns, and replaced with caissons and new caps. The foundations of Piers 14, 15, 16, 17A and 17B were modified during the original construction as a result of foundation damage caused by slope failure. The lower half of Pier 14, 15 and 16 columns were reinforced with a supplementary concrete jacket and shear walls were constructed between the columns.

The northbound I-71 bridge deck received a dense concrete overlay in 1978. In 1991, both bridges underwent minor rehabilitation, with the following repairs performed:

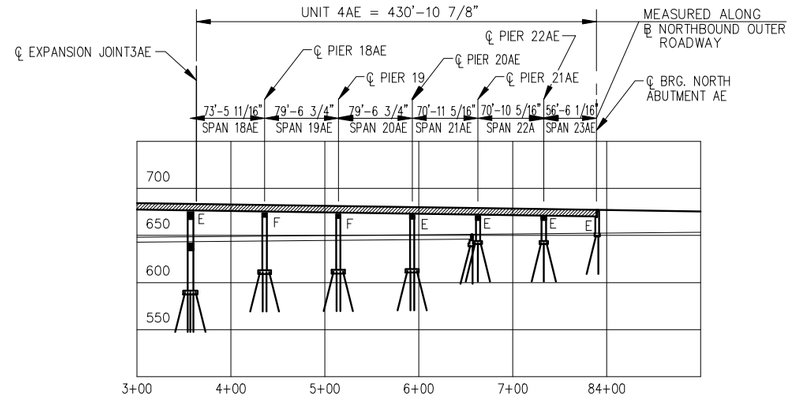
- The original safety curbs with aluminum railings were modified to the deflector shape parapets (Both bridges).
- The deck overlay was patched (I-71 Bridge).
- The deck received a super plasticized dense concrete (SDC) overlay (Jennings Freeway Bridge).
- All deck expansion joints were retrofit with elastomeric strip seals (Both bridges).
- The existing drainage systems were replaced. (Both bridges).
- All substructure units were patched and sealed. (Both bridges).
- Retrofit fatigue prone details on fracture-critical members (I-71 Bridge).
- The structural steel was cleaned and painted. (Both bridges).
- Additional miscellaneous repairs and modifications (Both bridges).

Photo 1– Elevation View of CUY-71-1791R & CUY-176-1334

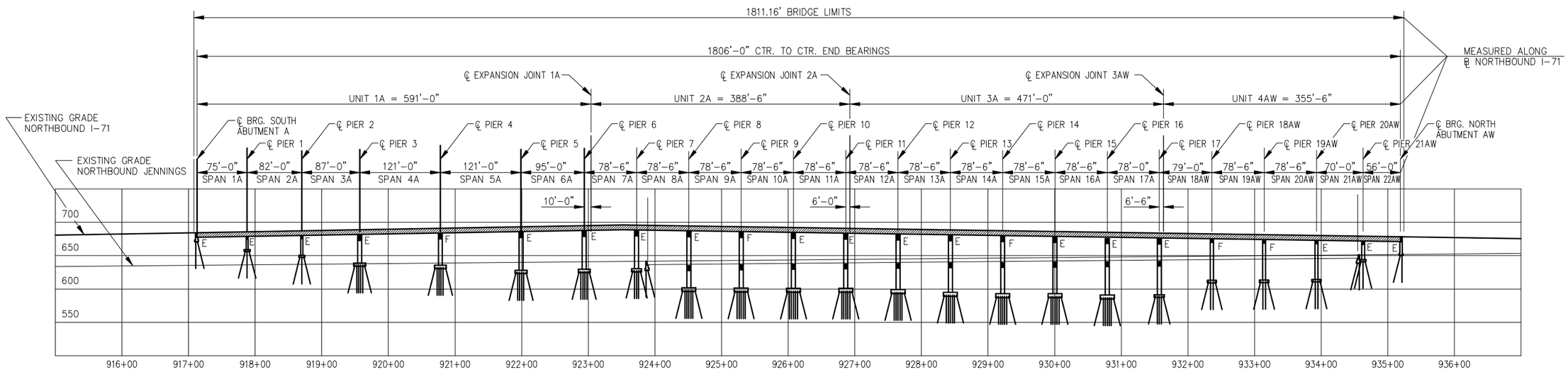
Photo 2 – North End View of CUY-71-1791R & CUY-176-1334



PLAN – NORTHBOUND I–71



ELEVATION – UNIT 4AE



ELEVATION

[F:\JOBS\728\FIGURE 2A.DWG] WJV 12/12/06 PLOT 1"=80'

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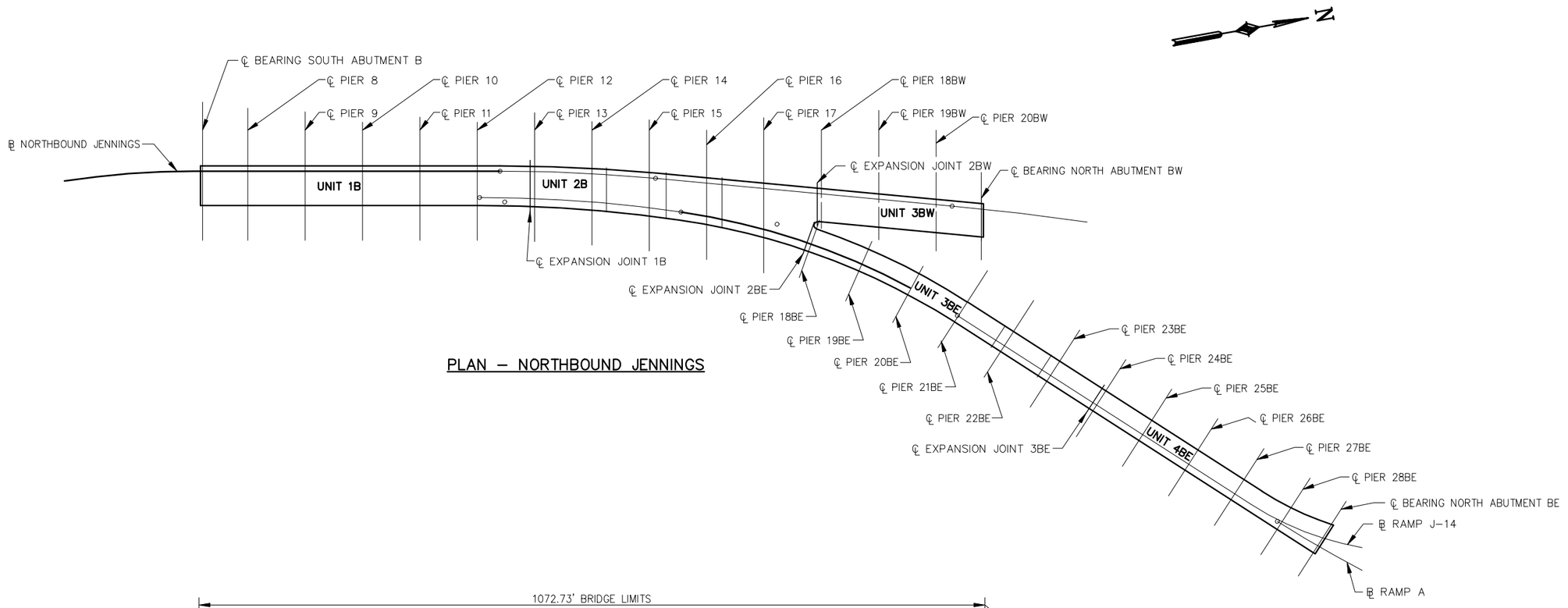
STRUCTURE FILE NUMBER 1805371

FIGURE 2 - GENERAL PLAN & ELEVATION

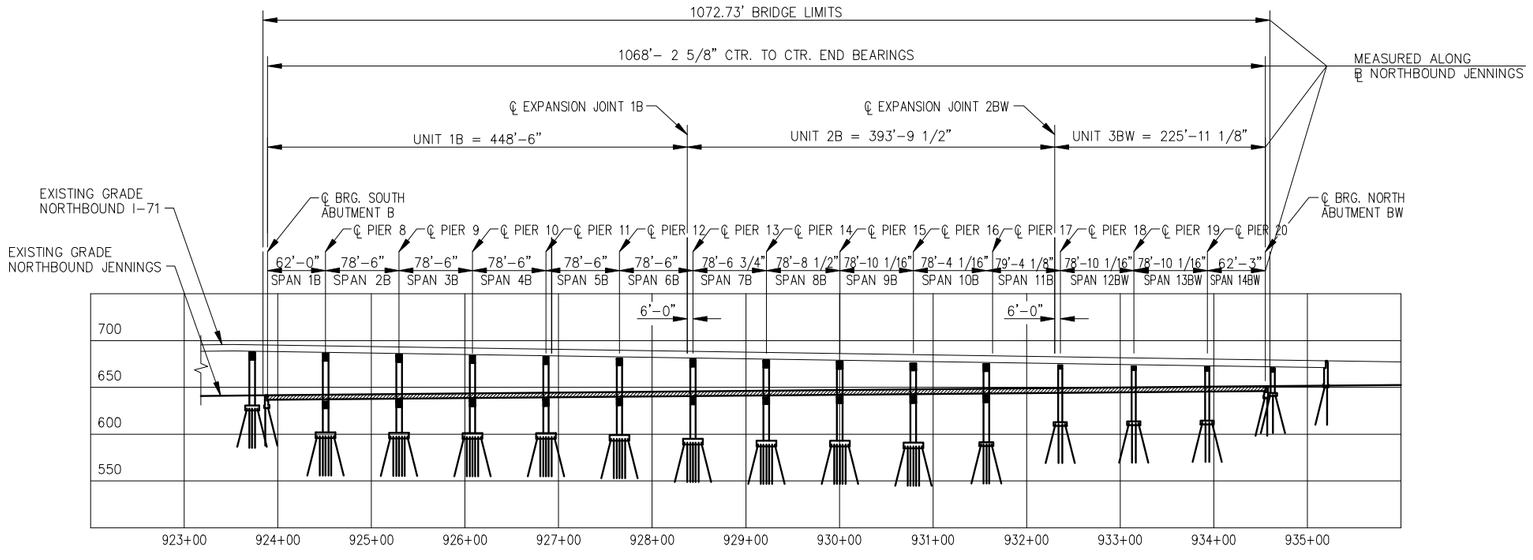
CUY–71–1791R

NORTHBOUND I–71 OVER NORTHBOUND JENNINGS

CUY-71-17.83
CUY-176-12.76



PLAN – NORTHBOUND JENNINGS



ELEVATION

FIGURE 3 - GENERAL PLAN & ELEVATION
CUY–176–1334R
NORTHBOUND JENNINGS UNDER I–71

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1805436

CUY-176-13.34

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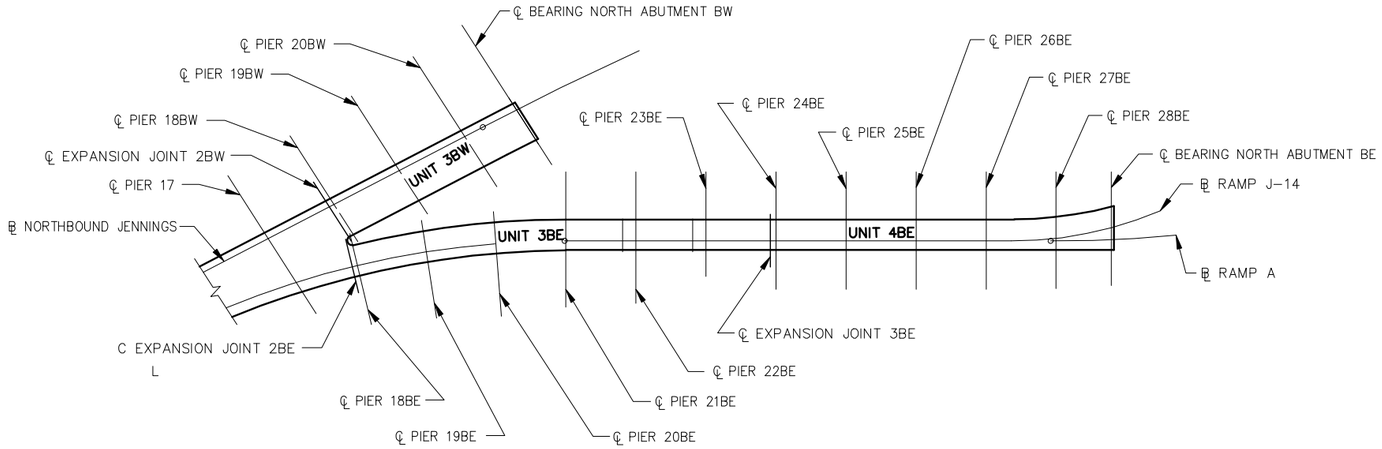
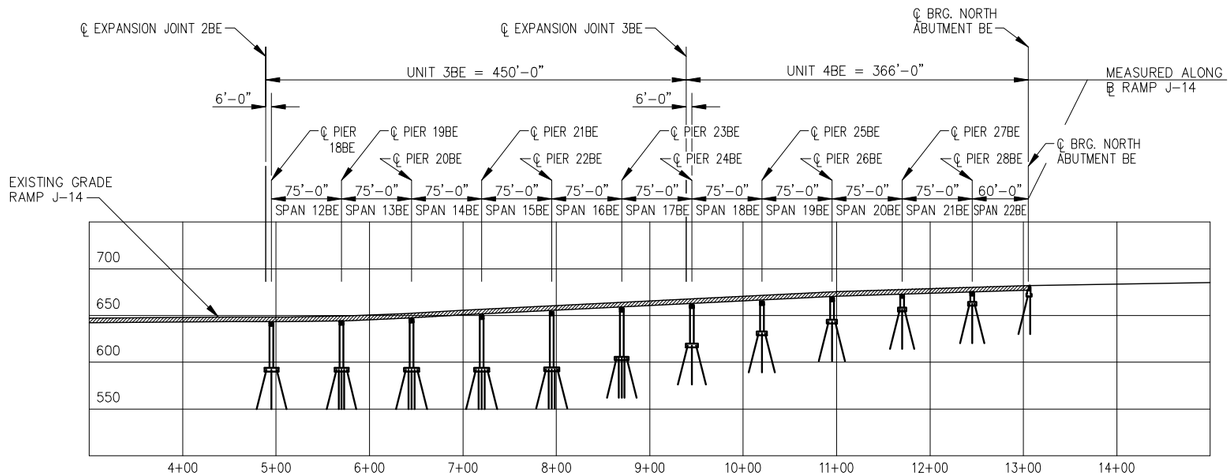
[F:\JOBS\728\ FIGURE 28] W.V 12/12/06 PLOT 1"=80'



PLAN – RAMP J–14



ELEVATION

FIGURE 4 - GENERAL PLAN & ELEVATION
CUY–176–13.34R & RAMP J–14
NORTHBOUND JENNINGS FREEWAY UNDER I–71

STRUCTURE FILE NUMBER
1805436

CUY-71-17.83
CUY-176-12.76

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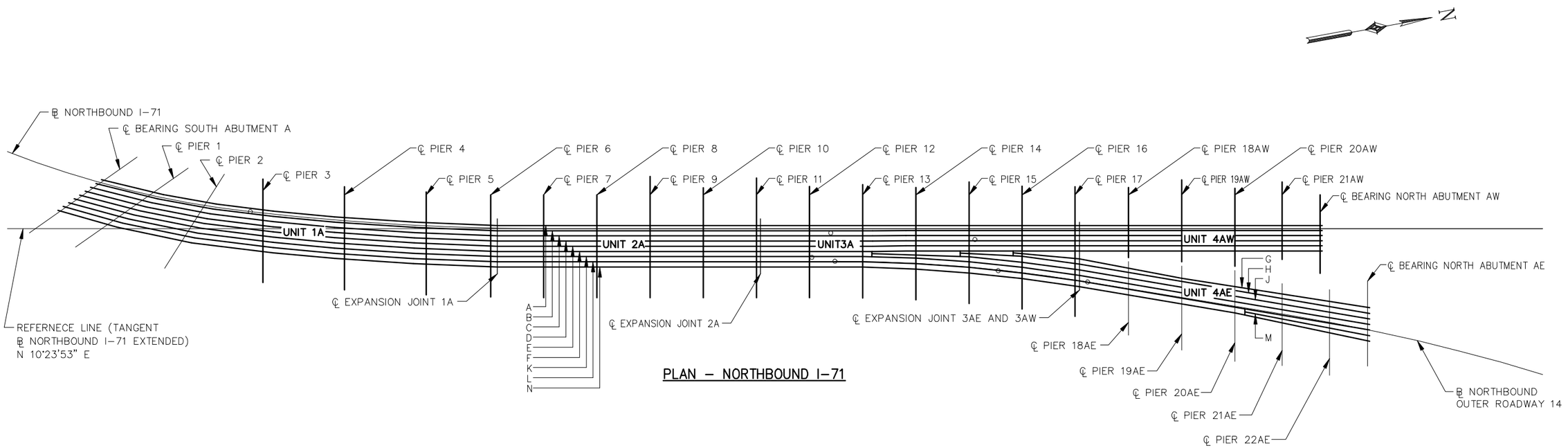
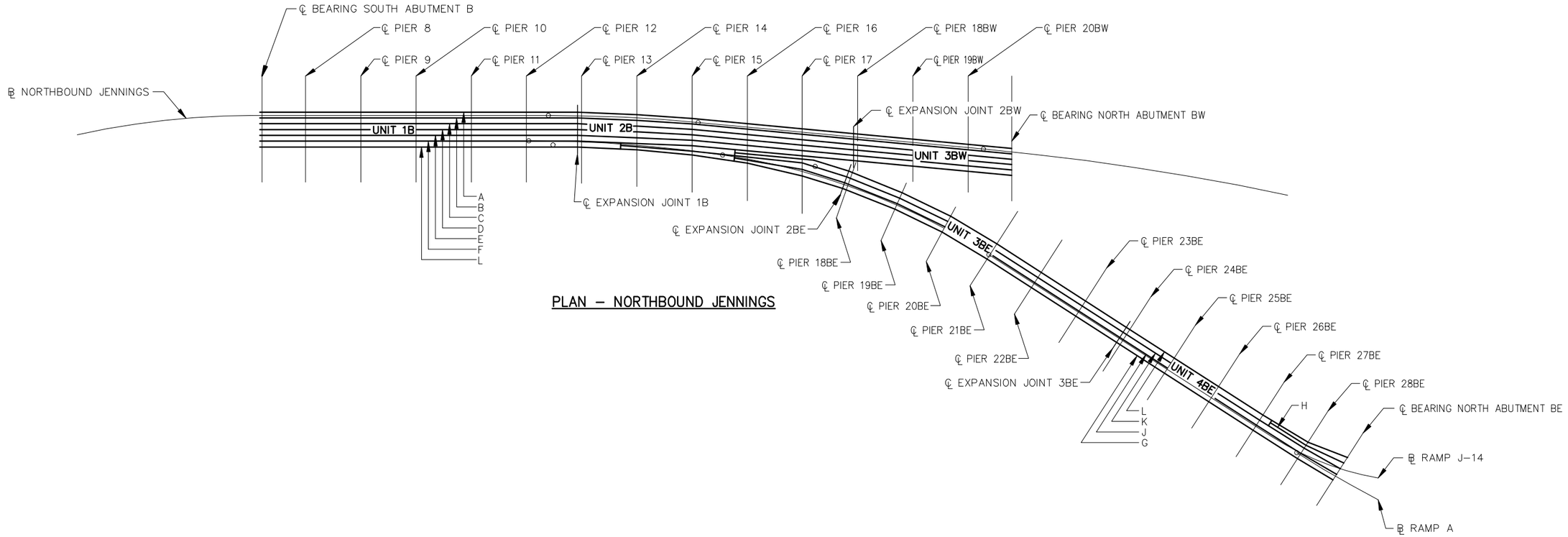
[F:\JOBS\728\728 FIGURE 2C.DWG] W.V 12/12/06 PLOT 1"=80'



PLAN – NORTHBOUND I-71



PLAN – NORTHBOUND JENNINGS

FIGURE 5 - FRAMING PLAN
CUY-71-1791R AND CUY-176-1334R
NORTHBOUND I-71 OVER NORTHBOUND JENNINGS AND NORTH

CUY-71-17.83
CUY-176-12.76

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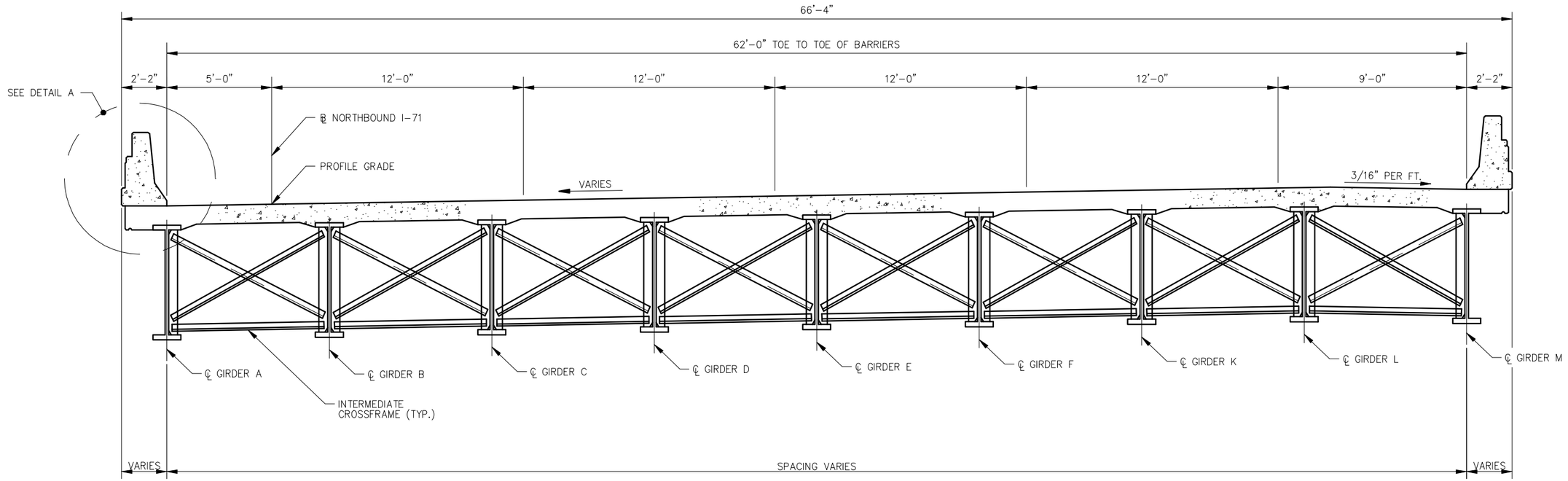
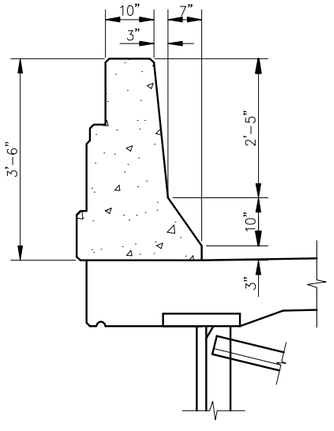
[F:\JOBS\728\728 FRAMING PLAN] WJV 12/12/06 PLOT 1"=80'

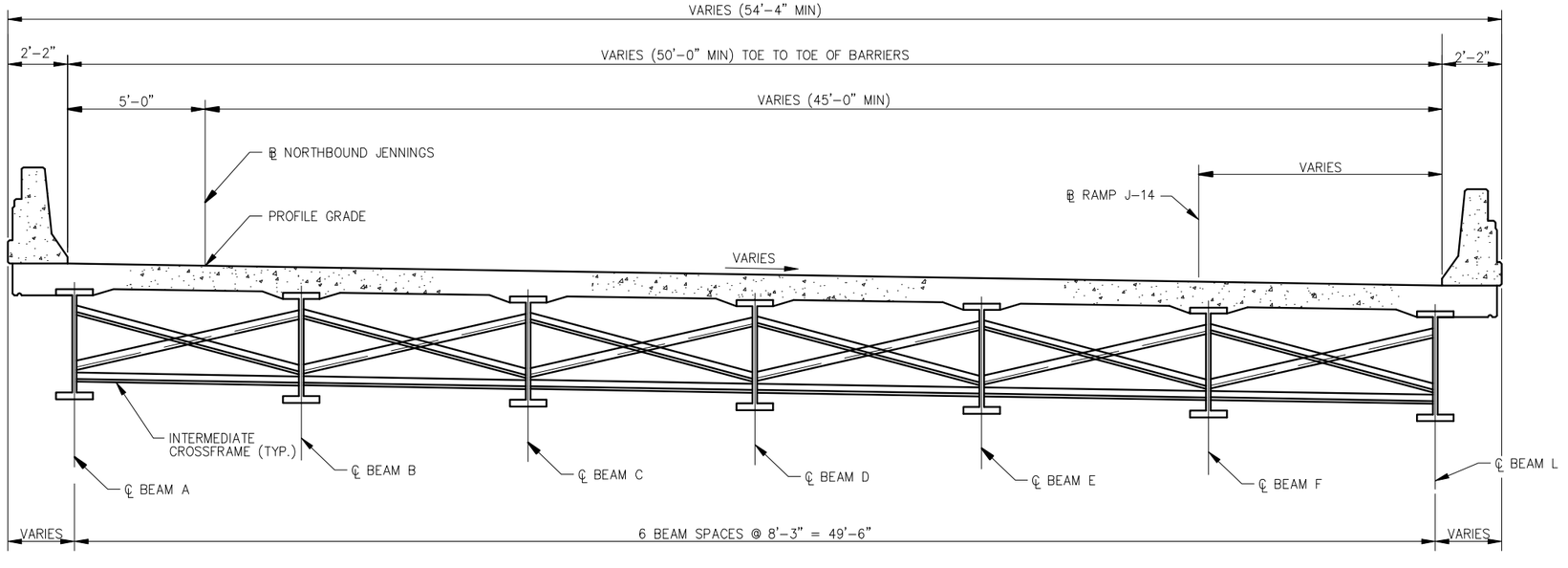


TYPICAL CROSS SECTION – I-71 BRIDGE

(UNIT 1A SHOWN)



DETAIL A



TYPICAL CROSS SECTION – JENNINGS FREEWAY BRIDGE

(UNIT 1B AND 1B SHOWN)

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STRUCTURE FILE NUMBER
1805371 / 1805436

FIGURE 6 - TYPICAL SECTIONS
CUY-71-1791R & CUY-176-1334
I-71 NB OVER NORTHBOUND JENNINGS / SR 176 NB

CUY-71-17.83

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PLOT .375"=1" 12/12/06 WJV [F:\JOBS\728\FIGURE 4 - TYPICAL SECTIONS.DWG]

Superstructure Units	Supporting Substructure Units	Spans
I-71 Bridge		
1A	S. Abutment A to P6 plus cantilever	1A to 6A
2A	Suspended span plus P7 to P11 plus cantilever	7A to 11A
3A	Suspended span plus P12 to P17A plus cantilever	12A to 17A
4AW	Suspended span plus P18AW to N. Abutment AW	18AW to 22AW
4AE	Suspended span plus B18AE to N. Abutment AE	18AE to 23AE
Jennings Freeway Bridge		
1B	S. Abutment B to P8 to P12 plus suspended span	1B to 6B
2B	Cantilever plus P13 to P17B plus suspended span	7B to 11B
3BW	Cantilever plus P18BW to N. Abutment BW	12BW to 14BW
3BE	Cantilever plus P18BE to P23BE plus suspended span	12BE to 17BE
4BE	Cantilever plus P24BE to N. Abutment BE	18BE to 22BE

Notes: 'A' descriptor indicates structural element of CUY-71-1791R
'B' descriptor indicates structural element of CUY-176-1334R
Piers 8 through 16 are common substructure units for both structures.
N = North, S = South, E = East & W = West
P = Pier

Table 1 – Superstructure Unit Designations & Orientation

Deck

I-71 Bridge

Floor

The existing floor is in fair condition with common transverse shrinkage cracks and light efflorescence. In Spans 3 through 13, there are areas where the deck underside was wet due to infiltration through the failed concrete wearing surface above (Photo 3). No delaminated or spalled concrete are present in these moist areas.

Photo 3 – Damp Areas to Underside of Floor, Span 7

Wearing Surface

The wearing surface is in fair condition. During this inspection, delaminated and spalled sections of wearing surface in the two right traffic lanes were repaired under a maintenance contract (Photo 4). The two left lanes (I-71 NB through traffic lanes) were visually inspected, and ten locations of spalling or obvious delamination were noted (Photos 5 & 6). Most deteriorated locations are within or adjacent to previous patches made during the 1991 repairs.

Photo 4 – Wearing Surface Repair, Lane 4, Span 7

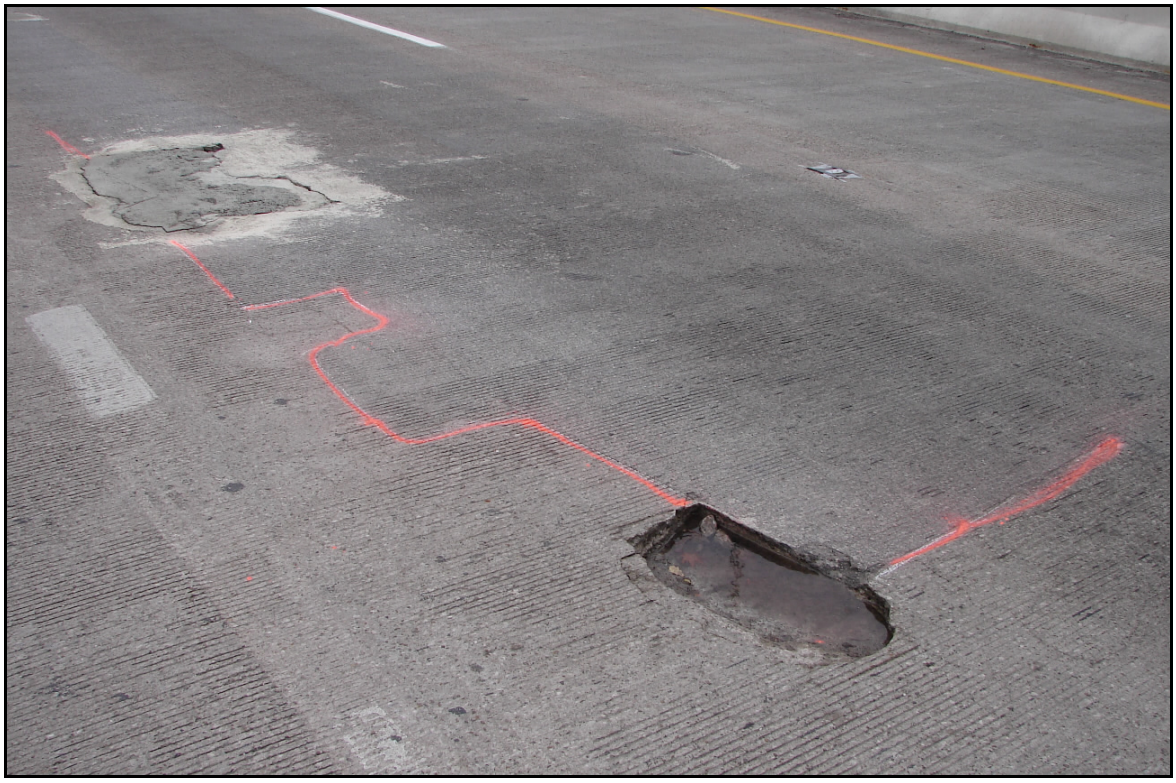


Photo 5 – Spall Adjacent to 1991 Patch, Lane 2
(Note: Paint lines partially outline perimeter of earlier repair.)

Photo 6 – Cracked Wearing Surface Within 1991 Patch

Railings

Overall the parapets are in fair condition. Of most concern however are locations of delaminated concrete on the exterior surfaces of the right parapet in Spans 2, 5, 17, 18AE and 19AE, over Jennings Freeway traffic (Photos 7 and 8). The cause of this deterioration likely is due to an anodic ring effect, a corrosion process in which the steel reinforcement in concrete surrounding a repair area begins to corrode preferentially to reinforcement in the newly repaired area (Figure 7, See Page 14). In this 1991 parapet modification, the concrete added for the safety shape acts as a newly "repaired" concrete area. Additionally, in some locations, deterioration has accelerated due to the close proximity of existing rebar to the original concrete surface (Photo 9).

In Unit 4AE, the top of the parapet is structurally cracking without signs of reinforcement corrosion (Photo 10). Also in Unit 4AE, in random areas, the corner concrete is cracking horizontally and spalling along the toe of the parapet deflector shape due to corrosion of the vertical leg of the embedded bulb angle gutter that remains from the original parapet construction (Photo 11).

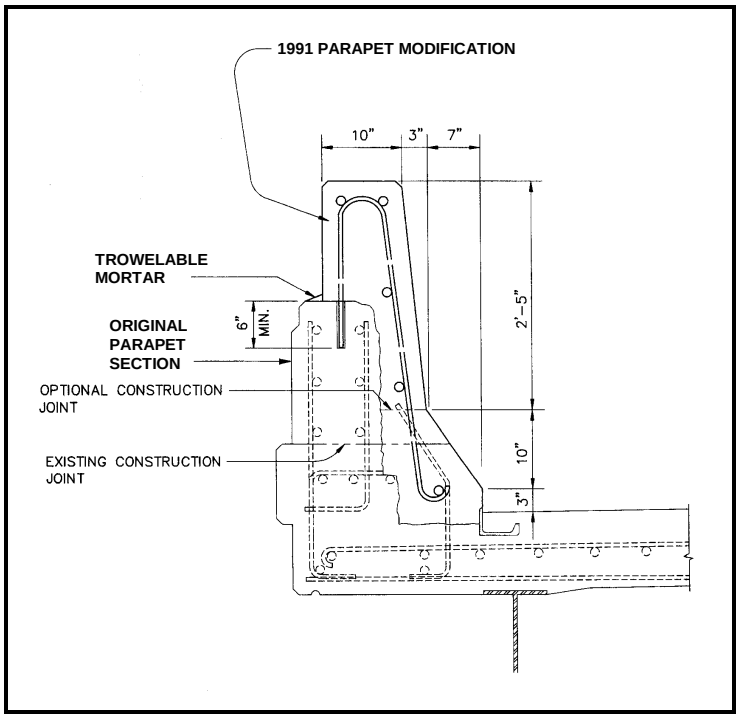


Figure 7 – Modified Deflector Shape Parapet Typical Section

Photo 7 – Cracked Exterior Parapet Face (Note: Upper spall is actually fallen trowelable mortar)

Photo 8 - Spalled and Delaminated Concrete to Parapet over NB Jennings Freeway to W. 14th Street Ramp

Photo 9 – Close-up of Parapet Spall with Deficient Cover to Original Rebar (Original vertical bar circled and horizontal bar noted with arrow.)

Photo 10 – Deteriorating Safety Parapet Shape, Unit 4AE

Photo 11 – Concrete Corrosion at Parapet Toe, Unit 4AE

Drainage

The drainage is in fair condition and is generally functioning without obstruction. The only blockage observed was at the Pier 6 downspout collector (Photo 12). Additionally, below Expansion Joint 2A, pack rust to the welded connections has broken these welds, resulting in the original drain trough now sitting loose across several expansion hinge plates (Photo 13). With the sealed expansion joints above, this drain trough only catches deck water that has leaked through tears in the seal that are currently present. During this maintenance contract, the original drain trough under Expansion Joint 1A was removed.

Along the right gutterline, deck water is ponding in extended lengths in Spans 3 and 4 (Photos 14 & 15). This standing water likely is the catalyst for the active corrosion to the exterior blister of adjacent parapet (Photo 15).

Additional downspout comments to drainage associated with the I-71 structure are discussed in the Jennings Freeway structure drainage section.

Photo 12 – Clogged Drainage Collector, Pier 6

Photo 13 – Broken Drain Trough Bracket and Loose Trough, Expansion Joint 2A

Photo 14 – Standing Water in Right Gutterline, Span 3

Photo 15 – Active Concrete Corrosion at Parapet Base, Outside Gutterline Ponding

Expansion Joints

The expansion joints are in fair condition. All expansion joints membranes have localized tears (Photo 16). At Expansion Joint 1A, a gap exists in the north horizontal plate and is the result of either a cracked or missing weld (Photo 17).

Photo 16 – Torn Membrane, Expansion Joint 1A

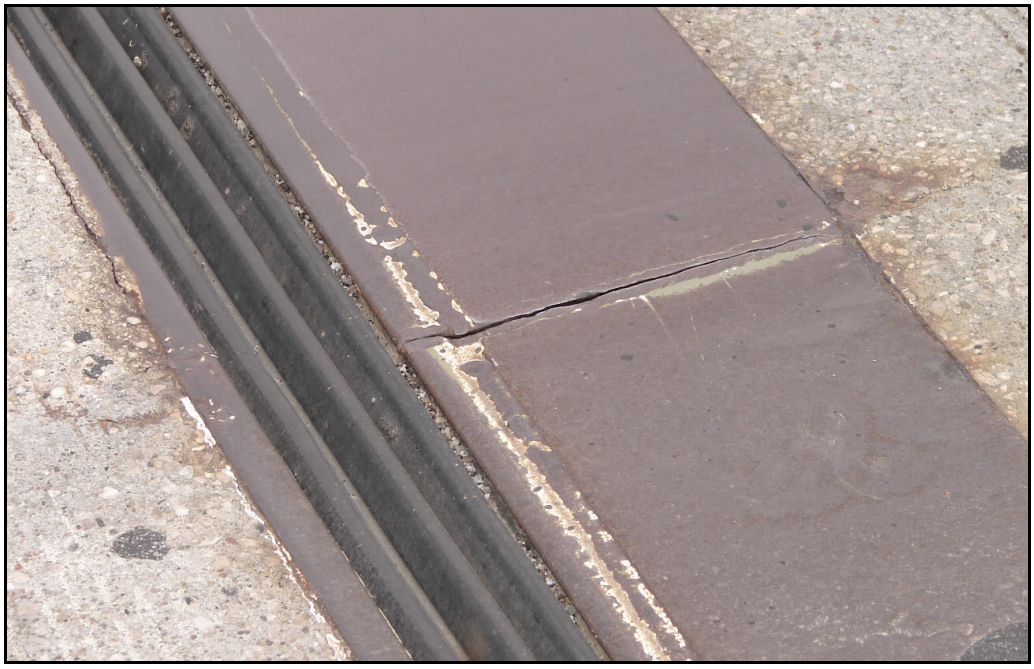


Photo 17 – Missing Seal Weld, Expansion Joint 1A

Jennings Freeway Bridge

Floor

The floor is in good condition. Only one area showing underdeck spall or delamination was noted, between Beams H and J in Span 26E (Photo 18).

Photo 18 – Underdeck Spall & Delamination, Span 26E

Wearing Surface

The wearing surface is generally in fair condition. The right two lanes and right shoulder of Units 1B and 2B were chain dragged, revealing only small localized areas of delamination (Photo 19) totaling 153 square feet, or approximately 0.8% of the wearing surface area of these two units. The left two lanes Portions of Units 1B, 2B, 3BW and 4BW show few significant deficiencies.

The wearing surface of the W. 14th Street Ramp, which is composed of Units 3BE and 4BE, also is in fair condition however this wearing surface in these units is estimated to be 10% and 18% delaminated respectively (Photo 20). Most of this ramp delamination is located on the left half of the ramp where the wearing surface has debonded en masse, though few cracks or spalls are currently present.

Photo 19 – Typical Delaminated Wearing Surface and Deck Cracks, Unit 1B

Photo 20 – Delaminated Wearing Surface Outlined in Paint, Unit 3BE

Railings

The railings of the Jennings Freeway structure are in good condition.

Drainage

The drainage is in fair condition. The downspout outlets have developed vegetated debris mounds around the pipe outlets, resulting in debris piling up into the drain itself (Photo 21). At the deck level, most scuppers were completely plugged with debris. Along scuppers were partially opened during this inspection. At the two open scuppers in Span 1B, near South Abutment B and one scupper at Pier24BE, the pipes are completely corroded through at the bottom of deck level (Photo 22). Also, near the base of Pier 24BE, one collector bracket is heavily corroded (Photo 23).

Expansion Joints

The expansion joints are in fair condition with numerous tears to the joint membranes.

Photo 21 – Typical Debris Back Up into Drain Pipe

Photo 22 – Corroded Pipe (Circled) at Bottom of Deck Level, Near South Abutment B

Photo 23 – Heavily Corroded Drainage Bracket, Pier 24BE

Superstructure

I-71 Bridge

Beams

The beams are in good condition with little section loss due to corrosion. The welded diaphragm connections to the beam webs are commonly undercut into the beam webs, resulting in stress risers in the beam section (Photo 24). At the expansion hinges, measurement of the top and bottom clearances clearly suggests that several beam lines were either misfabricated or not erected to the desired alignment.

Slight misalignment and pack rust is present at bottom flange field splice connections. This misalignment is due to the bottom flange plates being drawn down with improper fill plates installed during erection. For example, the misalignment of the bottom flange fill plates at the Span 9 field splice is due to an error in the beam field splice detail that was not corrected during fabrication (Photo 25, see Appendix C). Slight pack rust between these splice plates and bottom flanges is present where slight gaps have occurred due to this misfabrication.

Diaphragms

Overall the diaphragms are in fair condition. Some diaphragms located below Expansion Joints 1A, 2A and 3AE are either severely corroded or loose because the broken welds due to pack rust (Photo 26).

Photo 24 –Typical Diaphragm Weld Undercut to Beam Web

Photo 25 – Draw Down and Corrosion to Bottom Flange Splice Plates, Span 8A Field Splice

Photo 26 – Cracked Diaphragm Weld Due to Pack Rust

Bearings and Hinges

The bearings are in overall fair condition. In the 1991 rehabilitation, the bearings at the South Abutment were reset due to over-rotation. Currently, Bearing F at the South Abutment is in a very contracted position because the base plate has slid. Also Bearings L and N at Pier 1 are over-contracted, also because of sliding base plates (Photo 27).

At the expansion hinges, the alignment of several rollers has shifted causing the keeper teeth to wear along the edge of the keeper plates (Photo 28).

Protective Coating System

The paint system is in satisfactory condition and is rated as a ***6*** on the modified protective coating rating system. Active corrosion is present beneath expansion joint openings. Additionally, corrosion blooms are developing randomly throughout the superstructure to the underside of the bottom flanges (Photo 29).

Fatigue Prone Connections

The fatigue prone connections are in good condition. No distress was observed in the vicinity of the top flange welded cover plates embedded in the deck or at the beam connections at the steel pier caps at Pier 17A and Pier 18AE to 22AE.

Photo 27 – Over-Contracted Bearing and Sliding Base Plate, Pier 1

Photo 28 – Typical Wear to Hinge Keeper Teeth and Plates

Photo 29 – Typical Corrosion Blooms to Bottom Flange

Jennings Freeway Bridge

Beams

The beams are in good condition with little section loss due to corrosion. Like the I-71 superstructure, the welded diaphragm connections to the beam webs are commonly undercut, resulting in stress risers in the beam section. At the bottom flange field splices, slight pack rust is typically present along the bottom plates, causing slight distortion and minor section loss to the splice plates (Photo 30).

Diaphragms

Overall the diaphragms are in fair condition. Several diaphragms located below Expansion Joints 1B, 2B, 3BW and 3BE are either severely corroded or loose because of broken welds due to pack rust.

Bearings

The bearings are in overall fair condition. All expansion bearings are rocker type, and all bearings are reasonable oriented except for Bearing G at North Abutment BE which is over-contracted (Photo 31).

Protective Coating System

The paint system is in satisfactory condition and is rated as a ***6*** on the modified protective coating rating system. Active corrosion is present beneath expansion joint openings (Photo 32). Additionally, corrosion blooms are developing randomly throughout the superstructure to the underside of the bottom flanges.

Fatigue Prone Connections

The fatigue prone connections are in good condition. No distress was observed in the vicinity of the top flange welded cover plates embedded in the deck (Photo 33).

Photo 30 – Typical Pack Rust at Bottom Flange Splice Plates

Photo 31 – Over-Contracted Bearing G, North Abutment BE

Photo 32 – Typical Corrosion at Expansion Hinge

Photo 33 –End Weld to Bottom Flange Cover Plate
(Embedded Top Flange Cover Plate Welds Assumed Similar)

Substructure

I-71 Bridge

Abutments, Abutment Seats and Backwalls

All abutment elements are in fair condition with only small delaminations noted. During this inspection, repairs to the backwall of North Abutment AE being made as part of the ongoing maintenance contract. Remaining abutment delamination quantities are included in Table 2.

Piers and Pier Seats

The piers are in fair condition with several advancing delaminations to the columns below the pier caps (Photo 34). During this inspection, repairs to Piers 5, 6, 10, 11, 16 and 17A were being made under a maintenance contract. This work includes patching deteriorated concrete and installing fiberglass wrap to deteriorated areas of the pier columns above the Jennings Freeway Bridge pier caps and also to install external reinforcement via carbon fiber wrap of the pier caps at Piers 6 and 16 where shear cracks have appeared (Photo 35).

Remaining pier delamination and spall quantities are included in Table 2.

Location	Deterioration (FT^2)		
	Left	Right	Total
South Abutment A		2	2
Pier 1			5
Pier 2			2
Pier 3		4	4
Pier 4		4	4
Pier 9	3		3
Pier 12		35	35
Pier 14		72	72
Pier 15		30	30
Pier 17	125	15	140
Pier 21W	5		5
Total			**300 FT^2**

Table 2 – I-71 Bridge Substructure Deterioration Areas

Note: Abutments and piers not listed have no recorded deterioration.

Photo 34 – Delaminated Concrete to Pier Column along Jennings Freeway Traffic, Pier 14, I-71 Bridge

Photo 35 – Installation of External Carbon Fiber Reinforcement, Pier 11

Steel Box Pier Cap Pier 17A

The steel box pier cap is in good condition, though there are several maintenance concerns that need to be addressed to prevent current interior corrosion. From west to east, the interior panels have been numbered 1 through 22 for clarity. Details of the Pier 17 cap as well as panel designations are shown in Figure 8 (See Page 38).

Water has infiltrated through the access hatch located in the top flange plate at the east end of the box, through the eight $^{3}/_{4}$" diameter bolts needed to secure the hatch. At the time of this inspection, approximately 10 ounces of water was present in the east end of Panel 21 (Photo 36). Furthermore, two sets of nuts and washers were missing and the remaining steel washers had deformed and corroded significantly such that water infiltration was permitted. This infiltration has also resulted in nearly full section loss to approximately 25% to the underside of the $^{3}/_{8}$" hatch plate (Photo 37). Additionally, this infiltration has resulted in pack rust between the $^{1}/_{2}$" edge stiffener plate and the top flange plate, with this pack rust breaking the exterior perimeter seal weld between the top flange plate and stiffener plate. The broken perimeter weld thus permitting further infiltration and corrosion (Photo 38). During this inspection, minimal maintenance was performed as flake rust to the access door underside and to the stiffener plate was removed by hammer and wire brush and all bare steel areas were spray painted with a primer paint coat. Also, new stainless steel nuts and washers were used to secure the access door.

Observations made during the ODOT statewide 1988-89 steel pier cap inspection showed that steel box pier caps that were generally air-tight had up to several inches of water inside as airborne moisture was trapped inside the sealed boxes and subsequently condensed. Pier Cap 17A has screened vents at the west end of the pier cap, a capped vent with a solar powered fan in the access hatch and two drain holes in the bottom plate in Panel 22. These three vents prevent a cycle of condensation accumulation from taking place.

Photo 36 – Small Amount of Standing Water and Light Corrosion to Box Floor, Panel 21

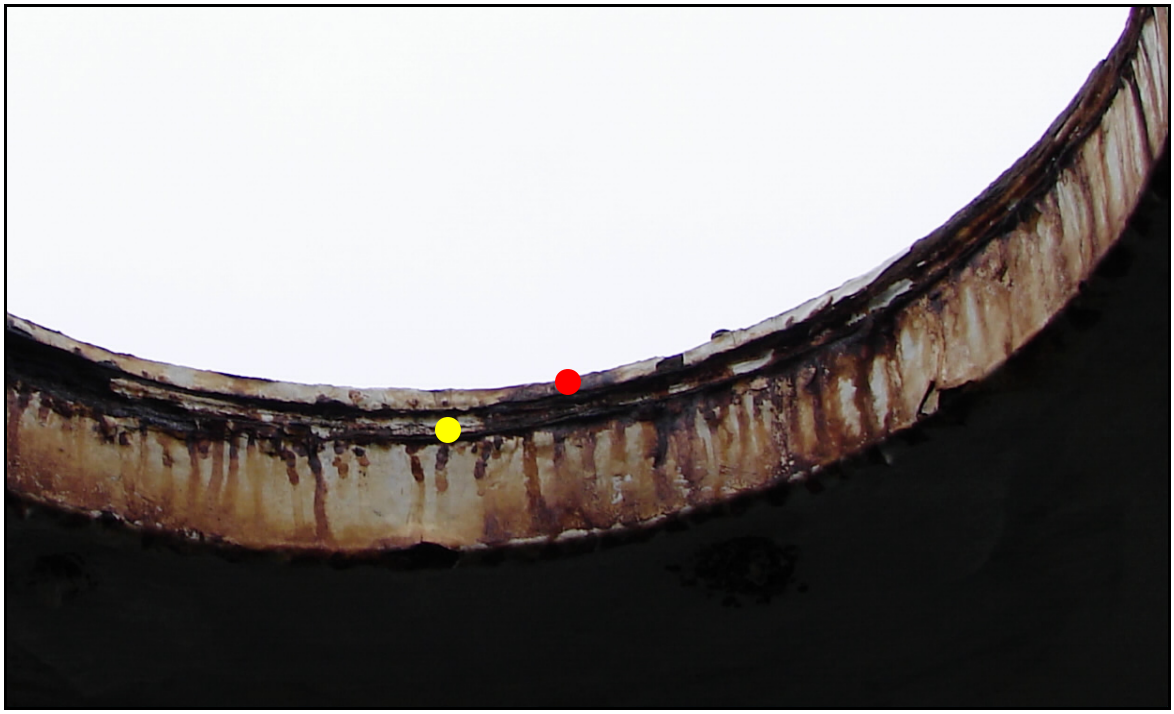


Photo 37 – Pack Rust Between Stiffener Plate (Red Dot) and Top Flange Plate (Yellow Dot), Steel Pier Cap 17A

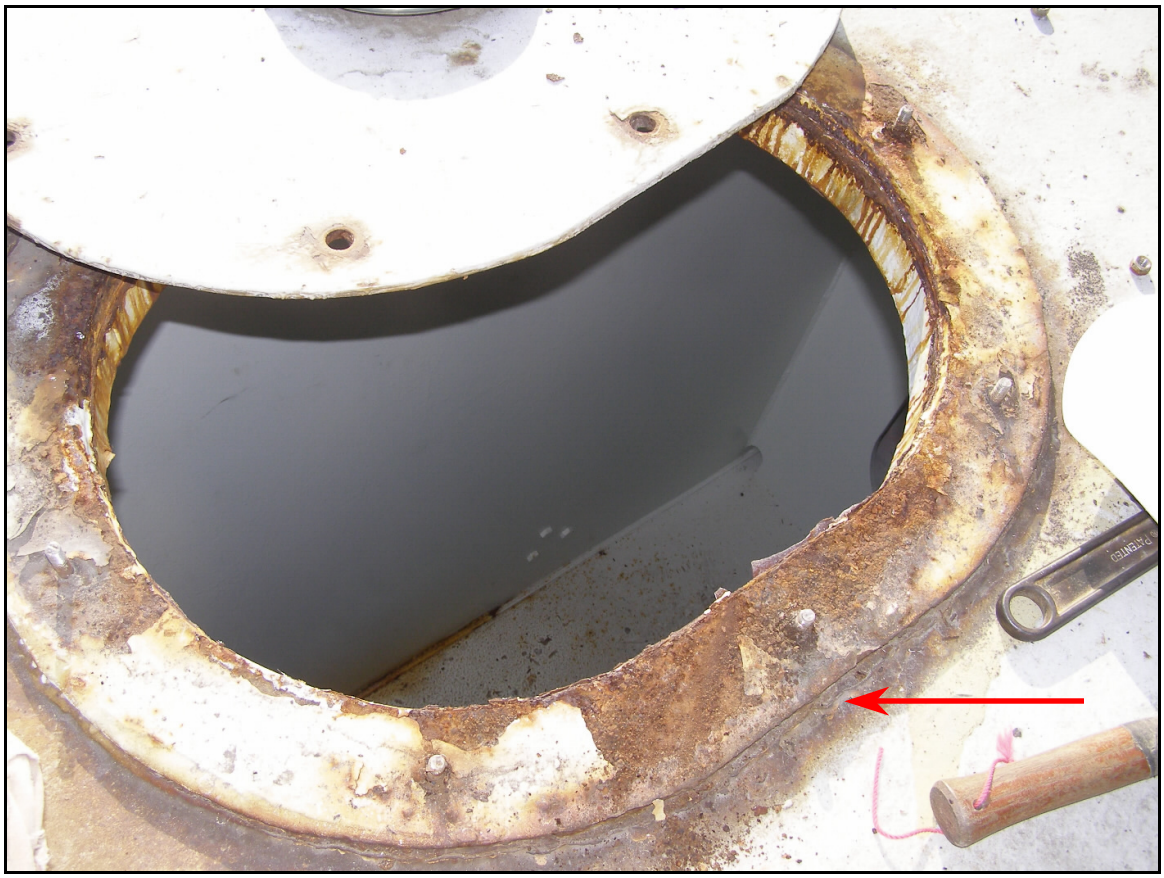
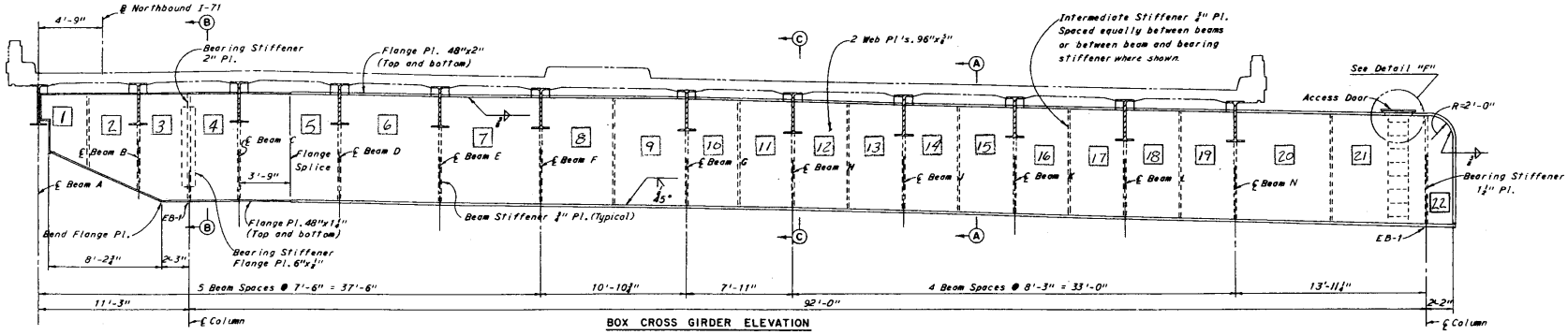
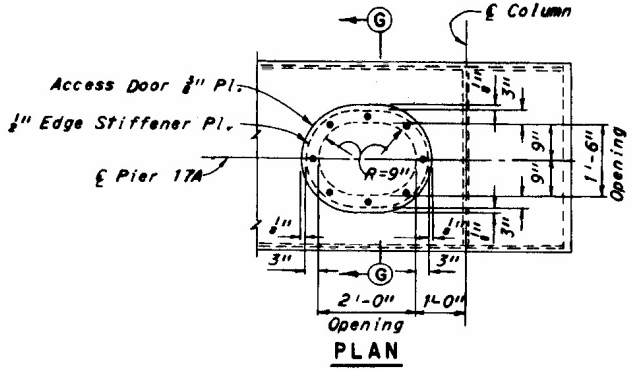
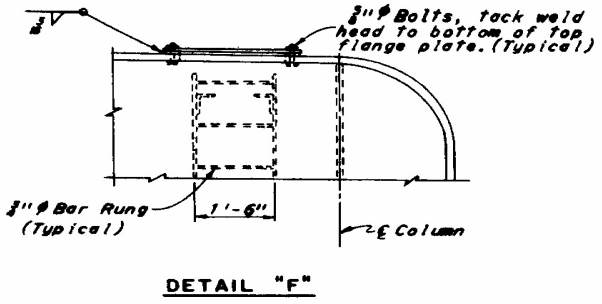


Photo 38 – Corrosion To Stiffener Plate and Cracked Weld to Top Flange Plate (See Arrow), Steel Pier Cap 17A



X - **Interior Box Panel No.**





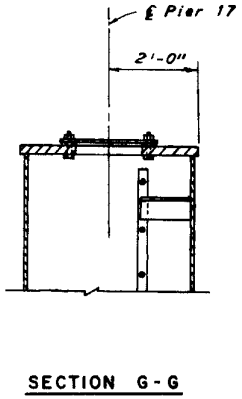


Figure 8 – Steel Pier Cap 17A Elevation and Details

At the west end of the pier cap, the screened louvers provide access for the settlement of airborne dirt on the interior floor and also slight paint failure and corrosion from airborne moisture along the diaphragm to floor weld in Panels 1, 2 and 3 (Photo 39).

Photo 39 – Slight Corrosion and Dirt to Interior Floor, Panel 3

Steel Pier Cap Pier 18 and 19AE through 22AE

These fracture critical pier caps are in good condition. The 1991 retrofits either removed or reduced the likelihood of fatigue cracks to all Category E and E' fatigue prone details. No significant section loss or steel cracks were observed. At the west end of Pier Cap 22AE, a tack weld placed during erection was observed between the Beam A web and the clip angle (Photo 40). Though this tack weld is likely in a tension region, its failure will not result in a catastrophic failure of the superstructure.

Photo 40 – Tack Weld (Circled) Between Beam A Web and Pier Cap Clip Angle, Pier 22AE

Wingwalls

The wingwalls are in good condition with few deficiencies noted. The left forward wingwall of the west forward abutment has a vertical crack near a contraction joint.

Slope Protection

The slope protection is in good condition with no unusual settlements of erosion noted. The South Abutment slope protection is composed of roller compacted concrete and is in good condition.

Jennings Freeway Bridge

Abutments, Abutment Seats and Backwalls

The abutment barrels and abutment seats are in good condition with little deficiencies noted (Photo 41).

The backwalls are in overall fair condition. During this inspection, backwall repairs at the North BW Abutment were in progress. Besides these repairs, several small areas of delamination are present to the North BW Abutment.

Abutment delamination quantities for the Jennings Freeway structure are included in Table 3.

Photo 41 – Delaminations to Abutment Barrel, North Abutment BW

Piers and Pier Seats

The piers are in fair condition with several areas of advancing delaminations. This is particularly so on Piers 8 through 13 where the pier caps extend beyond the Jennings Bridge deck and superstructure to connect with the I-71 Bridge pier columns above. These piers caps are in the splash zone of the Jennings Bridge deck above, resulting in salt contamination and concrete corrosion to the vertical faces and undersides of the pier caps (Photo 42).

At the east end of Pier 9, a concrete “dam” from a previous patch prevents water on top of the pier cap from draining over the edge. Any trapped water gradually seeps through cracks in the sealer, along the concrete patch interface to the bottom patch where it causes the sealer to blister away from the concrete surface (Photo 43). Also, on several tops of pier caps, the sealer is either mudcracking where applied too thick or is flaking where adhesion is lacking (Photo 44).

Pier delamination and spall quantities are included in Table 3 (See Page 44).

Photo 42 – Early Delamination Crack to Pier Cap Horizontal and Bottom Faces, Pier 11, East End

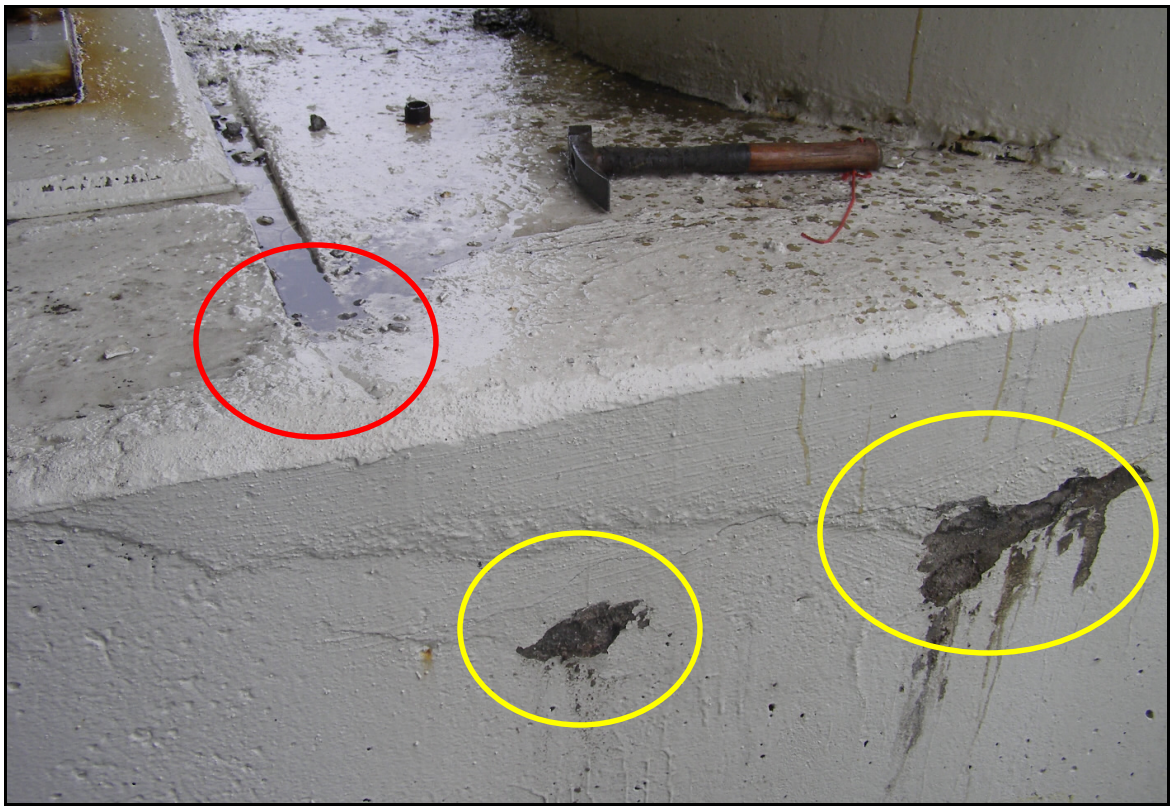


Photo 43 – Concrete Dam (Circled in Red) and Blistering Sealer (Circled in Yellow)

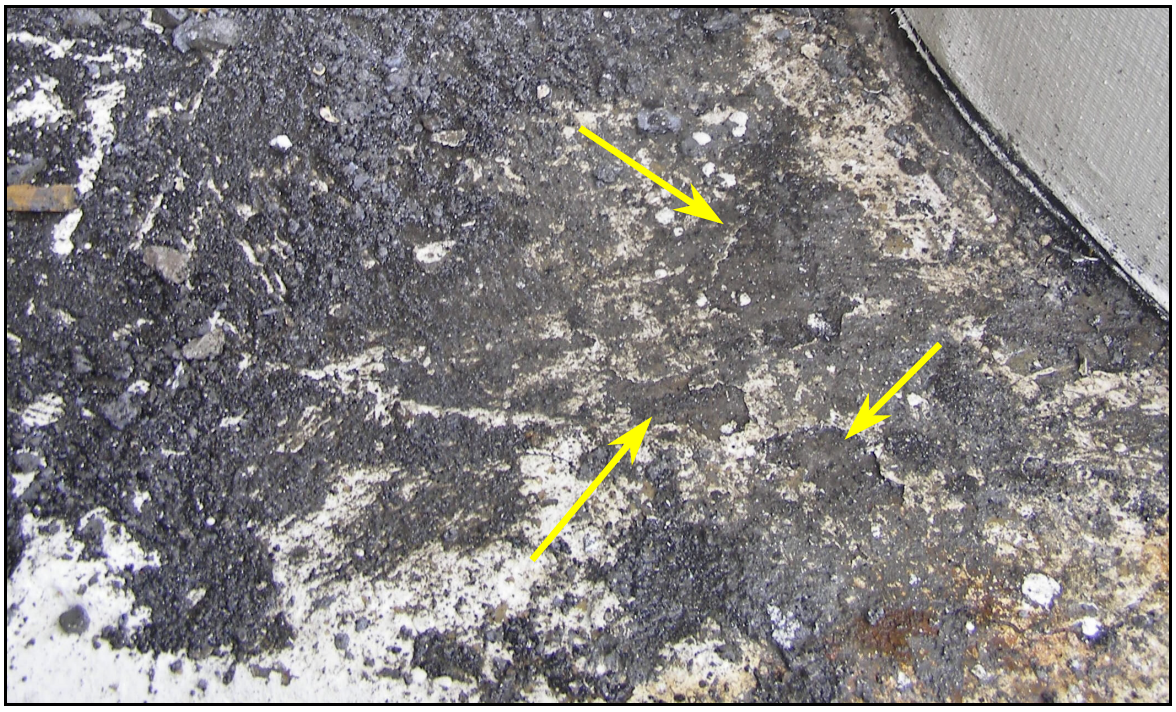


Photo 44 – Typical Sealer Flaking (See Arrows) to Pier Cap Top
(Note: Black debris is from current maintenance repairs.)

Location	Deterioration (FT^2)		
	Left	Right	Total
South Abutment B	2	3	5
Pier 8	13	14	27
Pier 9	20	5	25
Pier 10	5	1	6
Pier 11	115	76	191
Pier 12	10	107	117
Pier 13	15	40	55
Pier 14	14	182	196
Pier 15	10	24	34
Pier 17	4		4
Pier 18E		9	9
North Abutment BE	2	10	12
Total			**681 FT^2**

Table 3 – Jennings Freeway Bridge Substructure Repair Quantities

Note: Abutments and piers not listed have no recorded deterioration.

Wingwalls

The wingwalls are in good condition with no deficiencies noted.

Slope Protection

The slope protection is in good condition.

Approaches

I-71

All approach slabs have an asphalt wearing surface which is in fair condition. The rear approach is situated on a left curve with a sloped median between the northbound and southbound roadways. Portions of this median has become heavily vegetated, reducing the stopping sight distance for the two left lanes for any slowed or stopped traffic occurring on the bridge (Photo 45).

A catch basin located 480 feet south of the South Abutment behind the left guardrail is clogged with dirt (Photo 46).

Jennings Freeway

The approach slabs are in fair condition. All approach slabs have been overlaid with an asphalt wearing surface. A wearing surface spall is present adjacent to the rear expansion joint (Photo 47). Additionally, the rear approach has been milled to roughen the once polished roadway surface.

Photo 45 – Encroaching Tree Branches Limiting Stopping Sight Distance, South Approach, I-71 Bridge

Photo 46 – Clogged Catch Basin Along South Approach, I-71 Bridge

Photo 47 – Approach Slab Spall, Rear Approach, Jennings Freeway Bridge

General

Land Use

Over the last several years, the West Side Steel Mill adjacent to the I-71 and Jennings Bridge structure has been demolished and the Steelyard Commons commercial development is currently under construction. An eight-foot high chain link fence has been placed near and parallel to the limited access roadway right-of-way fence (Photo 48).

Photo 48 – New 8-Ft. High Chain Link Fence for Steelyard Commons

I-71 Bridge

Lighting

Lighting for the I-71 Bridge is provided by ground-mounted light masts located between the northbound and southbound roadways. All masts lights are fully operational.

Overhead Signage

An aluminum overhead sign bridge is present in at the 0.66 point of Span 16. This sign bridge is not mounted on the substructure. Furthermore, it is located near midspan and is thus subject to the dynamic responses that have been recently investigated by ODOT. No distress was observed to this sign bridge, however continued attention for fatigue cracking to the overhead truss should be included in future inspections.

Jennings Freeway Bridge

Lighting

Lighting for the Jennings Freeway Bridge is provided by light fixtures mounted on the upstation side of the left and right columns of Piers 5 through 16. Seven light fixtures are not operational with two exterior junction boxes broken or missing (Photo 49). Table 4 included the location and nature of these deficiencies. Additionally, most pull box covers have heavy corrosion to their exposed surfaces (Photo 50). These covers were likely corroded when covered with sealer several years ago.

Photo 49 – Missing Junction Box and Exposed Wiring, Right Parapet at Pier 11

Photo 50 – Typical Heavy Corrosion Pull Box Cover, Jennings Freeway Bridge

Pier	Side	Deficiency
5	Right	Broken Light
7	Right	Broken Light
9	Left	Broken Light
11	Right	Broken Junction Box
11	Right	Broken Light
12	Left	Broken Light
13	Left	Broken Light
14	Right	Broken Junction Box
15	Left	Broken Light

Table 4 – Jennings Freeway Bridge Lighting Deficiency Summary

Overhead Signage

All Jennings Freeway directional signs within the bridge limits are mounted overhead on the I-71 Bridge pier caps. No aluminum sign bridge fatigue issues are present for this structure.

Summary & Recommendations

The I-71 NB over Jennings Freeway and Jennings Freeway under I-71 Bridges (SFN 1805371 and SFN 1805436 respectively) are both rated in Satisfactory Condition, or ***6*** on the FHWA condition coding system. The following repairs and/or maintenance efforts shown below in a Five-Year Repair and Maintenance Schedule (Table 5) are recommended to maintain these structures for the foreseeable future and to minimize future repair costs.

	Repair/Maintenance Task	2007	2008	2009	2010	2011
1.	Pier 17A: Replace access door and secure with stainless steel nuts and fender washers. Remove existing stiffener plate, and consider replacing with elastomeric seal.	√				
2.	Remove loose parapet concrete over Jennings Freeway traffic.	√		√		√
3.	Repair spalled and delaminated wearing surface to left two traffic lanes.	√				√
4.	Remove loose drain trough at Expansion Joint 2A. Remove remaining drain troughs at Expansion Joints 3AE & 3AW.	√				
5.	Replace expansion joint seals.	√				
6.	Patch deteriorated substructure concrete.	√				
7.	Reset and secure bearing plates at I-71 South Abutment A, Pier 1 and North Abutment BW.					√
8.	Clear clogged drain collector, Pier 6.	√				
9.	Remove gutterline debris and clear clogged scuppers (I-71 and Jennings Freeway Bridges)	√		√		√
10.	Clear debris mounds from drain outlets.	√				√
11.	Clear clogged catch basins along South Approach of I-71 Bridge	√				√
12.	Restore broken light fixtures and junction boxes (Jennings Freeway Bridge).	√				
13.	Trim tree branches and vegetation from left embankment of I-71 NB South Approach.	√				√
14.	Perform zone painting at abutments and expansion hinges.					√
15.	Scrape corrosion and paint drainage bracket at base of Pier 24BE.					√

Table 5 – Five-Year Repair and Maintenance Schedule

APPENDIX A

BR-86 INSPECTION FORMS

State of Ohio Department of Transportation

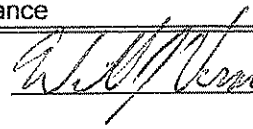
Bridge Inspection Report

1805436 (STRUCTURE FILE NUMBER) | Year Built 68 XX

Bridge Number CUY (Co.) 176 (Route) 1334R (Unit) CLEVELAND (Municipality)

Dist 12 | Bridge Type STEEL / BEAM / CONT | Type Service 19 | Location: Cuyahoga Valley

DECK			
1. Floor	2	2. Wearing Surface	2
3. Curbs, Sidewalks & Walkways		4. Median	
5. Railing	2	6. Drainage	2
7. Expansion Joints	2	**8. SUMMARY**	6
SUPERSTRUCTURE 1 Unit			
9. Alignment	1	10. Beams/Girders/Slab	1
11. Diaphragms or Crossframes	2	12. Joist/Stringers	
13. Floor Beams		14. Floor Beam Connection	
15. Verticals		16. Diagonals	
17. End Posts		18. Top Chord	
19. Lower Chord		20. Lower Lateral Bracing	
21. Top Lateral Bracing		22. Sway Bracing	
23. Portals		24. Bearing Devices	2
25. Arch		26. Arch Columns or Hangers	
27. Spandrel Walls		28. Protective Coating System	6
29. Pins/Hangers/Hinges	2	30. Fatigue Prone Connections	1
31. Live Load Response	S	**32. SUMMARY**	7
SUBSTRUCTURE			
33. Abutment 2- Conc	1	34. Abutment Seats	1
35. Piers	2	36. Pier Seats	2
37. Backwalls	2	38. Wingwalls	1
39. Fenders and Dolphins		40. Scour	
41. Slope Protection	1	**42. SUMMARY**	6
CULVERTS			
43. General		44. Alignment	
45. Shape		46. Seams	
47. Headwalls or Endwalls		48. Scour	
49		**50. SUMMARY**	
CHANNEL			
51. Alignment		52. Protection	
53. Waterway Adequacy		**54. SUMMARY**	
APPROACHES			
55. Pavement	2	56. Approach Slabs	2
57. Guardrail	1	58. Relief Joints	2
59. Embankment	1	**60. SUMMARY**	6
GENERAL			
61. Navigation Lights		62. Warning Signs Maint. Resp: 4-City	
63. Sign Supports	1	64. Utilities	3
65. Vertical Clearance	1	**66. GENERAL APPRAISAL & OPERATIONAL STATUS**	6 A

67. Inspected By  PE WJV (P.E. Intials)

William J. Vermes, E-53391, Euthenics, Inc.

Date 12 / 11 / 06

68. Reviewed By  PE KRD (P.E. Intials)

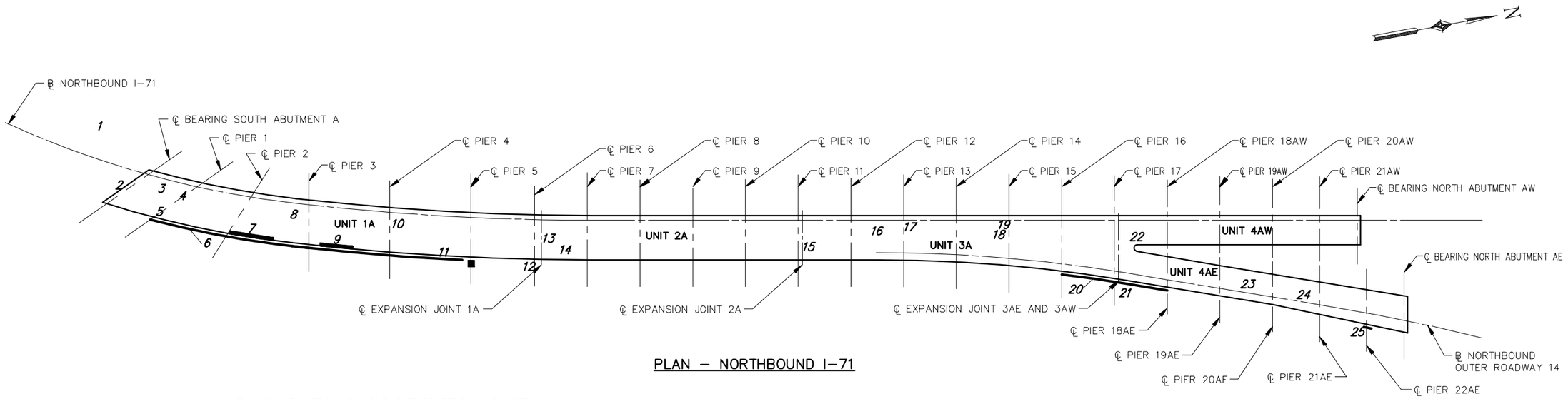
K. Robert Deetz, E-40873, Euthenics, Inc.

Date 12 / 12 / 06

Survey 1 1 1 1 1 N N N

APPENDIX B

STRUCTURE DEFICIENCY MAPS



PLAN – NORTHBOUND I–71

■ NON–FUNCTIONING LIGHT FIXTURE BELOW I–71 DECK

ITEM	DEFICIENCY
1	MEDIAN VEGETATION ENCROACHING ON DRIVER'S LINE OF SIGHT
2	BEARING F OVEREXPANDED, SOUTH ABUTMENT A
3	15 SF DELAMINATION AND CRACKS TO WEARING SURFACE
4	2 SF SPALL TO WEARING SURFACE
5	BEARING L & N OVEREXPANDED, PIER 1
6	LOOSE CONCRETE OVER TRAFFIC TO PARAPET EXTERIOR, PIER 1 TO PIER 5
7	WATER PONDING ALONG PARAPET INTERIOR
8	DELAMINATION ALONG WEARING SURFACE PATCH
9	WATER PONDING ALONG PARAPET INTERIOR
10	BROKEN WEARING SURFACE PATCH, LANE 2
11	VERTICAL CRACK TO PARAPET
12	CLOGGED DRAIN COLLECTOR AT GROUND LEVEL
13	BROKEN SEAL WELD TO EXPANSION JOINT ARMOR
14	DAMPNESS TO DECK UNDERSIDE
15	LOOSE DRAIN TROUGH BELOW EXPANSION JOINT

ITEM	DEFICIENCY
16	BROKEN WEARING SURFACE PATCH, LANE 2
17	5 FT. LONG SPALL ALONG WEARING SURFACE PATCH, LANE 1
18	2 SF DELAMINATION O WEARING SURFACE, LANE 2
19	6 SF CRACKED WEARING SURFACE ADJACENT TO PATCH, LANE 2
20	LOOSE CONCRETE OVER TRAFFIC TO PARAPET EXTERIOR, PIER 16 TO PIER 18AE
21	CRACKED AND LEAKING SEAL WELD TO STEEL PIER CAP HATCH, PIER 17
22	POTENTIAL LOOSE CONCRETE TO PARAPET EXTERIOR OVER TRAFFIC
23	28 SF DELAMINATION AND CRACKS TO WEARING SURFACE
24	2 SF DELAMINATION AND CRACKS TO WEARING SURFACE
25	CRACKED TOP OF PARAPET, 7 FT. LONG

NOTE: ALL EXPANSION JOINT MEMBRANES ARE TORN AND LEAKING

EUTHENICS INC.
CONSULTING ENGINEERS
STRONGSVILLE, OHIO

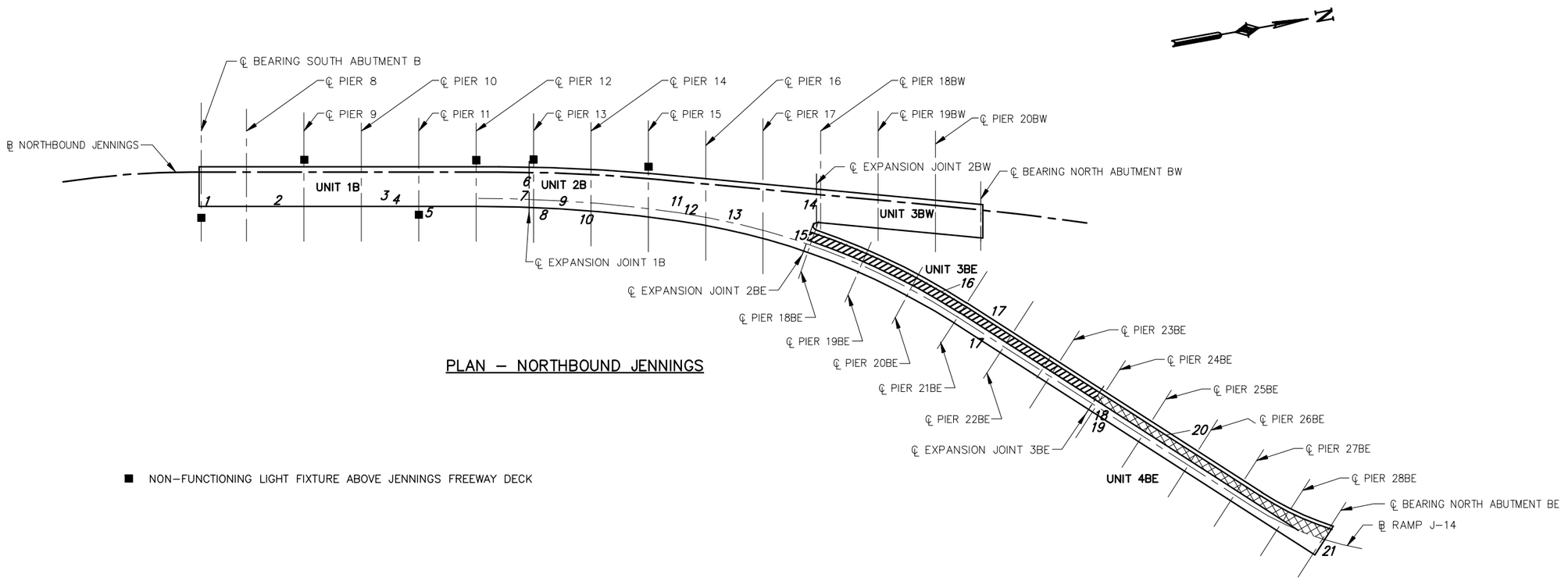
STRUCTURE FILE NUMBER
1805371

FIGURE B-1 - I-71 BRIDGE DEFICIENCY PLAN
CUY–71–1791R
NORTHBOUND I–71 OVER NORTHBOUND JENNINGS

CUY-71-17.83

B–1

PLOT 1"=80'
W.V 5/28/08
[F:\JOBS\728\FIGURE B-1.DWG]



PLAN – NORTHBOUND JENNINGS

■ NON–FUNCTIONING LIGHT FIXTURE ABOVE JENNINGS FREEWAY DECK

ITEM	DEFICIENCY
1	CORROSION HOLE TO DRAIN PIPE AT DECK SOFFIT, BOTH SCUPPERS
2	3 SF & 4 SF DELAMINATION ALONG EDGE LINE
3	10 SF DELAMINATION, LANE 3
4	5 SF, 4 SF & 4 SF DELAMINATION ALONG EDGE LINE
5	BROKEN EXTERNAL JUNCTION BOX FOR LIGHTING
6	14' X 6" WIDE DELAMINATION ALONG EXPANSION JOINT
7	TORN EXPANSION JOINT SEAL & ACTIVE CORROSION BELOW EXPANSION JOINT
8	CORROSION HOLE TO SCUPPER DRAIN PIPE AT DECK SOFFIT
9	96 SF DELAMINATION ALONG WEARING SURFACE COLD JOINT
10	BROKEN EXTERNAL JUNCTION BOX FOR LIGHTING
11	2 SF DELAMINATION TO WEARING SURFACE, LANE 3
12	4 SF & 5 SF DELAMINATION TO WEARING SURFACE ALONG COLD JOINT
13	3 SF & 2 SF DELAMINATION TO WEARING SURFACE ALONG COLD JOINT
14	TORN EXPANSION JOINT SEAL & ACTIVE CORROSION BELOW EXPANSION JOINT
15	TORN EXPANSION JOINT SEAL & ACTIVE CORROSION BELOW EXPANSION JOINT
16	20% DELAMINATION TO LEFT HALF OF WEARING SURFACE, UNIT 3BE
17	FLAKING SEALER TO PARAPETS
18	CORROSION HOLE TO SCUPPER DRAIN PIPE AT DECK SOFFIT
19	CORRODED DRAINAGE BRACKET AT BASE OF PIER 24BE
20	35 TO 40% DELAMINATION TO LEFT HALF OF WEARING SURFACE, UNIT 4BE
21	BEARING G OVER CONTRACTED, NORTH ABUTMENT BE

NOTE: GUTTERLINE DEBRIS IS PRESENT THROUGHOUT ENTIRE BRIDGE DECK.
MOST SCUPPERS ARE CLOGGED.

[F:\JOBS\728\FIGURE B-2] WJV 5/28/06 PLOT 1"=80'

EUTHENICS INC.
CONSULTING ENGINEERS
STRONGSVILLE, OHIO

STRUCTURE FILE NUMBER
1805436

FIGURE B-2 - JENNINGS FREEWAY BRIDGE DEFICIENCY PLAN
CUY-176-1334R
NORTHBOUND JENNINGS UNDER I-71

CUY-176-13.34

B-2

APPENDIX C

BEAM FIELD SPLICE MISFRABRICATION EXAMPLE

FED RD DIVISION	STATE	PROJECT	
2	OHIO		

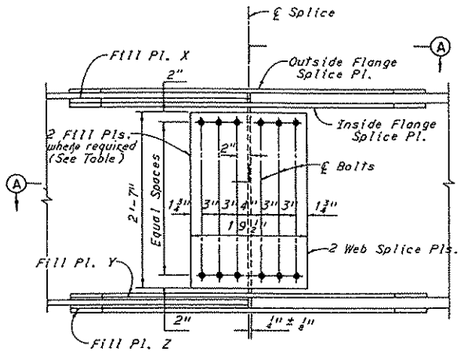
447
646

CUYAHOGA COUNTY
CUY 71-17.83
CUY - 176-12.76

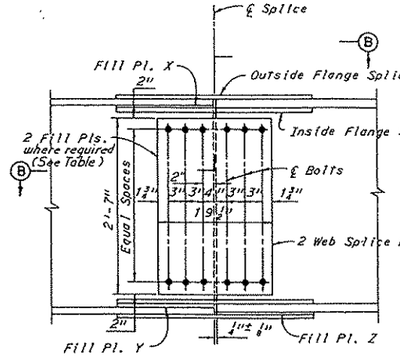
DETAILS OF 36 WF BEAM SPLICES

BEAM 36WF TO BEAM 36WF	WEB SPLICE				FLANGE SPLICE														
		*WEB PLATES	WEB BOLTS	FILL PLS.	*FLANGE PLATES			*FILL PLATES				FLANGE BOLTS						
	Type	2 Required	No.	2	Type	Outside 2 Required	Inside 2 Required	Type	Thickness(in.) X	Y	Z	No.	Spa. N	Dimensions (inches) Pitch	A	B	C
135 to 135	B	13 1/2 x 3/8 x 2'-7"	40	-	C	11 x 3/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	-	-	-	-	32	3	3 1/2	2 1/2	-	6 1/2
135 to 150	B	13 1/2 x 3/8 x 2'-7"	40	-	C	11 x 3/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	C	1/8	1/8	5/16	32	3	3 1/2	2 1/2	-	6 1/2
135 to 160	B	13 1/2 x 3/8 x 2'-7"	40	-	C	11 x 3/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	C	1/4	1/4	1/16	32	3	3 1/2	2 1/2	-	6 1/2
135 to 170	B	13 1/2 x 3/8 x 2'-7"	40	1/16	C	11 x 3/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	C	5/16	5/16	5/16	32	3	3 1/2	2 1/2	-	6 1/2
135 to 182	B	13 1/2 x 3/8 x 2'-7"	40	1/16	C	11 x 3/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	C	3/8	3/8	3/8	32	3	3 1/2	2 1/2	-	6 1/2
135 to 194	B	13 1/2 x 3/8 x 2'-7"	40	1/16	C	11 x 3/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	C	7/16	7/16	7/16	32	3	3 1/2	2 1/2	-	6 1/2
135 to 230	B	13 1/2 x 3/8 x 2'-7"	40	1/16	B	11 x 3/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	A	1/16	1/8	1/16	32	3	3 1/2	2 1/2	-	6 1/2
135 to 245	B	13 1/2 x 3/8 x 2'-7"	40	1/8	B	11 x 3/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	A	1/8	1/16	1/4	32	3	3 1/2	2 1/2	-	6 1/2
135 to 260	B	13 1/2 x 3/8 x 2'-7"	40	1/8	B	11 x 3/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	C	3/8	1/16	11/16	32	3	3 1/2	2 1/2	-	6 1/2
135 to 280	B	13 1/2 x 3/8 x 2'-7"	40	1/8	B	11 1/8 x 2'-4 1/2"	4 1/2 x 1/2 x 2'-4 1/2"	C	3/8	1/16	11/16	32	3	3 1/2	2 1/2	-	6 1/2
150 to 150	B	13 1/2 x 3/8 x 2'-7"	40	-	C	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	-	-	-	-	32	3	3 1/2	2 1/2	-	6 1/2
150 to 160	B	13 1/2 x 3/8 x 2'-7"	40	-	C	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	1/16	1/16	1/16	32	3	3 1/2	2 1/2	-	6 1/2
150 to 170	B	13 1/2 x 3/8 x 2'-7"	40	-	C	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	1/8	1/8	1/8	32	3	3 1/2	2 1/2	-	6 1/2
150 to 182	B	13 1/2 x 3/8 x 2'-7"	40	1/16	C	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	1/4	1/4	1/4	32	3	3 1/2	2 1/2	-	6 1/2
150 to 194	B	13 1/2 x 3/8 x 2'-7"	40	1/16	C	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	5/16	5/16	5/16	32	3	3 1/2	2 1/2	-	6 1/2
150 to 230	B	13 1/2 x 3/8 x 2'-7"	40	1/16	B	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	A	1/16	1/4	1/16	32	3	3 1/2	2 1/2	-	6 1/2
150 to 245	B	13 1/2 x 3/8 x 2'-7"	40	1/16	B	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	A	1/16	5/16	1/4	32	3	3 1/2	2 1/2	-	6 1/2
150 to 260	B	13 1/2 x 3/8 x 2'-7"	40	1/8	B	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	A	1/4	1/4	3/8	32	3	3 1/2	2 1/2	-	6 1/2
150 to 280	B	13 1/2 x 3/8 x 2'-7"	40	1/8	B	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	3/8	-	11/16	32	3	3 1/2	2 1/2	-	6 1/2
150 to 300	B	13 1/2 x 3/8 x 2'-7"	40	3/16	B	11 x 7/16 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	3/4	1/8	1/8	32	3	3 1/2	2 1/2	-	6 1/2
160 to 160	A	19 1/2 x 3/8 x 2'-7"	48	-	C	11 x 1/2 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	-	-	-	-	32	3	3 1/2	2 1/2	-	6 1/2
160 to 170	A	19 1/2 x 3/8 x 2'-7"	48	-	C	11 x 1/2 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	1/16	1/16	3/16	32	3	3 1/2	2 1/2	-	6 1/2
160 to 182	A	19 1/2 x 3/8 x 2'-7"	48	1/16	C	11 x 1/2 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	3/16	3/16	3/16	32	3	3 1/2	2 1/2	-	6 1/2
160 to 194	A	19 1/2 x 3/8 x 2'-7"	48	1/16	C	11 x 1/2 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	1/4	1/4	1/4	32	3	3 1/2	2 1/2	-	6 1/2
160 to 230	A	19 1/2 x 3/8 x 2'-7"	48	1/16	B	11 x 1/2 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	B	1/4	1/8	1/4	32	3	3 1/2	2 1/2	-	6 1/2
160 to 245	A	19 1/2 x 3/8 x 2'-7"	48	1/16	B	11 x 1/2 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	A	1/16	1/4	1/16	32	3	3 1/2	2 1/2	-	6 1/2
160 to 260	A	19 1/2 x 3/8 x 2'-7"	48	1/8	B	11 x 1/2 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	A	1/16	1/16	1/4	32	3	3 1/2	2 1/2	-	6 1/2
160 to 280	A	19 1/2 x 3/8 x 2'-7"	48	1/8	B	11 x 1/2 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	A	1/16	1/16	1/4	32	3	3 1/2	2 1/2	-	6 1/2
160 to 300	A	19 1/2 x 3/8 x 2'-7"	48	1/8	B	11 x 1/2 x 2'-4 1/2"	4 1/2 x 3/8 x 2'-4 1/2"	C	1/16	1/8	3/16	32	3	3 1/2	2 1/2	-	6 1/2
170 to 170	A	19 1/2 x 3/8 x 2'-7"	48	-	C	11 x 1/2 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	-	-	-	-	40	4	3 1/2	2 1/2	-	6 1/2
170 to 182	A	19 1/2 x 3/8 x 2'-7"	48	-	C	11 x 1/2 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	C	1/16	1/16	3/16	40	4	3 1/2	2 1/2	-	6 1/2
170 to 194	A	19 1/2 x 3/8 x 2'-7"	48	1/16	C	11 x 1/2 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	C	1/8	1/8	1/8	40	4	3 1/2	2 1/2	-	6 1/2
170 to 230	A	19 1/2 x 3/8 x 2'-7"	48	1/16	B	11 x 1/2 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	B	1/8	1/16	1/4	40	4	3 1/2	2 1/2	-	6 1/2
170 to 245	A	19 1/2 x 3/8 x 2'-7"	48	1/16	B	11 x 1/2 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	B	1/4	1/8	1/4	40	4	3 1/2	2 1/2	-	6 1/2
170 to 260	A	19 1/2 x 3/8 x 2'-7"	48	1/16	B	11 x 1/2 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	A	3/16	1/4	1/4	40	4	3 1/2	2 1/2	-	6 1/2
170 to 280	A	19 1/2 x 3/8 x 2'-7"	48	1/8	B	11 x 1/2 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	A	1/4	1/8	5/16	40	4	3 1/2	2 1/2	-	6 1/2
170 to 300	A	19 1/2 x 3/8 x 2'-7"	48	1/8	B	11 x 1/2 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	A	1/4	-	1/16	40	4	3 1/2	2 1/2	-	6 1/2
182 to 182	A	19 1/2 x 3/8 x 2'-7"	48	-	C	11 x 9/16 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	-	-	-	-	40	4	3 1/2	2 1/2	-	6 1/2
182 to 194	A	19 1/2 x 3/8 x 2'-7"	48	-	C	11 x 9/16 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	C	1/16	1/16	3/16	40	4	3 1/2	2 1/2	-	6 1/2
182 to 230	A	19 1/2 x 3/8 x 2'-7"	48	-	B	11 x 9/16 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	B	1/16	1/8	1/16	40	4	3 1/2	2 1/2	-	6 1/2
182 to 245	A	19 1/2 x 3/8 x 2'-7"	48	1/16	B	11 x 9/16 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	B	1/8	1/16	1/4	40	4	3 1/2	2 1/2	-	6 1/2
182 to 260	A	19 1/2 x 3/8 x 2'-7"	48	1/16	B	11 x 9/16 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	B	1/4	1/8	1/4	40	4	3 1/2	2 1/2	-	6 1/2
182 to 280	A	19 1/2 x 3/8 x 2'-7"	48	1/16	B	11 x 9/16 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	A	3/16	1/8	3/16	40	4	3 1/2	2 1/2	-	6 1/2
182 to 300	A	19 1/2 x 3/8 x 2'-7"	48	1/8	B	11 x 9/16 x 2'-11 1/2"	4 1/2 x 5/16 x 2'-11 1/2"	A	1/4	1/8	1/8	40	4	3 1/2	2 1/2	-	6 1/2
194 to 194	A	19 1/2 x 1/2 x 2'-7"	54	-	C	11 x 5/8 x 2'-11 1/2"	4 1/2 x 3/8 x 2'-11 1/2"	-	-	-	-	40	4	3 1/2	2 1/2	-	6 1/2
194 to 230	A	19 1/2 x 1/2 x 2'-7"	54	-	B	11 x 5/8 x 2'-11 1/2"	4 1/2 x 3/8 x 2'-11 1/2"	B	-	1/8	1/8	40	4	3 1/2	2 1/2	-	6 1/2
194 to 245	A	19 1/2 x 1/2 x 2'-7"	54	-	B	11 x 5/8 x 2'-11 1/2"	4 1/2 x 3/8 x 2'-11 1/2"	B	1/4	1/8	7/16	40	4	3 1/2	2 1/2	-	6 1/2
194 to 260	A	19 1/2 x 1/2 x 2'-7"	54	1/16	B	11 x 5/8 x 2'-11 1/2"	4 1/2 x 3/8 x 2'-11 1/2"	B	3/16	1/16	1/4	40	4	3 1/2	2 1/2	-	6 1/2
194 to 280	A	19 1/2 x 1/2 x 2'-7"	54	1/16	B	11 x 5/8 x 2'-11 1/2"	4 1/2 x 3/8 x 2'-11 1/2"	A	1/8	1/8	-	40	4	3 1/2	2 1/2	-	6 1/2
194 to 300	A	19 1/2 x 1/2 x 2'-7"	54	1/16	B	11 x 5/8 x 2'-11 1/2"	4 1/2 x 3/8 x 2'-11 1/2"	A	1/8	1/16	1/4	40	4	3 1/2	2 1/2	-	6 1/2
230 to 230	A	19 1/2 x 5/8 x 2'-7"	54	-	A	16 x 1/8 x 5'-0"	6 1/2 x 5/8 x 5'-0"	-	-	-	-	64	7	3 1/2	1 3/4	3	6 1/2
230 to 245	A	19 1/2 x 5/8 x 2'-7"	54	-	A	16 x 1/8 x 5'-0"	6 1/2 x 5/8 x 5'-0"	C	1/16	1/16	1/8	64	7	3 1/2	1 3/4	3	6 1/2
230 to 260	A	19 1/2 x 5/8 x 2'-7"	54	1/16	A	16 x 1/8 x 5'-0"	6 1/2 x 5/8 x 5'-0"	C	1/16	1/16	1/8	64	7	3 1/2	1 3/4	3	6 1/2
230 to 280	A	19 1/2 x 5/8 x 2'-7"	54	1/16	A	16 x 1/8 x 5'-0"	6 1/2 x 5/8 x 5'-0"	C	1/16	1/16	1/8	64	7	3 1/2	1 3/4	3	6 1/2
230 to 300	A	19 1/2 x 5/8 x 2'-7"	54	1/16	A	16 x 1/8 x 5'-0"	6 1/2 x 5/8 x 5'-0"	C	1/16	1/16	1/8	64	7	3 1/2	1 3/4	3	6 1/2
245 to 245	A	19 1/2 x 5/8 x 2'-7"	54	-	A	16 x 1/8 x 5'-0"	6 1/2 x 5/8 x 5'-0"	-	-	-	-	64	7	3 1/2	1 3/4	3	6 1/2
245 to 260	A	19 1/2 x 5/8 x 2'-7"	54	-	A	16 x 1/8 x 5'-0"	6 1/2 x 5/8 x 5'-0"	C	1/16	1/16	1/8	64	7	3 1/2	1 3/4	3	6 1/2
245 to 280	A	19 1/2 x 5/8 x 2'-7"	54	1/16	A	16 x 1/8 x 5'-0"	6 1/2 x 5/8 x 5'-0"	C	1/4	1/4	1/8	64	7	3 1/2	1 3/4	3	6 1/2
245 to 300	A	19 1/2 x 5/8 x 2'-7"	54	1/16	A	16 x 1/8 x 5'-0"	6 1/2 x 5/8 x 5'-0"	C	1/16	3/16	1/16	64	7	3 1/2	1 3/4	3	6 1/2
260 to 260	A	19 1/2 x 5/8 x 2'-7"	60	-	A	16 x 3/8 x 5'-0"	6 1/2 x 3/8 x 5'-0"	-	-	-	-	64	7	3 1/2	1 3/4	3	6 1/2
260 to 280	A	19 1/2 x 5/8 x 2'-7"	60	-	A	16 x 3/8 x 5'-0"	6 1/2 x 3/8 x 5'-0"	C	1/4	1/4	1/4	64	7	3 1/2	1 3/4	3	6 1/2
260 to 300	A	19 1/2 x 5/8 x 2'-7"	60	1/16	A	16 x 3/8 x 5'-0"	6 1/2 x 3/8 x 5'-0"	C	1/4	1/4	1/4	64	7	3 1/2	1 3/4	3	6 1/2
280 to 280	A	19 1/2 x 5/8 x 2'-7"	60	-	A	16 x 11/16 x 6'-3"	6 1/2 x 11/16 x 6'-3"	-	-	-	-	80	9	3 1/2	1 3/4	3	6 1/2
280 to 300	A	19 1/2 x 5/8 x 2'-7"	60	-	A	16 x 11/16 x 6'-3"	6 1/2 x 11/16 x 6'-3"	C	1/4	1/8	1/4	80	9	3 1/2	1 3/4	3	6 1/2
300 to 300	A	19 1/2 x 3/4 x 2'-7"	60	-	A	16 x 3/4 x 6'-3"	6 1/2 x 3/4 x 6'-3"	-	-	-	-	80	9	3 1/2	1 3/4	3	6 1/2

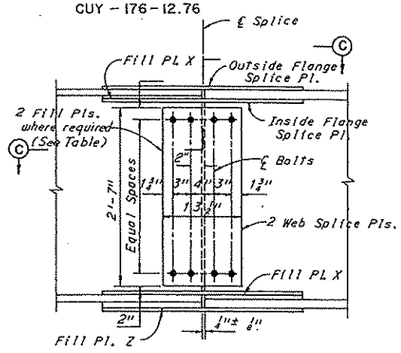
FILLS are based on the nominals member sizes being spliced, however, in the final shop assembly, fills shall be furnished to the nearest 1/4 inch in thickness based on the acutal measured sizes of the members being spliced. Drawing together of splice plates over material that varies by 1/16 inches or more in thickness, at the centerline of the splice, will not be permitted.



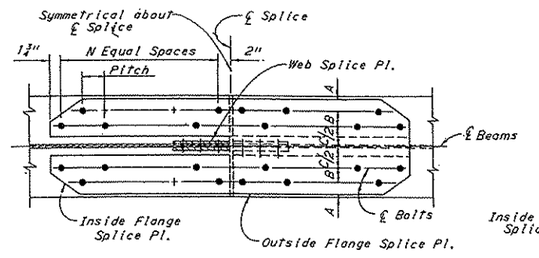
BEAM SPLICE DETAIL 1
FLANGE SPLICE TYPE A
FLANGE FILL PLATES TYPE A
WEB SPLICE TYPE A



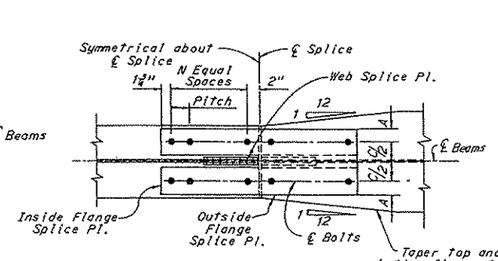
BEAM SPLICE DETAIL 2
FLANGE SPLICE TYPE B
FLANGE FILL PLATE TYPE B
WEB SPLICE TYPE A



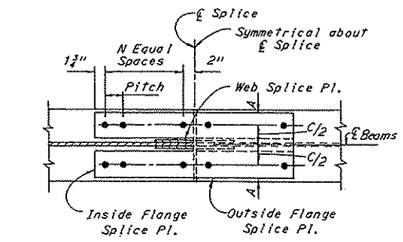
BEAM SPLICE DETAIL 3
FLANGE SPLICE TYPE C
FLANGE FILL PLATES TYPE C
WEB SPLICE TYPE B



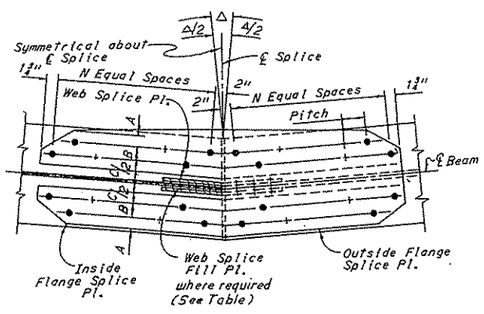
SECTION A-A



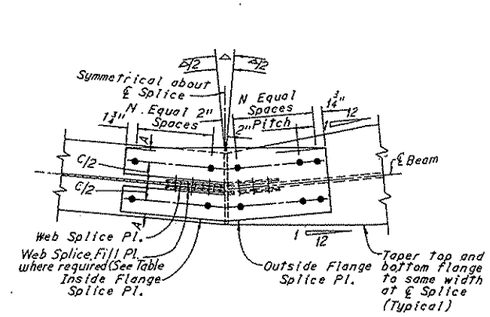
SECTION B-B



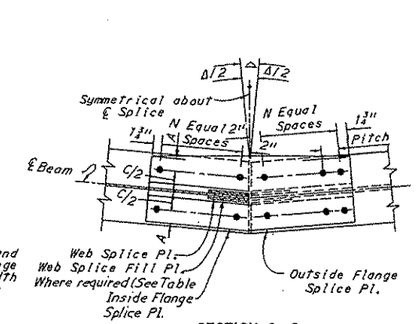
SECTION C-C



SECTION A-A
(Showing Beam Splice at Bend Point)



SECTION B-B
(Showing Beam Splice at Bend Point)



SECTION C-C
(Showing Beam Splice at Bend Point)

FIELD ASSEMBLY. In the final assembly of parts to be bolted each beam shall be so supported that drift pins may be placed in a sufficient number of holes (not less than 25% for field erection), to provide and maintain accurate alignment of holes and parts. Heavy driving of drift pins will not be permitted. Sufficient bolts shall be installed and brought to a snug tight condition to bring all parts of the splice into complete contact before the member is released. Bolts shall then be installed in any remaining open holes and tightened to a snug tight fit, after which all bolts shall be tightened completely by calibrated wrenches or by the turn-of-nut method. Drift pins shall then be replaced with bolts, tightened in the same manner.

All Splices shall be made with 1" ϕ High Strength Bolts. Bolts shall be placed with their heads on the outside face of the exterior girders and on the bottoms of flange plates.

Beam Splice located at Bend Point

The beams change direction at the centerline of field splice. Specially cut flange splice plates and bent web splice plates will be required. The top splice plate on the top flange and the bottom splice plate on the bottom flange shall be cut without re-entrant corners.

H.N.T.B BRIDGE NOS. 21A & 21B

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK

BEAM FIELD SPLICE DETAIL

NORTHBOUND I-71 OVER NORTHBOUND JENNINGS, AND NORTHBOUND JENNINGS

BR. NO. CUY-71-1789 R STA. 917+10.09
STA. 935+21.25

CLEVELAND CUYAHOGA COUNTY OHIO

DRAWN	TRACED	CHECKED	REVIEWED	REVISED
DATE 12-21-64	DATE	DATE 12-22-64	DATE 12-23-64	

SHEET 447

Figure C-1 – Beam Field Splice Detail, Original Construction Drawings