



FRACTURE CRITICAL PIER CAP INSPECTION REPORT

SFN3102246 (HAM-42-0000)
US-42/US-127 OVER SMITH
STREET/MEHRING WAY/WATER
STREET/W PETE ROSE WAY
HAMILTON COUNTY, OH
DISTRICT 8

Prepared for:



Prepared by:

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FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



TABLE OF CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION 1

 1.1 Purpose and Scope 1

 1.2 General Description of the Structure 1

 1.3 Method of Investigation 4

2.0 EXISTING CONDITIONS 6

 2.1 Pier Cap Conditions 6

 2.1.1 Pier Cap 18 6

 2.1.1.1 Pier Cap 18 Interior 7

 2.1.1.2 Pier Cap 18 Exterior 8

 2.1.1.3 Pier Cap 18 Fatigue Prone Details 10

 2.1.2 Pier Cap 19 12

 2.1.2.1 Pier Cap 19 12

 2.1.2.2 Pier Cap 19 Fatigue Prone Details 14

 2.1.3 Pier Cap 20 16

 2.1.3.1 Pier Cap 20 16

 2.1.3.2 Pier Cap 20 Fatigue Prone Details 20

3.0 EVALUATION AND RECOMMENDATIONS 22

EXHIBIT 1 – EXISTING PIER PLANS 23

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



EXECUTIVE SUMMARY

- Project:** VAR-District 8 Bridge Inspections No. 2023-4. (PID No. 105476)
- Purpose of Project:** To perform a fracture critical inspection of fracture critical 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 – Rob Parker – Gannett Fleming, Inc.
- Inspection Date(s):** June 20th, 2023

Summary of Findings:

- Pier 18
 - There were no major changes to the triaxial welds present on the cap interior at the tie plate/diaphragm/cap web plates. No cracks were observed during this inspection.
 - There were no major changes to the triaxial welds present on the cap exterior at the cap web plate/tie plates/girder knee brace seats. No cracks were observed during this inspection.
 - The stress relief retrofits on the south side continued to function as designed, with no major changes observed during this inspection.
 - Pigeons continued to enter at the east end of the cap and leave debris and residue inside the cap. This complicated inspection access and the visibility of the pier cap interior at the east end.
 - Overall, there were no significant changes to the pier cap condition.
- Pier 19
 - There was a 1/2 in. crack in the intersecting welds between the seat plate and the north side of the pier cap web plate at Girder 2. The crack appeared to be the result of a fabrication error. There were several seat plates with a large amount of weld material present, but no other cracks were observed during this inspection. This has not changed since the prior inspection.
 - Overall, there were no major changes to the pier cap condition.
- Pier 20
 - Vertical cracks were present in the fillet weld between the utility support angle and the reinforcement plate on the south end of the pier caps. This was present between both Girder 1 and 2, and between Girder 2 and 3. See Section 2.1.3.1 below for specifics.
 - There was no change to the crack in the keeper bar weld at the north side of Girder 8. See Section 2.1.3.1 below for specifics.
 - Painted over pitting and painted over section loss was present towards the bottom of the pier cap due to a previously leaking joint; this was heavier on the east end of the cap. Overall, this has not changed significantly since the prior inspection.
 - Missing or sheared bolts for the expansion joint armor were present on the top flange of the cap from a prior joint replacement. This is an old condition that has not changed.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



- The girders were still rubbing against the east side of the sliding seats with up to 1/32 in. wear on the keeper plates. This has not changed since the prior inspection.

Summary of Recommendations:

- Caulk or cover the gap between the south web plate and Girder 8 on the south end of Pier 18. Pigeons entered at this location and deposited extensive debris on the east end of the cap interior. The pigeon debris on the east end of Pier 18 should be removed to facilitate future inspections.
- Future inspections should monitor growth in the existing cracks identified on Pier 20. There were a total of 3 cracks present, two of which have grown since the prior inspection. Details are listed in Section 2.1.3.
- In future inspections, continue monitoring the Category E fatigue details of intersection welds for cracks or other detriments. Consideration should be given to drilling holes or grinding welds to alleviate triaxial welds. Install handles on the Pier 18 cover plates to improve access to the interior.
- The severed conduit on the east column of Pier 20 should be repaired.

NBI Ratings:

Item ID	Description	Condition Rating	Summary
B.C.14	NSTM	6-Satisfactory	Minor growth in small cracks, no major changes overall.

AASHTO National Bridge Element (NBE) Ratings:

Element #	Description	Units	Total	Condition State			
				1	2	3	4
152	Steel Floor Beam	LF	199	119	64	16	0

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

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



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 US-42/US-127 Bridge over Smith Street/Mehring Way/Water Street/W Pete Rose Way in Hamilton County, OH. Collins Engineers, Inc. (Collins) conducted the fracture critical pier cap inspection for the Ohio Department of Transportation (ODOT), District 8 on June 19th and 20th, 2023.

1.2 General Description of the Structure

The SFN3102246 (HAM-42-0000) Bridge is a twenty-three-span welded steel plate girder bridge serving as the Ohio approach spans of the Clay Wade Bailey Bridge. The bridge was built in 1974 to provide an additional link between Covington and Cincinnati and carries US-42/US-127 across the Ohio River (see Figure 1). The Ohio approach spans carry five lanes of traffic at the north end of the structure and taper down to three lanes as they near the main truss span. Two lanes of southbound traffic travel towards the main truss span, two lanes of northbound traffic travel from the main truss span and turn lanes onto W 2nd Street/US-27 are present for both northbound and southbound traffic. Three lanes of traffic cross the Ohio River on the main truss spans with traffic direction signals determining the number of lanes in each direction.

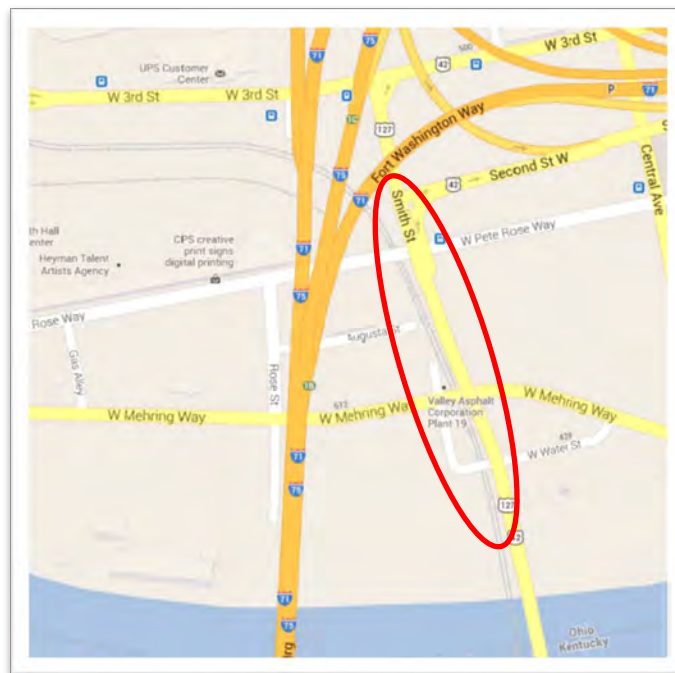


Figure 1: General Bridge Location

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



The structure has three fracture critical integral pier caps which are located at Piers 18 through 20 (see Figure 2). The pier cap at Pier 18 is a welded steel plate box girder while the other two pier caps are welded steel plate I-girders. Eight longitudinal girders are framed into the pier caps. Two rectangular holes were cut through each web plate of the pier caps to carry utility conduit through the caps on the western end of the cap.

Pier Cap 18 is simply supported between two pot bearings that rest on circular reinforced concrete columns spaced 58 ft-9 in. center-to-center. There is a 9 ft-6 in. cantilevered portion of the pier cap that extends past the east bearing to accommodate the connection of Girder 8. Girders 1-7 are continuous over the pier cap by means of bottom flange tie plates that pass-through slots in the web plates and top flange tie plates that extend across the top flange of the pier cap. The bottom flange tie plates are attached to the pier cap web plates by fillet welds. The top flange tie plates are bolted to the flange plates of the girders and the pier cap. The girder webs are connected to the pier cap webs using bolted clip angles, and knee braces are welded to the pier cap web plates below the bottom tie plates for additional rigidity. Girder 8 is connected to the east end of the pier cap web plates using bolted clip angles that attach to the girder web.

Pier Cap 19 is simply supported between two pot bearings that rest on circular reinforced concrete columns spaced 51 ft-0 in. center-to-center. There are two 5 ft-9 in. cantilevered portions of the pier cap that extend past the west and east bearings to accommodate the connections of Girders 1 and 8 respectively. Girders 2-6 are continuous over the pier cap by means of bottom flange tie plates that are welded to both sides of the pier cap web and top flange tie plates that extend across the top flange of the pier cap. The top flange tie plates are bolted to the flange plates of the girders and pier cap. The girder webs are connected to the pier cap web using bolted clip angles, and knee braces are welded to the pier cap web below the bottom tie plates for additional rigidity. Girders 1 and 8 are connected to the ends of the pier cap web plate using bolted clip angles that attach to the girder webs.

Pier Cap 20 is simply supported between two pot bearings that rest on circular reinforced concrete columns spaced 52 ft-6 in. center-to-center. There are two 7 ft-0 in. cantilevered portions of the pier cap that extend past the west and east bearings to accommodate the connections of Girders 1 and 8 respectively. All eight girders have fixed connections to the south face of the pier cap with 72 in. web plates, and all eight girders have expansion connections to the north face of the pier cap with 48 in. web plates. The expansion connection consists of a pin-and-hanger suspender system with a bent plate welded to the pier cap web below the hanger to serve as a guide plate.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023

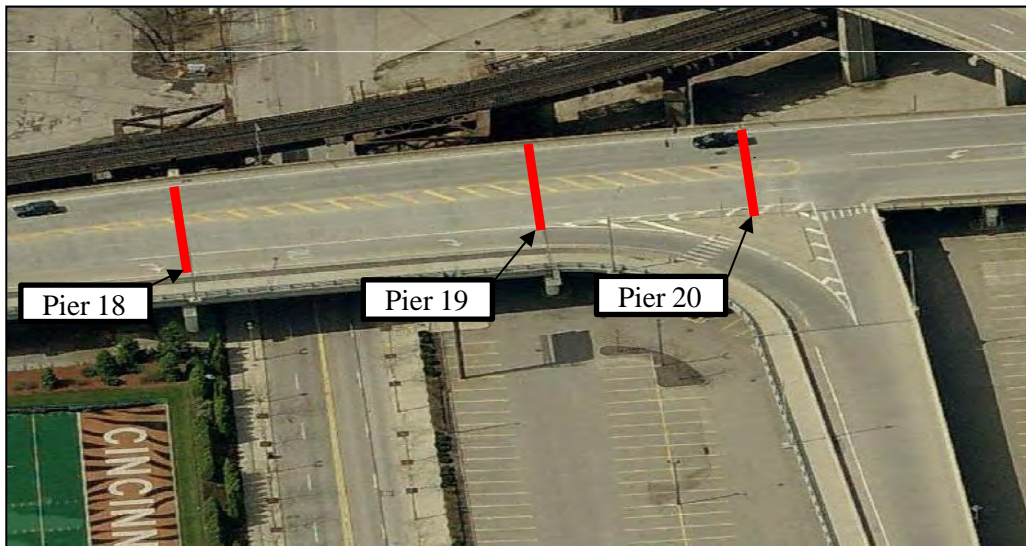


Figure 2: SFN3102246 (HAM-42-0000) Location Map

The nomenclature and girder designation shown on the design plans were used in the inspection of the three pier caps. The bridge was previously rehabilitated to address fatigue prone details and areas of corrosion. The south web plate of Pier Cap 18 has been retrofitted with stress relief holes on both sides of each girder. The pier caps were cleaned and painted, and the deck joint above Pier Cap 20 was replaced.

This bridge is inventoried in a south to north direction, and superstructure units are labeled from left to right looking north. Substructure units are labeled as Rear and Forward Abutments and Piers 2 through 23. Refer to Photographs 1 and 2 below for overall views of the bridge superstructure.



Photograph 1: General Elevation, Looking North.



Photograph 2: General Elevation, Looking South.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



1.3 Method of Investigation

Collins Engineers, Inc. performed a fracture critical inspection of the steel pier caps of Bridge SFN3102246 (HAM-42-0000) on June 19th, 2023 and June 20th, 2023. A three-person team consisting of a professional engineer and NBI team leader (Michael A. Seal, P.E.) and technicians Trent Graham (Collins) and Rob Parker (Gannett Fleming) conducted this inspection. A 46 ft bucket truck was used to access the pier caps and perform the “arm’s length” exterior inspection of all three pier caps. The west hatch cover of Pier 18 was removed for entry and reinstalled after completing the work. The hatch cover was 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. Traffic control was provided by A&A Safety to gain access to Pier Cap 18 interior and exterior. Traffic control efforts consisted of a single lane closure as follows:

- Smith Street – Single lane closures between the hours of 8:00 AM to 4:00 PM were necessary to inspect Pier Cap 18.

No traffic control was required for the inspection of Pier Cap 19 or Pier Cap 20 as they are located within a private parking lot. OSHA confined space entry procedures were followed while inspectors were working inside Pier Cap 18. Entry was performed in accordance with complete permit-required confined space entry procedures per 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.

Field measurements were taken using tape measures, calipers, and an ultrasonic thickness gauge to verify 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 to document the physical condition of the pier caps.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



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 caps.

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.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



2.0 EXISTING CONDITIONS

2.1 Pier Cap Conditions

2.1.1 *Pier Cap 18*

Pier Cap 18 was in Good Condition (7) overall. The paint system was in good condition overall. Soot was present along the bottom web plate due to the parallel railroad structure at this location. Pigeons continued to enter through the opening on the east end of the cap and at the opening between the south web plate of the cap and the web of Girder 8. Nests and extensive debris were present; see the interior notes for specifics. During a previous rehabilitation, the south web plate was retrofit with stress relief holes on both sides of the girder bottom flange splice plates. Overall photos are included below and specifics for the interior are included in Sections 2.1.1.1 and 2.1.1.2 below.



Photograph 3: Overall Elevation, Looking South.



Photograph 4: Overall Elevation, Looking South.



Photograph 5: Pier 18 Underview, Looking North.



Photograph 6: Pier 18 Underview, Looking Southwest.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



2.1.1.1 Pier Cap 18 Interior

The interior of Pier Cap 18 was in Good Condition (7). Specific items to note include:

- The fillet welds between the bottom flange and web plates typically intersected the fillet welds of the web plates and girder diaphragms (Photographs 7 and 8). This created a near triaxial weld condition. No cracks or issues from excessive restraint were observed.
- The south web plate was retrofit with drilled stress relief holes connected by vertical saw cuts adjacent to the welded connections of the girder bottom flange tie plates (Photographs 9 and 10).
- There was a gap between the south web plate and the web of Girder 8 that allowed pigeons to enter the area between Girder 7 and 8. The east end was inhabited by pigeons with active nests containing eggs. There was a significant quantity of pigeon feces on the bottom flange between the girders as well as the remains of deceased pigeons (Photograph 11).
- The paint system exhibited minor isolated areas of surface corrosion along the bottom flange and isolated locations with surface corrosion along the diaphragms and webs. Corrosion was usually along the toes of welds and along edges of stiffeners or plates. No section loss was present.
- There was a buildup of soot and pigeon debris along the bottom flange. The soot appeared to enter the pier cap from the railroad that parallels the structure through the screens at the conduit holes located towards the west end of the cap.



Photograph 7: View of West Face of Diaphragm 2 Under Tie Plate. Typical Triaxial Detail on Pier Cap Interior, Looking East.



Photograph 8: View of West Face of Diaphragm 2 on Top of Tie Plate. Typical Triaxial Detail on Pier Cap Interior, Looking East.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



Photograph 9: Overall View of Typical Stress Relief Hole Retrofit in the East Face of Diaphragm 1, Looking South.



Photograph 10: Close-Up View of Typical Stress Relief Hole Retrofit at the Top Drilled Hole in the West Face of Diaphragm 1, Looking South.



Photograph 11: View of the Bottom Flange Plate Between Diaphragms 7 and 8. Note Pigeon Debris Accumulating on Top of Plate, Looking East.

2.1.1.2 Pier Cap 18 Exterior

The exterior of Pier Cap 18 was in Good Condition (7). Specific items to note include:

- The vertical and horizontal welds connecting the knee braces to the pier cap web plates below the girder bottom flange tie plates typically intersected the fillet welds between the tie plates and the pier cap webs. There were no issues with excessive constraint observed during this inspection (Photograph 12).
- The vertical knee brace welds also intersected the fillet weld at the pier cap bottom plate at the northern web plate of the pier cap below Girders 4 and 5. There were no issues with excessive constraint observed during this inspection.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



- The vertical and horizontal fillet welds between the girder bottom flange tie plates and the web plates intersected at the edges of the tie plates. There were no issues with excessive constraint observed during this inspection.
- The south web plate was retrofit with stress relief holes, but the north web was not retrofit. Several of the saw cut retrofits were cut with a slight curve. A mis-drilled hole was observed at the east side of Girder 7 (Photograph 14).
- The pot bearings, circular columns, and exterior paint system exhibited minor surface corrosion on the bearings and soot accumulation along the bottom flange. This has not changed since the prior inspection.
- The east bearing had an anchor nut not fully seated on the south side of the column (Photograph 15). This has not changed since the prior inspection.
- At the east end of the pier cap, the web plates were coped at the bottom to facilitate the connection to Girder 8. No cracks were observed at the copes during the inspection.
- On the south web, there was errant weld material extending for 2 in. from the corner of the cope. This is an old condition that has not changed.



Photograph 12: Typical Example of Triaxial Welds at the Exterior of the Pier Cap. North face of the Cap at the Girder 1 Connection, Looking South.



Photograph 13: Typical Example of Bottom of Knee Brace Weld Intersecting the Bottom Pier Cap Plate at Girder 4 North Side, Looking South.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



Photograph 14: View of Misdrilled Bolt Hole for Retrofit on South Side of Pier Cap in the East Face of Girder 1 with No Change, Looking North.



Photograph 15: Bearing Anchor Bolt Nut Not Fully Seated on the East Bearing with No Change, Looking North.

2.1.1.3 Pier Cap 18 Fatigue Prone Details

Fatigue Prone Detail 1

Fillet welds between diaphragms or stiffeners and web plates.

Category: C'

Location: All girder diaphragms and 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 in., on flange plate.

Category: C

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

Fatigue Prone Detail 8

Intersection of fillet welds.

Category: E

Location:

- Fillet welds of bottom flange and both web plates intersecting fillet welds of both web plates and diaphragms of Girder 1 through Girder 6.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



- Fillet weld of the girder bottom flange tie plates and both web plates intersecting fillet welds between knee braces and both web and tie plates.
- Fillet weld of bottom flange and north web plate intersecting fillet welds of web and knee braces below Girder 4, 5, and 7.
- Intersection of the horizontal and vertical fillet welds between the north web and the edges of the bottom flange tie plates of Girder 1 through Girder 6.

Fatigue Prone Detail 9

Drilled hole stress relief retrofit in web plates.

Category: B

Location: South web plate on each side of all girder connections.

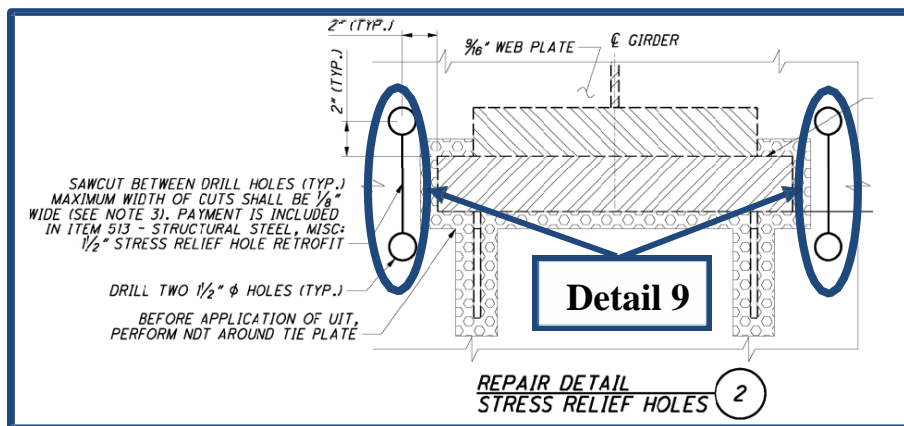


Figure 3: Web Plate Retrofit of Pier Cap 18

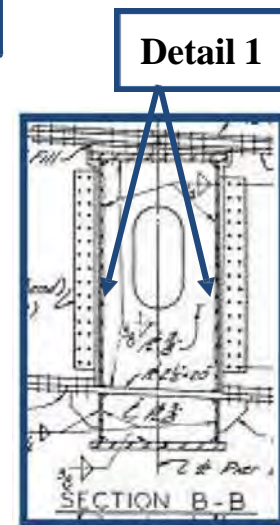


Figure 4: Section of Pier Cap 18

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023

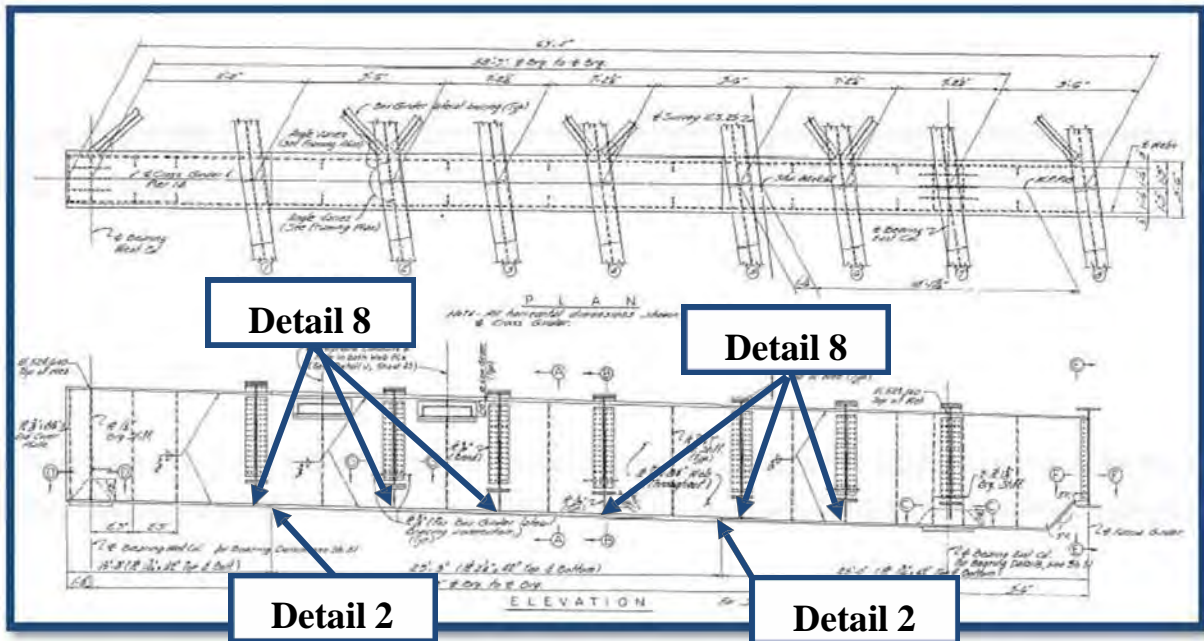


Figure 5: Plan and Elevation of Pier Cap 18

2.1.2 Pier Cap 19

Pier Cap 19 was in Good Condition (7) overall. The paint system was in good condition overall. The pot bearings, circular reinforced concrete columns, and exterior paint system of Pier Cap 19 were in Good Condition (7) with only minor surface corrosion with no section loss present on the bearings and in isolated locations along the lower flange. Overall, there were no changes from the prior inspection.

2.1.2.1 Pier Cap 19

- Below each girder there was a horizontal seat plate and a vertical web plate that were welded to the pier cap web. The fillet welds connecting these plates intersected below every girder. The stiffeners were welded only to the cap web and were not welded to the bottom flange. This has not changed since the prior inspection.
- On the north and south faces of the integral pier cap, there were support angles that carry utility conduit that pass through holes cut into the web between Girders 1 and 3. The hole cut on the pier cap web between Girders 1 and 2 was in a slightly negative moment zone (due to the cantilever), though most of the stress in this area is shear (Photograph 17).
- There was a 1/2 in. crack in the intersecting welds between the seat plate and the north side of the pier cap web plate at Girder 2 (Photograph 18). The crack appeared to be the result of a fabrication error. The crack is not located in the primary load path and does not affect the general appraisal rating. There

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



were several seat plates with a large amount of weld material present, but no other cracks were observed during this inspection. This has not changed since the prior inspection.

- Several of the seat plates were bowed and not tight against the bottom flange splice plate across the bottom of the member. This is likely from initial construction and has not changed over the past couple inspection cycles.
- There were multiple unseated bolts along the girder bottom flange splice plates on both sides of the web. This is an old comment and has not changed.
- There was a bend in the splice plate at Girder 5. This is an old comment that has not changed for this inspection.
- On the south face, the support angle was attached to the pier cap web with a bearing plate welded directly to the pier cap web plate between Girders 1 and 2. This is an old comment that has not changed.
- Between Girders 2 and 3 the support angle was welded to an additional plate that was welded to the south web plate around the conduit hole. The areas around the conduit holes were closely inspected to ensure there were no cracks or other signs of distress and no abnormalities were found.
- Significant pigeon feces were found on the bottom flange between Girders 2 and 3.



Photograph 16: Pier 19 Elevation, Looking North.



Photograph 17: View of West End of Pier 19, North Face. Note Cut Out Portion of Cap Web for Conduit. No Change.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



Photograph 18: 1/2 in. crack in the intersecting welds between the seat plate and the north side of the pier cap web plate at Girder 2, Looking Northeast.

2.1.2.2 Pier Cap 19 Fatigue Prone Details

Fatigue Prone Detail 1

Fillet welds between stiffeners and web plates.

Category: C'

Location: All girder web stiffeners.

Fatigue Prone Detail 2

Full penetration groove weld of flange splice.

Category: B

Location: Four bottom flange splices.

Fatigue Prone Detail 5

Fillet weld greater than 4 in. or 12 times the connection thickness, with a connection thickness less than 1 in. on the web plate.

Category: E

Location: Top of web plate between Girder 1 and west bearing.

Fatigue Prone Detail 8

Intersection of fillet welds.

Category: E

Location: Fillet welds between girder seat plates and web intersecting fillet welds between stiffeners and both the web and seat plates.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



2.1.3 Pier Cap 20

Pier Cap 20 was in Fair Condition (5) overall because of painted over pitting on the bottom flange and along the bottom of the web and weld crack growth (see below). This was lowered from Satisfactory Condition (6) from the 2021 fracture critical inspection. The pot bearings, circular reinforced concrete columns, and exterior paint system of Pier Cap 20 were in Good Condition with only minor surface corrosion with no section loss present on the bearings.

2.1.3.1 Pier Cap 20

- Vertical cracks were present in the fillet welds between the utility support angle and the reinforcement plate on the south end of the pier caps. Specific details include:
 - The previously noted 3/4 in. vertical crack in the fillet weld between the utility support angle and the reinforcement plate at the east end of the angle on the south side of the cap web between Girders 2 and 3 has grown to 1 in. (Photographs 19 and 20).
 - The previously noted 1/2 in. vertical crack in the fillet weld between the utility support angle and the reinforcement plate at the east end of the angle on the south side of the cap web between Girders 1 and 2 has grown to 3/4 in. (Photographs 21 and 22). These cracks were initiated and propagated by pack rust between the support angles and reinforcement plates that pries the angles from the plates.
- A 1 in. long crack in the keeper bar weld was observed at the north side of Girder 8. This crack did not affect the pier cap, has not changed since the prior inspection, and should be monitored during future inspections (Photographs 23 and 24).
- Section loss and painted over pitting was present at several locations along the pier cap. These overall are old comments that have not significantly changed for this inspection. See Photographs 25 and 26 for typical examples. Specifics and locations include:
 - Section loss up to 3/16 in. is evident on the top of the bottom flange on the north side of the pier cap, and at girder connections to the pier cap. This was due to a previously leaking expansion joint, and the loss is heavier on the east end. At the east end it also affects the bottom flange of Girder 8 on the north side, the web of the pier cap, and the web of Girder 8 on the south side.
 - The web plates and web stiffeners near this area exhibited section loss up to 1/8 in. extending up to 6 in. above the bottom flange (Photograph 26).
 - Painted over pitting up to 1/8 in. deep was present at the interface between the girder hanger bracket and the pier cap.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



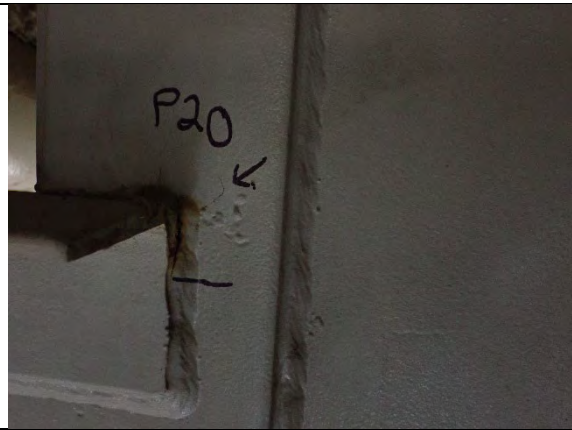
- At the north side of the pier cap at the easternmost web stiffener, the base of stiffener had a 1.5 in. by 1/2 in. corrosion hole.
- During a previous rehabilitation, the deck expansion joint was replaced, and the pier cap was cleaned and painted. There was no indication of moisture on the pier cap and the existing corrosion was painted over, though painted over pitting to 1/8 in. deep existed on the bottom of the lower flange. Missing or sheared bolts for the expansion joint armor were present in the top flange between Girders 1 and 2, 3 and 4, and 6 to 8. This is an old comment that has not changed (Photograph 27).
- At the sliding seats for the girders, all the girders were rubbing against the east side of the guide at the seat plates. There was up to 1/32 in. wear on the guide plates (Photograph 28). This is an old comment that has not changed.
- Welds between the north side of the web and the girder brackets typically intersected the fillet weld of the web and bottom flange. There was some paint cracking consistent with higher stress areas near the cope along Girder 1. This is an old comment that has not changed.
- On the south face of the pier cap, a support angle was attached to the reinforcement plate by a fillet weld to support the conduits. Web stiffeners overlap the reinforcement plates around the holes and the fillet welds of the web, and the stiffeners intersected the fillet welds between the web and the reinforcement plates. This is an old comment that has not changed.
- Portholes cut through the top of the pier cap web plate between Girders 1 and 3 allowed utility conduits to pass through the pier cap. Around each of these conduit holes, a 1/2 in. thick by 4 in. wide reinforcement plate was welded to each side of the pier cap web plate. The hole between Girders 1 and 2 was in the cantilevered portion of the pier cap and was therefore in a tension zone while the hole between Girders 2 and 3 was in a compression zone, though most stresses at these locations were shear.
- A severed conduit was identified at the east column. This is an old comment that has not changed.
- A small gap was typical between the seat plate and the girder at the pin and hanger system on the north side. This is an old comment that has not changed.
- There was a loose anchor nut on the west side of the west bearing.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



Photograph 19: Perspective View of 1 in. Crack to Fillet Weld Between Utility Support Angle and the Reinforcement Plate at the East End of the Angle, South Side of Cap Web Between Girders 2 and 3, Looking North.



Photograph 20: Close Up View of 1 in. Crack to Fillet Weld Between Utility Support Angle and the Reinforcement Plate at the East End of the Angle, South Side of Cap Web Between Girders 2 and 3, Looking North.



Photograph 21: Perspective View of 3/4 in. Crack to the Fillet Weld Between the Utility Support Angle and the Reinforcement Plate at the West End of the Angle, South Side of Cap Web Between Girders 1 and 2, Looking North.



Photograph 22: Close Up View of 3/4 in. Crack to the Fillet Weld Between the Utility Support Angle and the Reinforcement Plate at the West End of the Angle, South Side of Cap Web Between Girders 1 and 2, Looking North.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



Photograph 23: Perspective View of 1 in. Crack in the Keeper Bar Weld at the North Side of Girder 8, Looking South



Photograph 24: Close Up View of 1 in. Crack in the Keeper Bar Weld at the North Side of Girder 8, Looking South



Photograph 25: Typical Example of Painted Over Section Loss at the Interface of the Hanger Bracket and the Pier Cap with No Change.



Photograph 26: Typical Example of Painted Over Section Loss at the Base of the Pier Cap Web Stiffeners and Web with No Change.



Photograph 27: Typical Example of Sheared/Missing Bolts on the Top Flange of the Pier Cap with No Change.



Photograph 28: Typical Example of Girder Bottom Flanges Rubbing Against the Keeper Plates with Up to 1/32 in. Wear on the Keeper Plates and No Change.

FRACTURE CRITICAL INSPECTION

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2.1.3.2 Pier Cap 20 Fatigue Prone Details

Fatigue Prone Detail 1

Fillet welds between stiffeners and web.

Category: C'

Location: All web stiffeners.

Fatigue Prone Detail 2

Full penetration groove weld of flange splice.

Category: B

Location: Two bottom flange splices.

Fatigue Prone Detail 5

Fillet weld greater than 4 in. or 12 times the connection thickness, with a connection thickness less than 1 in. on the web plate.

Category: E

Location: Top of web plate between Girder 1 and west bearing.

Fatigue Prone Detail 8

Intersection of fillet welds.

Category: E

Location: Fillet welds of stiffeners and web intersecting fillet welds of web and conduit hole reinforcement plate between Girder 1 and the west bearing.

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023

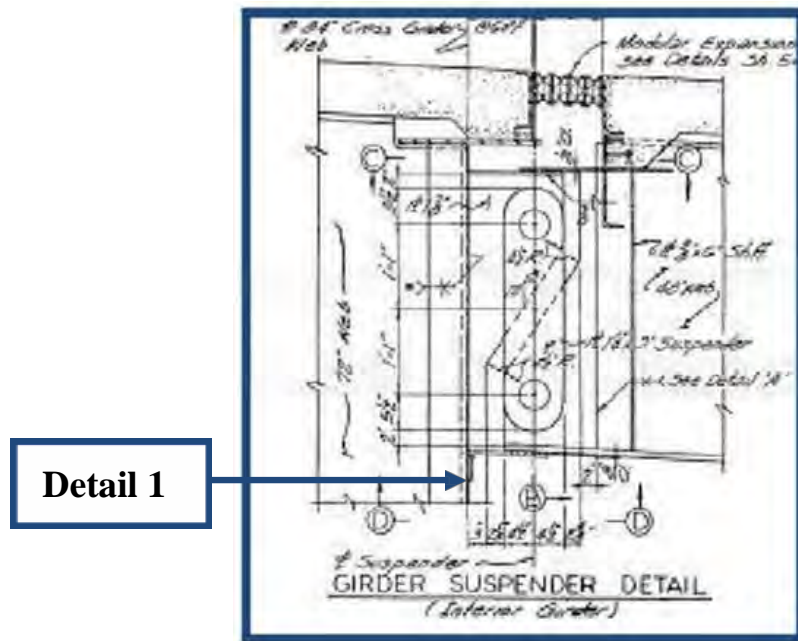


Figure 8: Section of Pier Cap 20

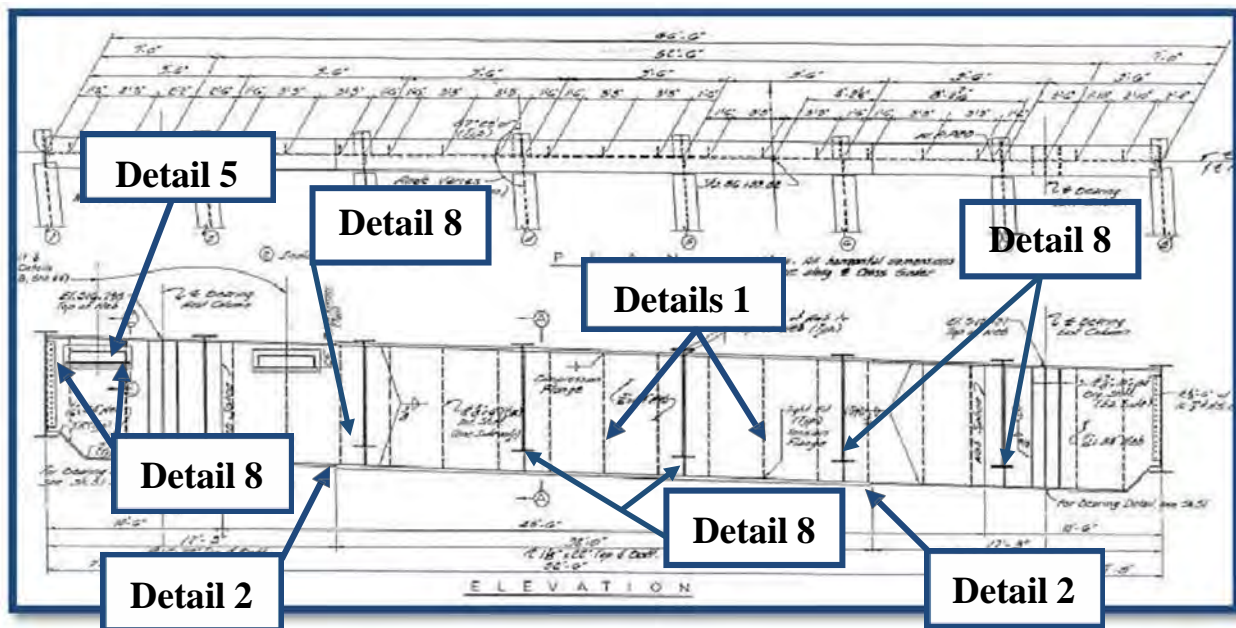


Figure 9: Plan and Elevation of Pier Cap 20

FRACTURE CRITICAL INSPECTION

US-25/US-42/US-127 over Smith Street/Mehring Way/Water Street/W Pete Rose Way
SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023



3.0 EVALUATION AND RECOMMENDATIONS

Based on this inspection, Pier Cap 18 and Pier Cap 19, and their associated fatigue-prone details, were in Good Condition (7) overall. Pier Cap 20 and its associated fatigue-prone details were in Fair Condition (5) overall due to the section loss below the expansion joint above the north face of the pier cap and the growth in small weld cracks at the west end of the cap; the Pier Cap 20 rating was lowered from the prior fracture critical inspection but the overall rating for NSTM (B.C.14) has not changed. Keeping the areas well painted will prevent further damage and section loss. The recommendations for maintenance of the pier cap were listed earlier in the Executive Summary of this report.

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.

A handwritten signature in blue ink that reads "Michael Seal".

Michael Seal, P.E.

Project Manager

A handwritten signature in black ink that reads "Kevin Mitchell".

Originated by:

Kevin Mitchell, E.I.T.

Assistant Project Manager

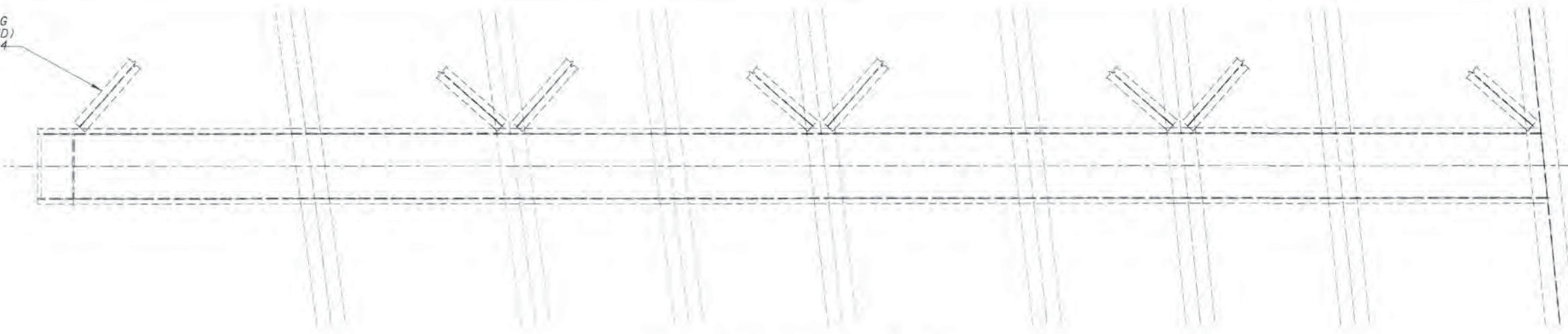
FRACTURE CRITICAL INSPECTION

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SFN3102246 (HAM-42-0000) • Hamilton County, OH • June 2023

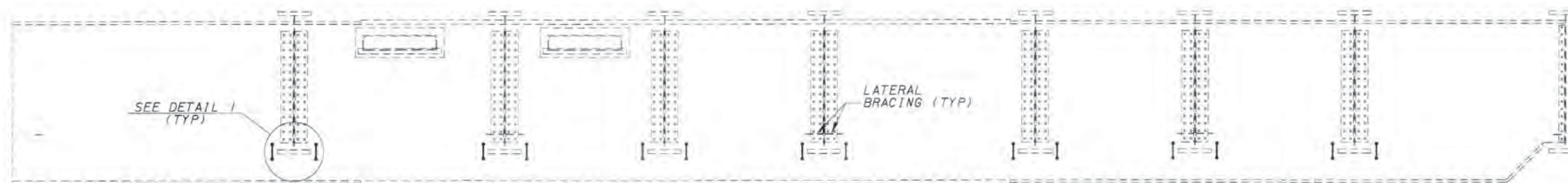


EXHIBIT 1 – EXISTING PIER PLANS

LATERAL BRACING
(TO BE REPLACED)
SEE SHEET 13/24

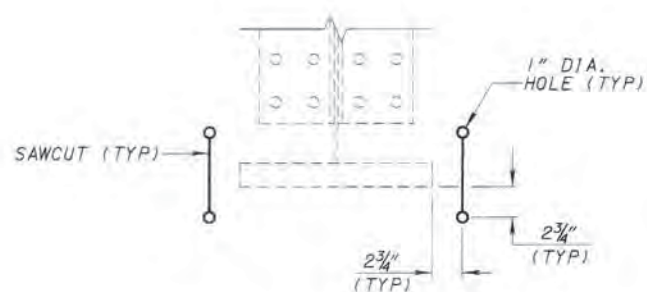


PIER 18 BOX GIRDER CAP PLAN

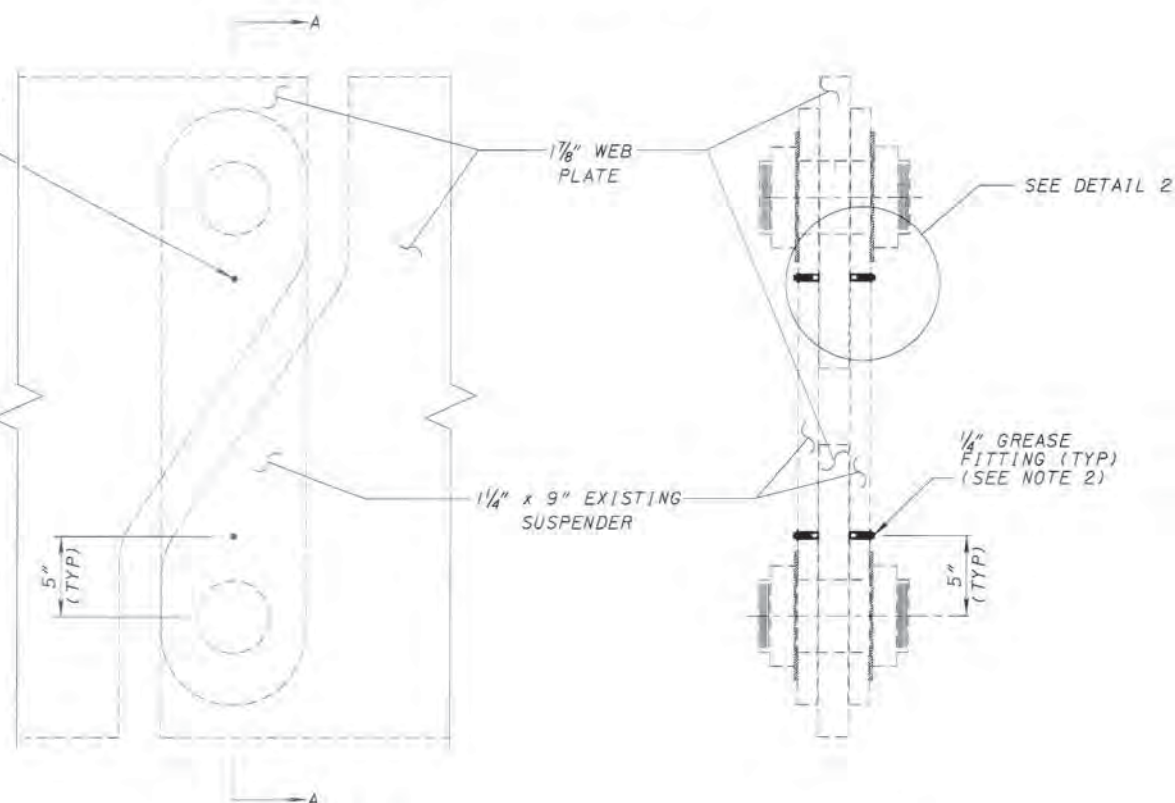


PIER 18 BOX GIRDER CAP ELEVATION
(TYP AT BOTH SIDES OF BOX GIRDER CAP)

DRILL HOLE THRU 1/4" SUSPENDER ONLY, GRIND SMOOTH AND INSTALL 1/4" GREASE FITTING AT ALL HINGES, BOTH SIDES OF GIRDER (TYP) (SEE NOTE 2)

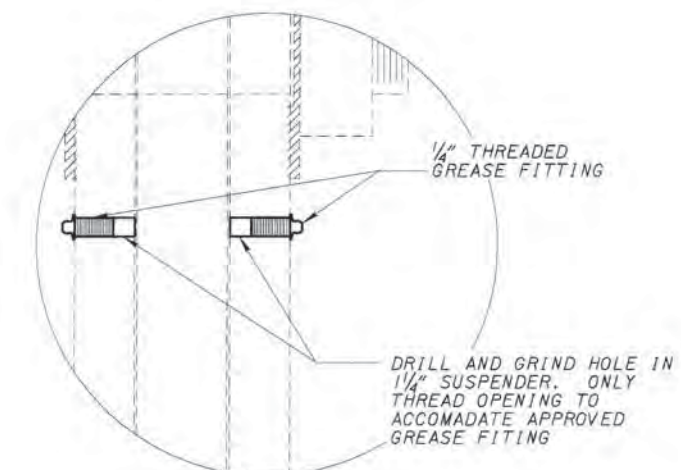


DETAIL 1
(SEE NOTE 1)



GREASE FITTING RETROFIT
@ PIER 20

SECTION A-A



DETAIL 2

NOTES

1. SAWCUTS SHALL START AND END IN THE 1" DIA. HOLES. SAWCUTS SHALL HAVE A MAXIMUM WIDTH OF 1/8". GRIND THE HOLES UNTIL THEY ARE SMOOTH. CAULK THE HOLES WITH A TWO COMPONENT CAULK AS SPECIFIED IN CMS 514.02. THIS WORK SHALL BE INCLUDED WITH ITEM 513 STRUCTURAL STEEL MISC., DRILLING STRUCTURAL STEEL. THE HOLES AND SAWCUTS ARE TO BE PAINTED IN CONJUNCTION WITH THE STRUCTURAL STEEL PER ITEM 514.
2. GREASE FITTING SHALL BE 1/4" PTF, STRAIGHT, 0.8" LONG GREASE FITTING, MANUFACTURED BY AMERICAN LUBRICATION EQUIPMENT CORPORATION, OR APPROVED EQUAL. THE CONTRACTOR SHALL TAKE CARE WHEN DRILLING THROUGH THE 1/4" SUSPENDERS, NOT TO DAMAGE THE 1/8" WEB PLATE.



ME
DESIGN AGENCY
23 TRIANGLE PARK DRIVE
SUITE 2300
CINCINNATI, OH 45246

REVIEWED DATE 11/06/02
PAR STRUCTURE FILE NUMBER 3102246

DRAWN ENB
REVISOR ENB
DESIGNED ENB
CHECKED C.M.D.

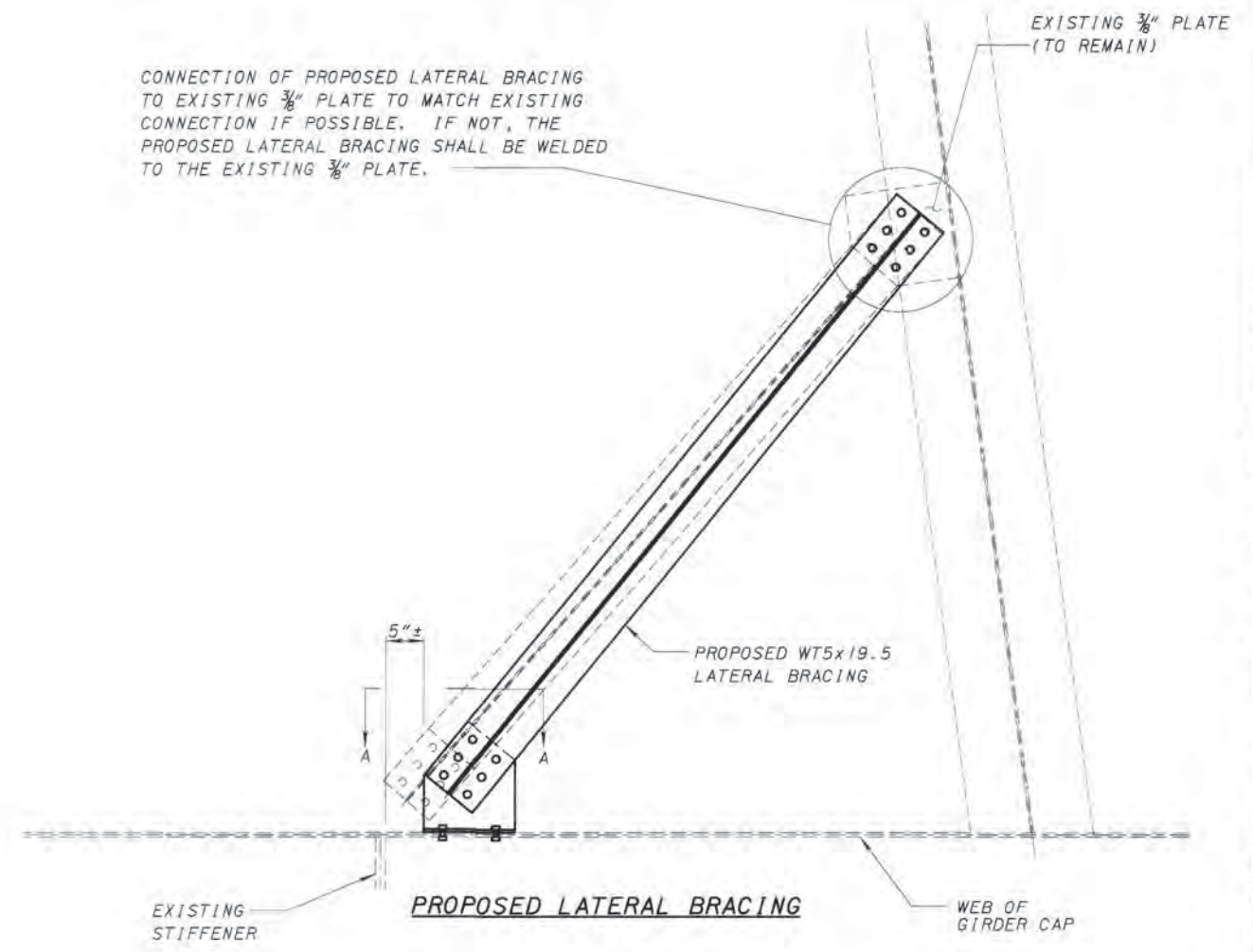
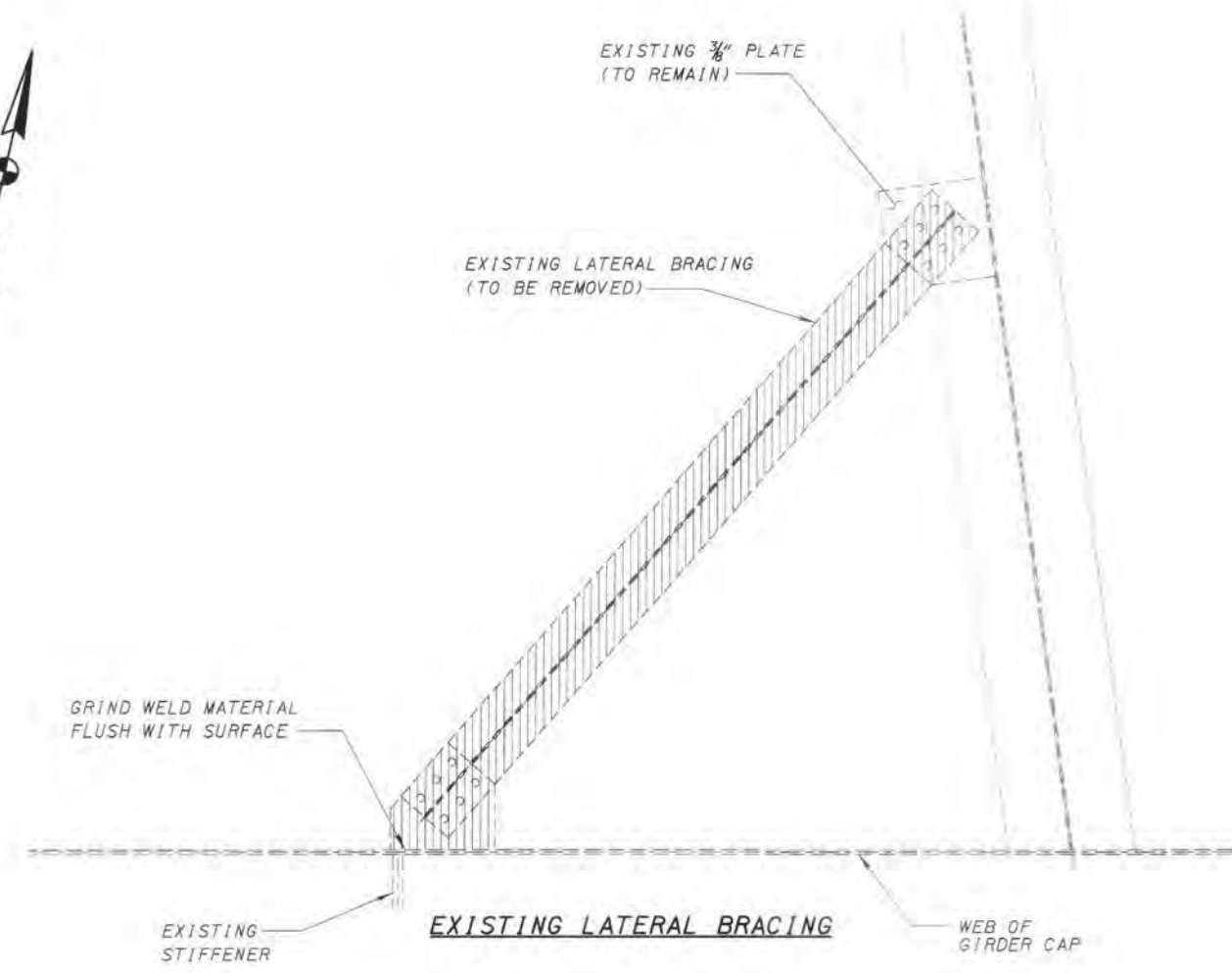
SUPERSTRUCTURE DETAILS
BRIDGE NO. HAM-42-0000
U.S. 42 OVER MEHRING WAY

HAM-42-0.00

12/24

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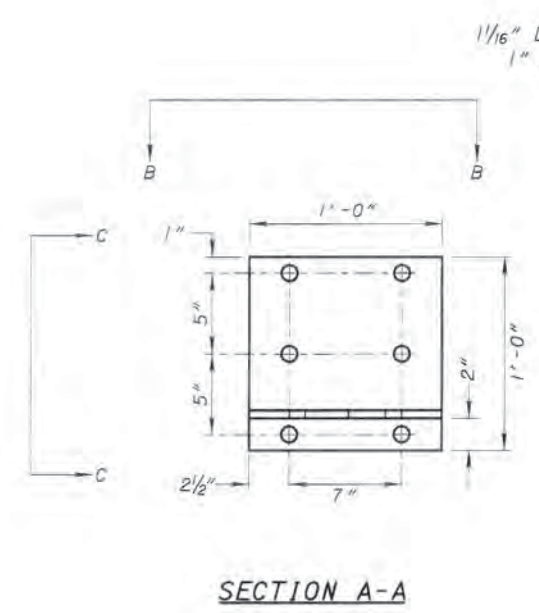
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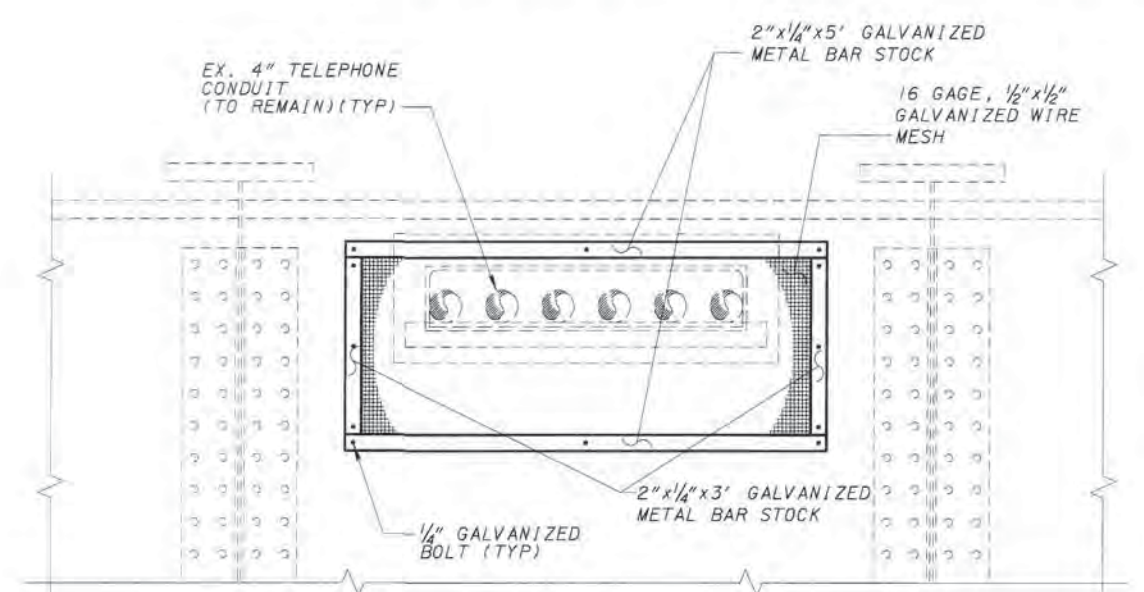
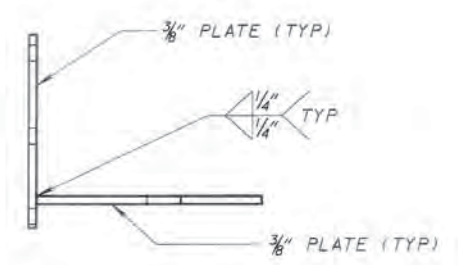
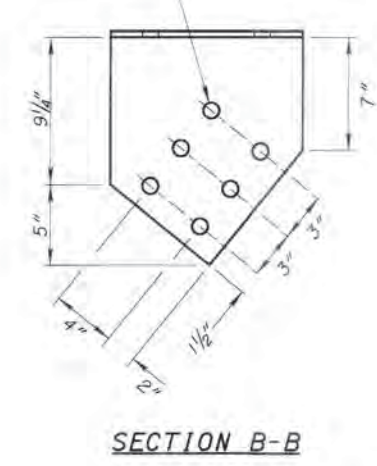
CONNECTION OF PROPOSED LATERAL BRACING TO EXISTING 3/8" PLATE TO MATCH EXISTING CONNECTION IF POSSIBLE. IF NOT, THE PROPOSED LATERAL BRACING SHALL BE WELDED TO THE EXISTING 3/8" PLATE.

NOTES

- HIGH STRENGTH BOLTS SHALL BE 1" DIAMETER A325, GALVANIZED, UNLESS OTHERWISE NOTED.
- SEE SHEET 12/24 FOR LOCATION OF LATERAL BRACING TO BE REPLACED



1 1/16" DIA. BOLT HOLE FOR 1" DIA. BOLT (TYP)



BIRD SCREEN @ PIER 18 BOX GIRDER CAP

05/26/08 11M
07/02/2003
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		DESIGN AGENCY 23 TRIANGLE PARK DRIVE SUITE 2300 CINCINNATI, OH 45246
DESIGNED ENB	CHECKED CMD	DRAWN ENB
REVIEWED PAR	DATE 11/06/02	STRUCTURE FILE NUMBER 3102246
LATERAL BRACING AT PIER 18 BRIDGE NO. HAM-42-0000 U.S. 42 OVER MEHRING WAY		
HAM-42-0.00		
13/24		53 73