# FRACTURE CRITICAL PIER CAP

# INSPECTION REPORT

**SFN3102807 (HAM-50-1903L)**
**US 50 WB OVER MILL CREEK/CSX TRANSPORTATION/CENTRAL RAILROAD OF INDIANA**
**HAMILTON COUNTY, OH**
**DISTRICT 8**

**July 2023**

*Prepared for:*

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

STATE OF OHIO
MICHAEL A.
SEAL
E-70350
10/2/2023
REGISTERED
PROFESSIONAL ENGINEER

*Prepared by:*

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# EXECUTIVE SUMMARY

***Project:*** VAR-District 8 Bridge Inspections No. 2023-4. (PID No. 105476)

***Purpose of Project:*** To perform a fracture critical inspection of steel pier caps of bridges for the Ohio Department of Transportation, District 8.

***Inspection Team:*** Team Leader – Michael Seal, P.E. – Collins Engineers, Inc.
Team Member – Trent Graham – Collins Engineers, Inc.
Team Member – Matthew McFadden, E.I.T. – Gannett-Fleming

***Inspection Date(s):*** July 12, 2023

***Summary of Findings:***

- **Pier 5N:**
  - The cap interior is a humid environment, with water and humidity likely entering through the cap hatches. This has allowed surface corrosion to develop at both ends of the cap. This corrosion continues from the past few inspection cycles.
  - There is evidence of leakage through bolt holes for the top clip angles at the cap web plates on the interior. Water likely infiltrates cracks in the deck and seeps through these bolt holes. This continues, but has not significantly changed since the prior inspection.
  - The bolted sleeves for the water line installation retrofit continues to function as intended, though some bolts are drilled through fillet welds for web stiffeners. This has not changed and no cracks were noted.
  - Active corrosion and laminating corrosion is present on the south end of the pier cap exterior. Localized pits up to 1/8 in. deep are present. This corrosion continues for each inspection cycle.
  - Bird debris has accumulated at most of the acute corners of the girder to cap connections. This has not significantly changed since the prior inspection. This retains moisture and can promote corrosion.
  - Active corrosion continues on the south bearing. The anchor bolt nuts still exhibit extensive section loss to the nuts, but the bearings currently function as designed.

***Summary of Recommendations:***

- Future inspections should continue to monitor the corrosion at the ends of the caps for increased section loss or growth.
- Future inspections should monitor the bolted sleeves for the water line where the bolt holes are through existing fillet welds, and locations of triaxial welds nearby. These locations should be scrutinized for fatigue cracks or deterioration from excessive restraint, respectively.
- Future inspections should monitor the section loss to the south bearing anchor bolt nuts for additional section loss or adverse effects to the bearing.

**NBI Ratings:**

| Item ID | Description | Condition Rating | Summary |
|---|---|---|---|
| B.C.14 | NSTM | 6-Satisfactory | Active corrosion at ends, leakage through the top cap plate at bolts. |

**AASHTO National Bridge Element (NBE) Ratings:**

| Element # | Description | Units | Total | Condition State | | | |
|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 |
| 152 | Steel Floor Beam | LF | 67 | 57 | 10 | 0 | 0 |

Note: Ratings were developed using the FHWA Specifications for the National Bridge Inventory and AASHTO Manual for Bridge Element Inspection, 2nd Edition.

# 1.0 INTRODUCTION

## 1.1 Purpose and Scope

This report consists of the results of a detailed inspection of non-redundant steel tension members (fracture critical) performed at the WB US 50 Bridge over Mill Creek, CSX Transportation and the Central Railroad of Indiana railroad tracks in Hamilton County, OH. Collins Engineers, Inc. (Collins) conducted the fracture critical pier cap investigation for the Ohio Department of Transportation (ODOT), District 8 on July 12, 2023.

## 1.2 General Description of the Structure

The HAM-50-1903L Bridge is a 14-span, welded steel plate girder structure with a reinforced concrete deck that carries westbound US 50 traffic over Mill Creek, CSX Transportation, and the Central Railroad of Indiana railroad tracks (See Figure 1). The overall length of the bridge is 1,049.0 ft.


Figure 1: General Bridge Location

The structure has one fracture critical pier cap located at Pier 5N. This cap spans over the Central Railroad of Indiana track (See Figure 2). Pier Cap 5N is a 67 ft.-5in. simply supported welded steel box beam. A 24 in. diameter water line passes through the cap at mid-span. The nomenclature and girder designations shown on the design plans were used in the fracture critical inspection of the pier cap. The bridge was rehabilitated in 2015 to widen US 50. Structural improvements, including fatigue retrofits, were performed on the pier cap in 1993 and 2013. The 1993 rehabilitation included several fatigue-prone weld details. Two 2 in. diameter stress-relief holes were drilled through the longitudinal girder webs at their connection to the top flange of the pier cap (both north and south face) and then connected with a vertical sawcut. Tack welds between the longitudinal girder bottom flanges and the bottom flanges of the pier caps were ground out. Tack welds that attached the backer bars to the pier cap webs and bottom flange plates were ground out. Sections of backer bar that had bent away from the web plates of the pier caps were removed.

This bridge is inventoried in a west to east direction, and superstructure girders are numbered from left to right looking east (starting at 1). Substructure units are labeled as Rear and Forward Abutments, and Piers 2 through 13.

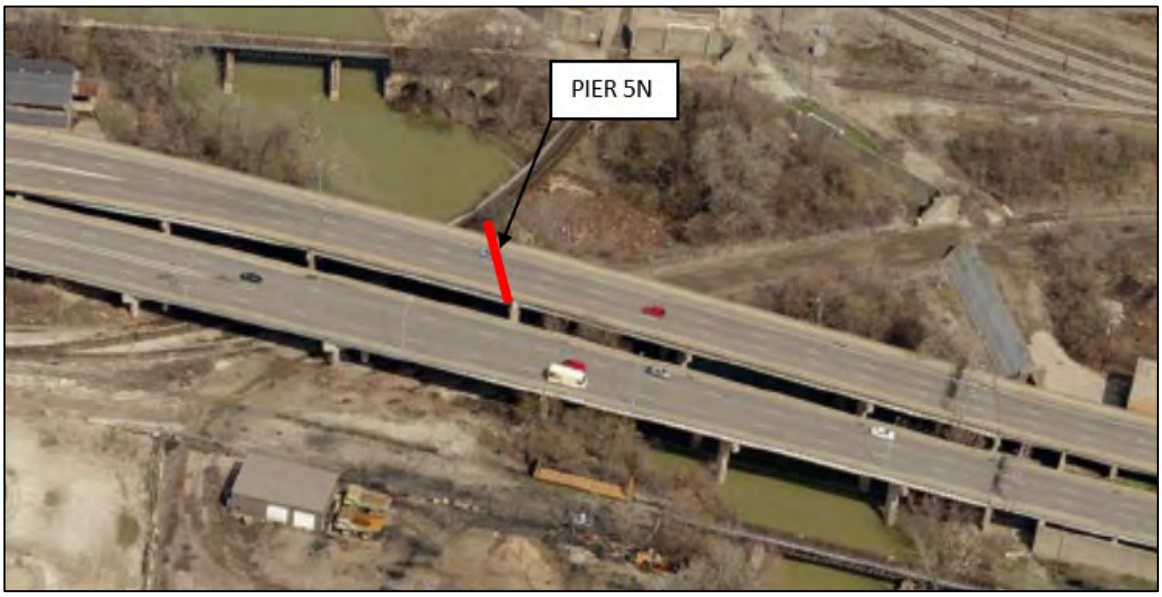


Figure 2: Fracture Critical Pier Cap Location

## 1.3 Method of Investigation

On July 12, 2021, a three-person team consisting of professional engineer and NBI team leader Michael Seal and Trent Graham (Collins Engineers) and Matthew McFadden (Gannett Fleming) performed a fracture critical inspection of Pier Cap 5N. A railroad flagger was present to coordinate train traffic on the Central Railroad of Indiana tracks in the work zone and ensure safe operation around the rail lines. A 46ft. bucket truck was used to access the pier cap interior and perform the "arm's length" exterior inspection. The pier cap hatch cover was removed for the entry and replaced with an impact wrench and resealed with exterior grade silicone caulk after inspection. Various socket sizes from 1/2 in. to 15/16 in. were required to remove the hatch bolts.

OSHA confined space entry procedures were followed while inspectors were working inside the pier cap. Entry was performed in accordance with complete permit-required confined space entry procedures per GF SOP #10 and 29 CFR 1910.146. This included the use of an entry permit system, pre-entry air monitoring, continuous air monitoring, the designation of qualified entrants, attendants, and supervisor(s), and available emergency response. OSHA compliant safety harnesses and lanyards were worn by inspectors when working in the bucket truck.

Field measurements were taken using tape measures, calipers, and an ultrasonic thickness gauge to verify structural component dimensions. Observed deficiencies were recorded on member-specific field inspection forms. Digital photographs were taken of the fatigue prone details and other areas of interest or concern to further document the physical condition of the pier cap.

## 1.4 Condition Ratings

State and Federal guidelines for evaluating the condition of bridges have been developed to promote uniformity in the inspections performed by different teams at different times. Condition ratings are used to describe the existing, in-place bridge as compared to the as-built condition. The following table was used as a guide in evaluating the condition of the various members of the pier cap.

| CODE | CONDITION | DESCRIPTION |
|---|---|---|
| N | NOT APPLICABLE | Component does not exist. |
| 9 | EXCELLENT | Isolated inherent defects. |
| 8 | VERY GOOD | Some inherent defects. |
| 7 | GOOD | Some minor defects. |
| 6 | SATISFACTORY | Widespread minor or isolated moderate defects. |
| 5 | FAIR | Some moderate defects; strength and performance of the component are not affected. |
| 4 | POOR | Widespread moderate or isolated major defects; strength and/or performance of the component is affected. |
| 3 | SERIOUS | Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions. |
| 2 | CRITICAL | Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions in order to keep the bridge open. |
| 1 | IMMINENT FAILURE | Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service. |
| 0 | FAILED | Bridge is closed due to component condition, and is beyond corrective action. Replacement is required to restore service. |

The inspection of this bridge was performed in accordance with the following documents:

1. Manual of Bridge Inspection, Ohio Department of Transportation (ODOT), 2014.
2. Manual for Bridge Element Inspection, AASHTO, 2019.
3. Bridge Inspector's Reference Manual, U.S. Department of Transportation, 2002 (rev 2012).
4. Inspection of Fracture Critical Bridge Members, U.S. Department of Transportation, 1986.
5. Specifications for the National Bridge Inventory, U.S. Department of Transportation, 2022.

# 2.0 EXISTING CONDITIONS

## 2.1 Pier Cap Conditions

### *2.1.1 Pier Cap 5N Overall*

The steel pier cap was in Satisfactory condition [7] (Photograph 1). The pier cap is a built-up steel plate section 6 ft. – 6 in. in height and 4 ft. – 0 in. in width. The bridge girders were attached to the pier cap via bolted tie plates connected to the flanges of both members and bolted angles on the webs. The pier cap was retrofitted in 1992 and 2013, which is detailed in section 1.2 above.

Photograph 1 – View of Pier Cap 5N. Looking north.

Photograph 2 – Elevation View of Pier Cap 5N. Looking East.

#### *2.1.1.1 Pier Cap 5N Interior*

The paint system of the pier cap interior exhibited several areas of light surface corrosion. Active surface corrosion with no loss of section is present inside the cap, predominantly along the bottom plate towards the end of the cap (Photograph 3). This is likely from the humid environment for the interior. This has not changed from the prior inspection. There was evidence of leakage through the bolted connection on the top flange of the pier cap at Girders 1 and 6 (Photograph 4), suggesting that concrete deck cracking above the pier cap is causing water to filter through at the bolt. This continues from the prior inspection.

Other specific items to note on the interior include:

- During the rehabilitation project, a bolted sleeve was added to holes that were previously cut into the web plates to allow installation of a 24in. water main through the pier cap. Some of the bolts (4 bolts total per web plate) that connect the conduit sleeves to the web plates were cut

through the fillet welds of the longitudinal web stiffeners surrounding the conduit holes (Photograph 5). This occurs on the top stiffener for both cap web plates, and also to a lesser amount on the bottom east plate. The bottom stiffener west plate has bolts adjacent to the fillet weld, but not through the weld (Photograph 6). Fillet welds with bolt holes through the welds are less wide with less cross-sectional area, which causes a reduced weld capacity and with the copes/section changes can be more susceptible to crack initiation. This situation has not changed since the prior inspection and no weld cracks were observed during this inspection.

- The fillet welds of the transverse and longitudinal web stiffeners surrounding the water main porthole intersect in tension zones of the web plates (Photograph 7). These locations are closer to the neutral axis than an extreme fiber.
- The horizontal stiffeners below the Girder 6 diaphragm portal were both bent downward slightly (Photograph 8). This is likely construction damage.
- Tack welds are still present at isolated locations inside the cap. These locations include:
    - The two tack welds measuring 1-1/2 in. and 2-1/2 in. on the top flange of the east cap web at the north side of Girder 1 have not changed (Photograph 9).
    - A tack weld was observed over a fillet weld for the south bearing stiffener on the west cap web plate (Photograph 10). This is an old condition that has not changed.
    - A tack weld was observed on the lower west corner of the north face of Diaphragm 3, near the clip angle (Photograph 11). This is an old condition that has not changed.
- There were several locations of un-welded butt joints between the bottom flange backer bar sections. This is an old condition that has not changed.

Photograph 3 – General Example of Active Corrosion On Bottom Plate At End of Cap. South End East Plate Shown. Looking East.


Photograph 4 – Typical Corrosion Through Clip Angle at Cap Top Flange Plate. Diaphragm 6 South Side Shown. Looking North.

Photograph 5 – General Example of Holes Cut Through Fillet Welds of Horizontal Cap Web Stiffeners Above Water Line at Cap Web Plate. Looking West.

Photograph 6 – General Example of Holes Cut Through Fillet Welds of Horizontal Cap Web Stiffeners Below Water Line at Cap Web Plate. Looking West.

Photograph 7 – General Example of Intersecting Welds For Cap Web Plate Stiffeners Near Water Line. Looking east.

Photograph 8 – General Example of Bent Web Stiffener, Girder 6 North Side Shown. No Change. Looking South.

Photograph 9 – View of 1-1/2 in. and 2-1/2 in. Tack Welds On The Cap Top Flange Plate at the East Cap Web at the North Side of Girder 1. Looking east.


Photograph 10 – View of Tack Weld Located At the South Bearing Stiffener, West Cap Web Plate. Looking Southwest.


Photograph 11 (left) – General Example of Tack Weld Still Present Between Diaphragm and Clip Angle. North Face of Diaphragm 3 At Lower West Corner Shown. Looking South.

*2.1.1.2 Pier Cap 5N Exterior*

The paint system of the pier cap exterior exhibited active and laminating corrosion around the south end of the cap on both the flange plates and the web plates (Photograph 12). Isolated pits up to 1/8 in. deep were observed (Photograph 13). There is active corrosion with no section loss at several isolated locations along the cap (Photograph 14). In the 2013 rehabilitation project, tack welds were removed from the bottom flange and girder bottom flange tie plates. Three tack welds measuring between 1-3/4 in. and 2-3/4 in. remain on the west side of the bottom flange between Girders 2 and 3 (Photograph 15). This is an old comment that has not changed. Specific items on the exterior to note include:

- Heavy bird debris is present at the acute corners for the girder connections at the cap webs. This will retain moisture and promote corrosion (Photograph 16).
- Active pack rust was observed on the structure at the following locations:

- Beginning to impact the bottom flange of the pier cap at the east cap web on the north side of Girder 1. No change from prior inspections.
- Between the Girder 6 bottom flange tie plate and both the pier cap filler plate and girder bottom flange. No change from prior inspections.

- The bearing devices for Pier Cap 5N consist of curved plate bearings. Both bearings display active surface corrosion, heavier on the lower portion at the masonry plates (Photograph 17). The anchor bolts and nuts exhibited laminating corrosion with section loss of up to 60% (Photograph 18). This does not appear to have advanced significantly since the prior inspection.


Photograph 12 – View of Laminating Corrosion on the South End of the Cap, East Side. Looking North.

Photograph 13 – View of Laminating Corrosion on the South End of the Cap, Lower East Corner, With Isolated Pits to 1/8 in. Deep. Looking North.

Photograph 14 – General Example of Active Corrosion on Cap With No Section Loss. South End West Face. Looking North.


Photograph 15 – View of 3 Tack Welds Present on the West Side of the Cap Bottom Flange Between Girders 2 and 3. Looking East.

Photograph 16 – General Example of Heavy Bird Debris at Girder to Cap Web Plate Connections. West Cap Plate Shown, Looking East.

Photograph 17 –View of the South Bearing, Note Active Corrosion Continues, Heaviest On Masonry Plate. Looking North.


Photograph 18 – General Example of Section Loss to Anchor Bolt Nuts at the South Bearing. Looking North.

*2.1.1.3 Pier Cap 5N Fatigue Prone Details*

*Fatigue Prone Detail 1*

Fillet welds between transverse stiffeners and web plates. Category: C'

Location: All transverse web stiffeners.

*Fatigue Prone Detail 2*

Full penetration groove weld of flange splice. Category: B

Location: Two bottom flange splices.

*Fatigue Prone Detail 3*

Tack welds, less than 2", on flange plate. Category: C

Location: Two tack welds on exterior of bottom flange at Girder 2.

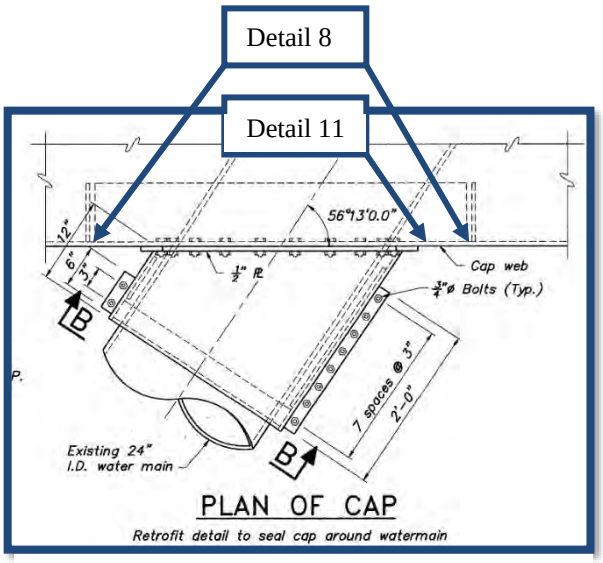



**Figure 3:** Water main portal detail.

*Fatigue Prone Detail 4*

Tack welds, greater than, or equal to, 2" and less than, or equal to, 4". Category: C

Location: One 2 ½" tack weld on exterior of bottom flange at Girder 2.

*Fatigue Prone Detail 8*

Intersection of fillet welds.

Category: E

Location: Fillet welds of web plates and longitudinal stiffeners intersecting fillet welds of web plates and transverse stiffeners around the water main portholes between Girders 3 and 4.

*Fatigue Prone Detail 10*

Unwelded butt joint between sections of backer bar.

Category: No fatigue category is defined, but a significant potential exists for crack initiation in the web and flange plates adjacent to the butt joint. Location: Butt joints between sections of bottom flange backer bars along both webs (5 total).

*Fatigue Prone Detail 11*

Fillet welds between longitudinal stiffeners and web plates. Category: B

Location: Longitudinal web stiffeners around the water main portholes between Girders 3 and 4.

*Fatigue Prone Detail 13*

Weld intersection removal holes in web plates. Category: C

Location: Bottom of web plates at all transverse stiffeners.

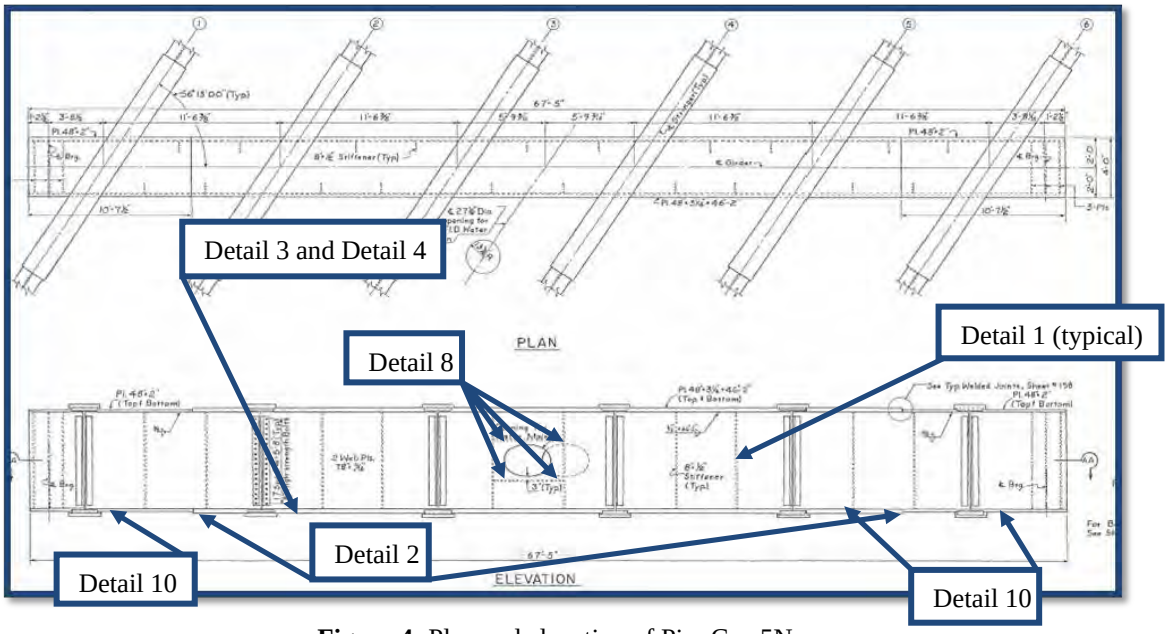



**Figure 4:** Plan and elevation of Pier Cap 5N

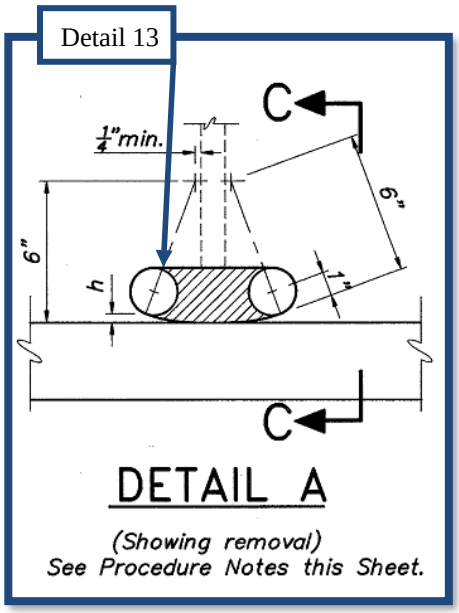



**Figure 5:** Weld intersection retrofit.

## 3.0 EVAULATION AND RECOMMENDATIONS

Based on the inspection, the fracture critical pier cap of Bridge No. HAM-50-1903L and its associated fatigue prone details were in overall SATISFACTORY condition. This is due to the laminating corrosion occurring on the exterior and interior towards the south end of the cap. This corrosion continues for each inspection and localized pits up to 1/8 in. deep are present in this area at isolated locations.

Collins appreciates the opportunity to work with the Ohio Department of Transportation on this project and looks forward to working together in the future. We would be happy to discuss any aspect of the report with you in person or via phone or email.

Respectfully Submitted,
COLLINS ENGINEERS, INC.

Michael Seal, P.E.
Project Manager

Originated by:

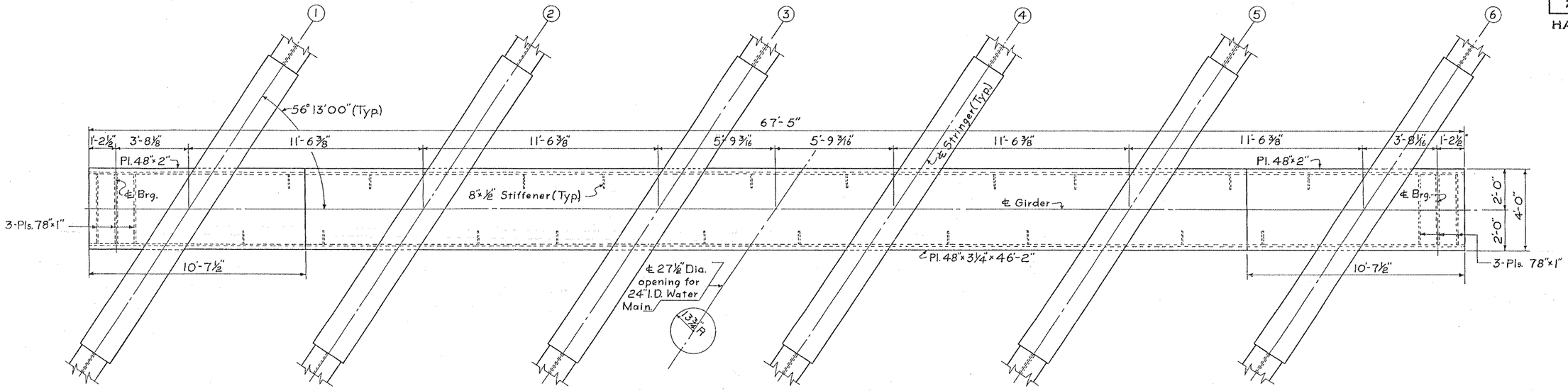
Kevin Mitchell, E.I.T.

# EXHIBIT 1 – EXISTING PIER PLANS

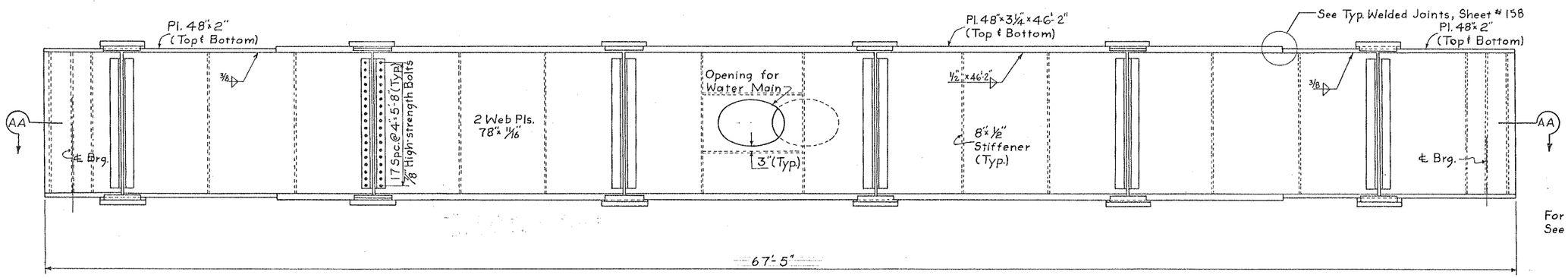
| FED. RD. DIV. | STATE | PROJECT | FISCAL YEAR |
|---|---|---|---|
| 2 | OHIO | | |

151
227

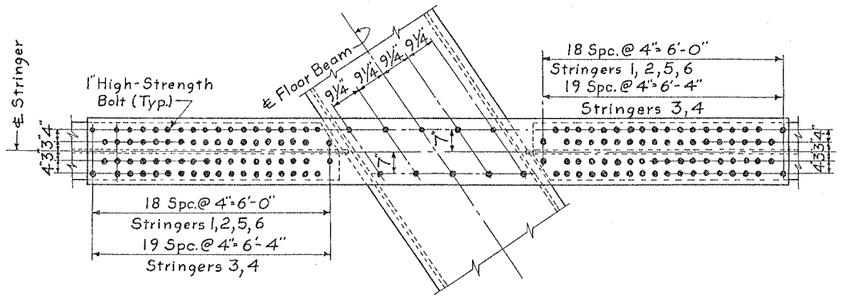
HAM-50-19.38




PLAN




ELEVATION




PLAN OF TIE PLATE

(Showing Bolt Spacing - Typ. Top & Bot. Pls.)

Intermediate Stiffeners (8"x½") Welding Sequence

(1) Use a stiffener that does not fit too tightly (Say D- 1/16")

(2) Push tight against tension flange (No welding)

(3) Weld to web. Use ¼

(4) Weld to compression flange only. Use 5/16

Work this sheet with Sh. # 152

HAZELET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

# STRUCTURAL STEEL DETAILS
## UNIT 4
BRIDGE NO. HAM-50-1938 R.&L.

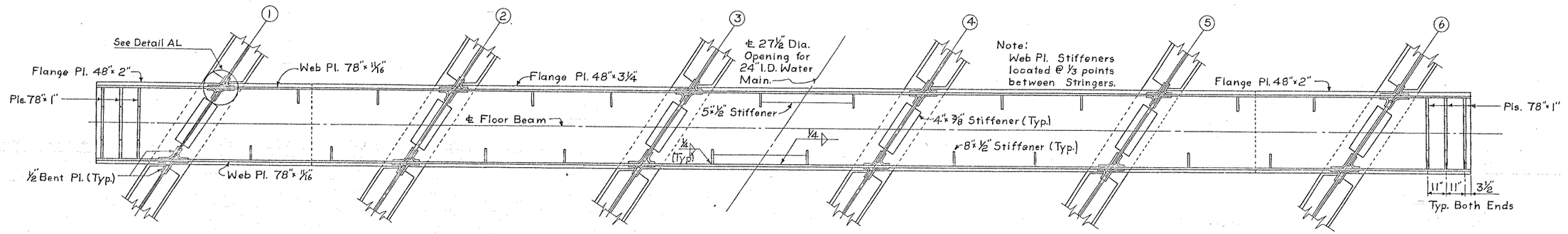
H. & E. BRIDGE NO. 1

| DESIGNED | DRAWN | TRACED | CHECKED | REVIEWED DATE | REVISED |
|---|---|---|---|---|---|
| | RAG | LTC | LHO | 2-4-2 | |

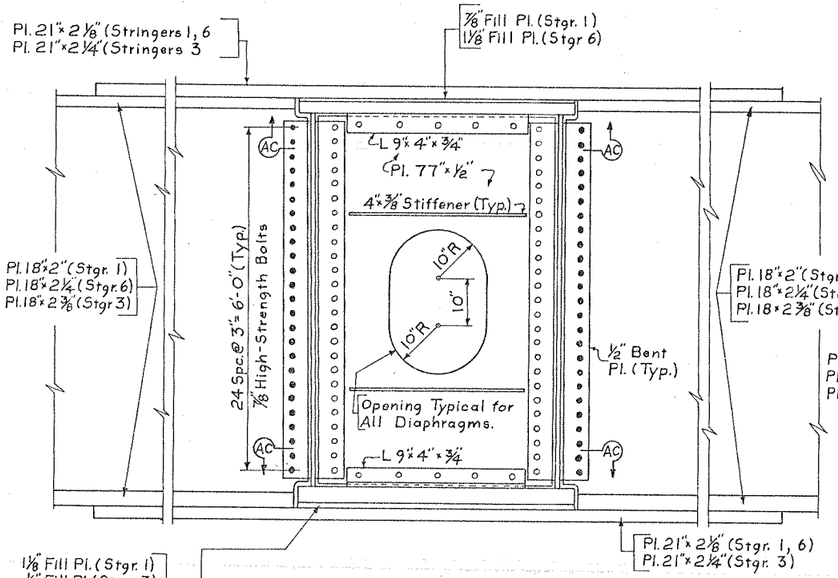
| FED. RD. DIV. | STATE | PROJECT | FISCAL YEAR |
|---|---|---|---|
| 2 | OHIO | | |

152
227

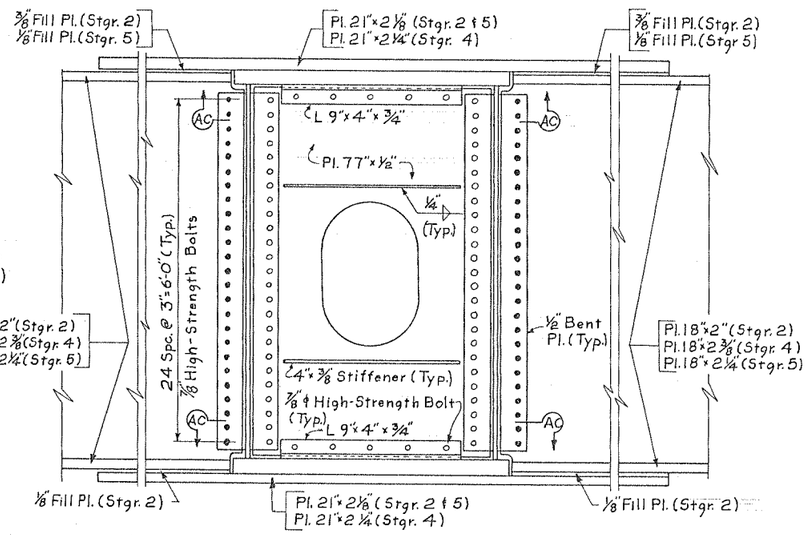
HAM-50-19.38



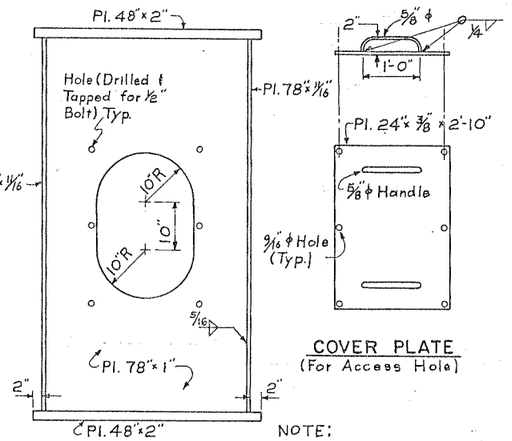

## SECTION AA-AA
(Showing Diaphragms)




### SECTION PARALLEL TO STRINGER
SHOWING: TOP FLANGE & FILL PLS. FOR STRINGERS 1 & 6
BOT. FLANGE & FILL PLS. FOR STRINGERS 1, 3, 4, 5, 6



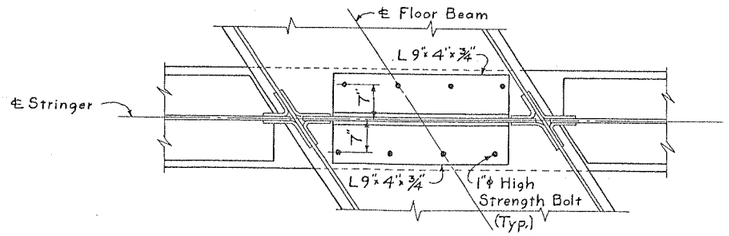

### SECTION PARALLEL TO STRINGER
SHOWING: TOP FLANGE & FILL PLS. FOR STRINGERS 2, 4, 5.
BOT. FLANGE & FILL PLS. FOR STRINGER 2.



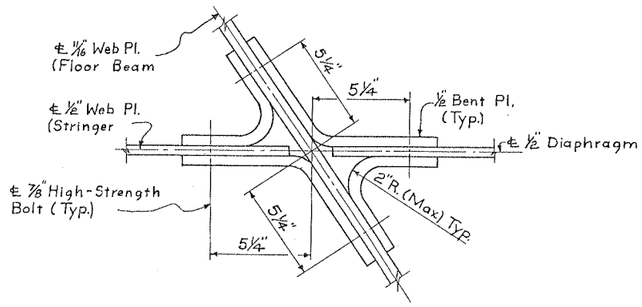

### COVER PLATE
(For Access Hole)

### END VIEW
(For Each End of Floor Beam)

NOTE:
Stiffeners to be grooved and fully butt-welded to the bottom flange plate and fitted in close contact without welding at the top flange pl.




### SECTION AC-AC




### DETAIL AL

Work this sheet with sheet No. 151



HAZELET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

# STRUCTURAL STEEL DETAILS
## UNIT 4
BRIDGE NO. HAM-50-1938 R.&L.

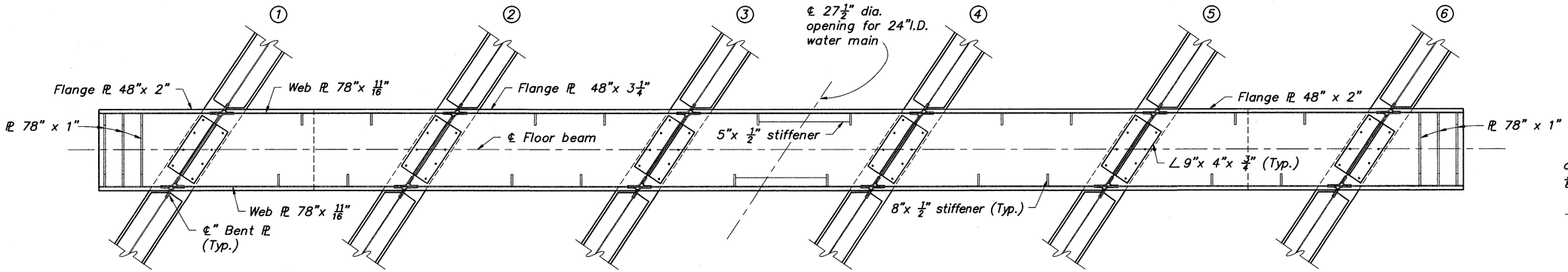
H.&E. BRIDGE NO. 1

| DESIGNED | DRAWN | TRACED | CHECKED | REVIEWED DATE | REVISED |
|---|---|---|---|---|---|
| | B.O.G. | J.T.C. | JHO | M.A.Z. | |

# EXHIBIT 2 – REHABILITATION PLANS

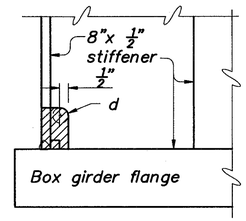
| CALC. BY DATE | HAMILTON COUNTY HAM-50-19.36 | OHIO |
|---|---|---|
| CHKD. BY DATE | | FHWA REGION 5 |

162/255

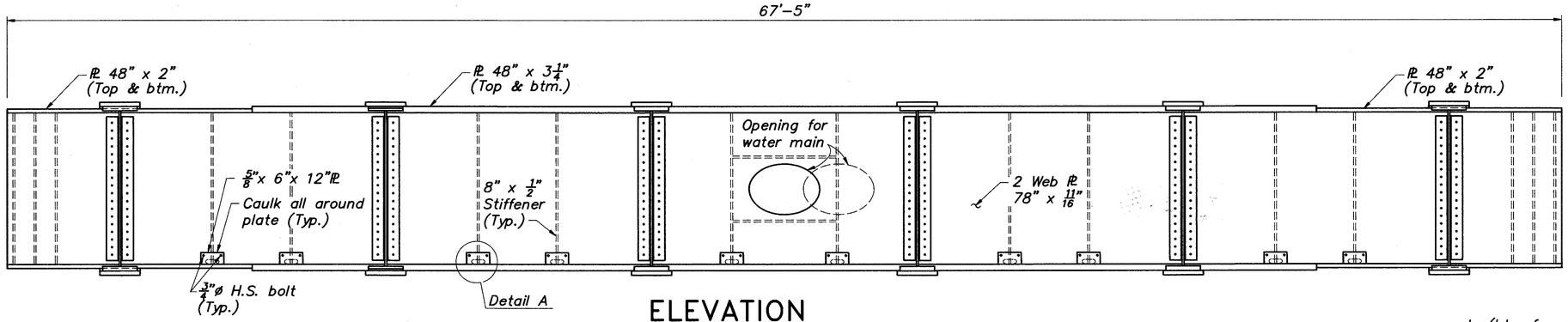



## SECTION A-A

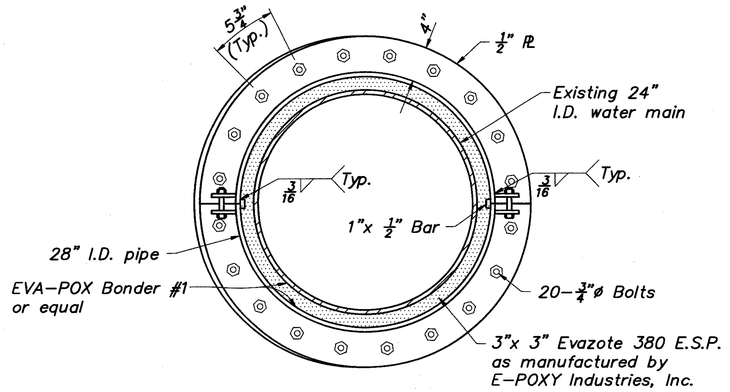
d=diameter of hole= ⅜" + width of backing bar.



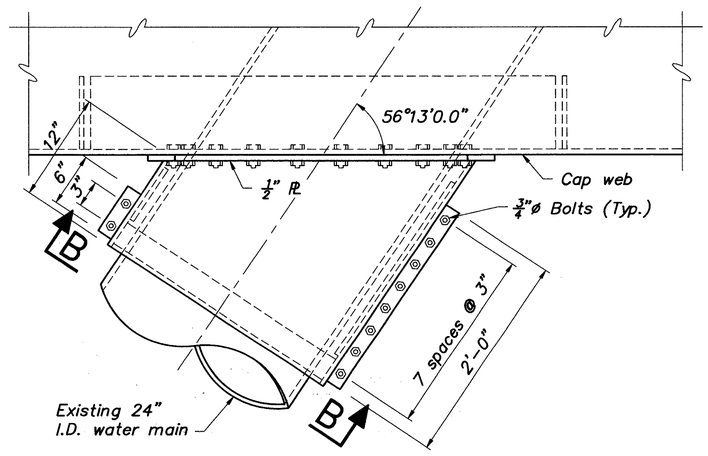

## SECTION C-C




## ELEVATION

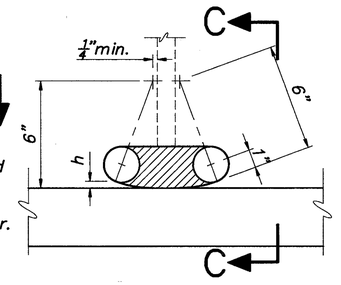



## SECTION B-B




## PLAN OF CAP

Retrofit detail to seal cap around watermain




h=(ht. of groove weld + ⅛") or (ht. of backing bar + ⅛"), whichever is greater.

## DETAIL A

(Showing removal)
See Procedure Notes this Sheet.

*PROCEDURE*

1. Drill hole in stiffener.
2. Drill twin 2"ø holes through web and backing bar.
3. Remove crosshatched areas by grinding. Preliminary removals may be by other methods as approved by the Engineer, provided NO DAMAGE is done to the metal which is to remain. Grinding shall be used to make all surfaces smooth and according to plan contours.
4. Perform magnetic particle and/or dye penetrant tests of the remaining metal in the presence of the Engineer.

*NOTES:*

1. See sheet 14/30 for description of required work.


BALKE ENGINEERS
1848 SUMMIT ROAD
CINCINNATI, OHIO 45237


13/30

PIER 5N DETAILS
BRIDGE NO. HAM-50-1936 R & L
SIXTH STREET EXPRESSWAY
OVER RR AND MILL CREEK

| DESIGNED | DRAWN | TRACED | CHECKED | REVIEWED DATE | REVISION |
|---|---|---|---|---|---|
| MRS | ALH | ~ | DWI | CRS 4/92 | |

DISK 4 1936BOX

| CALC. BY DATE | HAMILTON COUNTY HAM-50-19.36 | OHIO | 163 |
|---|---|---|---|
| CHKD. BY DATE | | FHWA REGION 5 | 255 |

SCOPE OF WORK:

The following work is required at the box girder floorbeam at Pier 5N.

1. Remove bird droppings & nests from bottom flanges of girders.
2. Remove bird & wasp nests & trash from interior of box girder.
3. Retrofit backing bars at stiffeners inside box girder as noted on plans.
4. Excess weld material is present on underside of bottom flange near girder #5. Grind excess material flush with bottom flange.
5. Clean & prime corroded and repaired areas on the interior of the box girder. Apply final coat of paint to entire inside of box girder. Final coat to be silver or white in color. Cleaning & painting to be per System EEU.
6. Seal opening around water main. See Sheet 13/30 for details.
7. Provide 1/8" neoprene gasket for each access hatch cover. Gasket to be same dimensions as cover. Provide additional bolts as indicated.

All labor, material, & equipment necessary to execute items 1 thru 7 shall be included for payment in the unit price bid for Item 513, Structural steel, misc.: repair fracture critical box girder pier cap.

8. Replace the bottom splice plates connecting the longitudinal girders.

All labor, material, & equipment necessary to execute item 8 shall be included for payment in the unit price bid for Item 513, Structural steel, misc.: splice plate replacement.

9. Remove stitch welds along backing bars as noted with the following restrictions: Stitch welds 2" or less in length shall not be removed; stitch welds from 2" to 4" in length shall not be removed between girders 1 & 2 and 5 & 6. After stitch welds have been removed, the web-to-flange groove weld adjacent to removal areas shall be examined by the use of dye penetrant or magnetic particle testing to check for damage. The Engineer shall approve the welds to be removed.

All labor, material, & equipment necessary to execute item 9 shall be included for payment in the unit price bid for Item 513, Structural steel, misc.: removal of backing bar stitch weld including NDT.

NOTES:

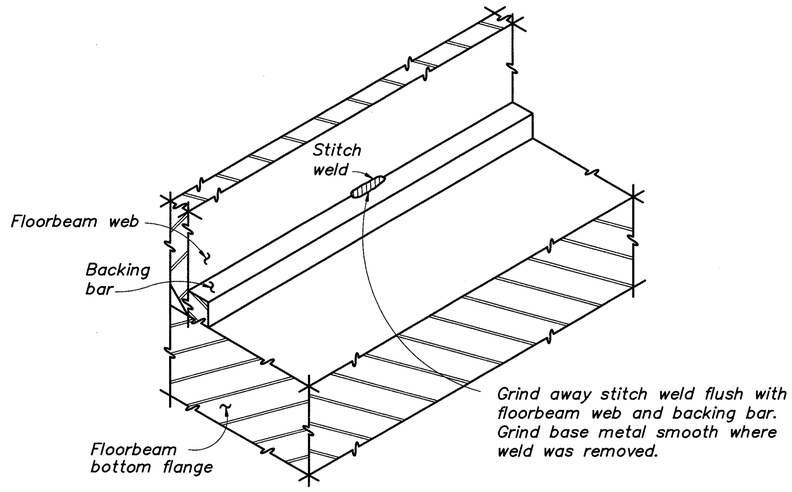
The box girder pier cap is a fracture critical member and as such, requires high quality work be performed in a careful manner which will not damage the member.

SPLICE PLATE REPLACEMENT:

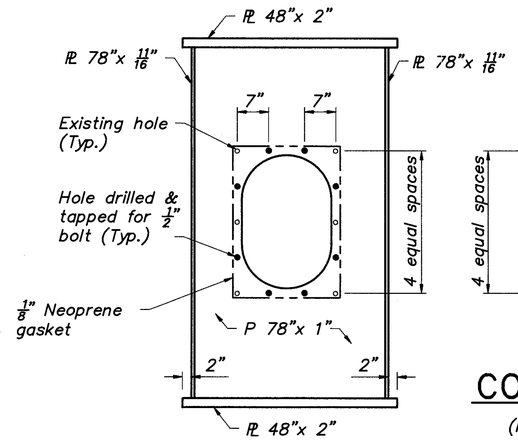
Suggested procedure is as follows:

a. Shore girders on each side of the box girder pier cap to relieve dead load.
b. Remove the bottom splice plate and, where present, the fill plate from the bottom flange of the box girder pier cap by removing the bolts and chipping through the welds. Care shall be taken not to gouge or remove any portion of the flange of the box girder.
c. Remove the splice plate and fill plates from the bottom flange of the longitudinal girders.
d. Grind flush remaining weld material on bottom flange of box girder.
e. Reassemble new splice plates and fill plates to the girders and box girder with new 1" dia. ASTM A325 bolts and nuts.
f. Clean and paint repaired areas per OZEU except that faying surfaces shall be coated with primer only.*
g. Tighten all existing bolts in web connection angles to proper torque.

The Contractor shall submit his shoring plan to the Engineer for approval. Alternate construction methods may be submitted by the Contractor for approval.

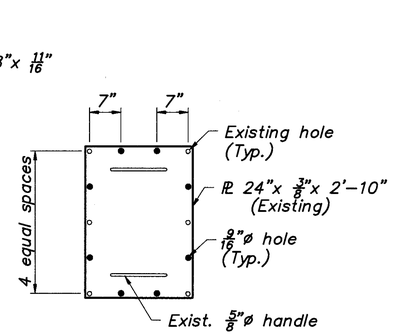



## STITCH WELD REMOVAL ON BACKING BAR




## END VIEW

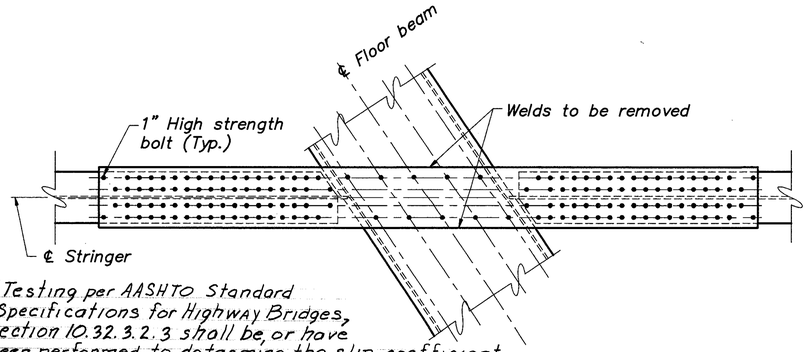
(For each end of floor beam)




## COVER PLATE

(For access hole)

## ACCESS COVER DETAIL




*Testing per AASHTO Standard Specifications for Highway Bridges, Section 10.32.3.2.3 shall be, or have been performed, to determine the slip coefficient. A min. coeff. of 0.33 is required. Certification showing the test results shall be furnished.

## PLAN OF BOTTOM SPLICE PLATE


BALKE ENGINEERS
1848 SUMMIT ROAD
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14/30

PIER 5N DETAILS

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DISK 4 1936BOX1