



FRACTURE CRITICAL PIER CAP INSPECTION REPORT

SFN3106608 (HAM-71-0159)

I-71 over

EGGLESTON/SENTINEL/CULVERT/I-471

RAMP SB

HAMILTON COUNTY, OH

DISTRICT 8

Prepared for:



Prepared by:

COLLINS
ENGINEERS INC.

4449 Easton Way, Suite 200

Columbus, Ohio 43219

614.849.2777 • www.collinsengr.com



TABLE OF CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION 8

 1.1 Purpose and Scope 8

 1.2 General Description of the Structure 8

 1.3 Method of Investigation 9

1.4 Condition Ratings 10

2.0 EXISTING CONDITIONS 12

 2.1 Pier Cap Conditions 12

 2.1.1 Pier Cap 1W 12

 2.1.1.1 Pier Cap 1W Interior 12

 2.1.1.2 Pier Cap 1W Exterior 13

 2.1.1.3 Pier Cap 1W Fatigue Prone Details 15

 2.1.2 Pier Cap 2E 2

 2.1.2.1 Pier Cap 2E Interior 2

 2.1.2.2 Pier Cap 2E Exterior 3

 2.1.2.3 Pier Cap 2E Fatigue Prone Details 5

 2.1.3 Pier Cap 2W 7

 2.1.3.1 Pier Cap 2W Interior 7

 2.1.3.2 Pier Cap 2W Exterior 8

 2.1.3.3 Pier Cap 2W Fatigue Prone Details 12

 2.1.4.1 Pier Cap 3W Interior 14

 2.1.4.2 Pier Cap 3W Exterior 17

 2.1.3.3 Pier Cap 3W Fatigue Prone Details 20

 2.1.5 Pier Cap 4W 21

 2.1.5.1 Pier Cap 4W Interior 21

 2.1.5.2 Pier Cap 4W Exterior 22

 2.1.5.3 Pier Cap 4W Fatigue Prone Details 23

 2.1.6 Pier Cap 7E 25

 2.1.6.1 Pier Cap 7E Interior 26

 2.1.6.2 Pier Cap 7E Exterior 27

 2.1.6.3 Pier Cap 7E Fatigue Prone Details 29

 2.1.7 Pier Cap 8W 31

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



2.1.7.1 Pier Cap 8W Interior.....	32
2.1.7.2 Pier Cap 8W Exterior.....	33
2.1.7.3 Pier Cap 8W Fatigue Prone Details	34
2.1.8 Pier Cap 9W.....	36
2.1.8.1 Pier Cap 9W Interior.....	36
2.1.8.2 Pier Cap 9W Exterior.....	37
2.1.8.3 Pier Cap 9W Fatigue Prone Details	38
3.0 EVALUATION AND RECOMMENDATIONS	40
EXHIBIT 1 – EXISTING PIER PLANS	41

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 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 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.
Team Member – Matthew McFadden, E.I.T. – Gannett Fleming, Inc.
- Inspection Date(s):** July 10-13, August 1 to 3, 2023

Summary of Findings:

- **Pier 1W:**
 - There are a total of 5 bolts that were sheared off from a prior deck rehabilitation. New bolts and washers were installed and these currently function as intended with no leakage through the bolts.
 - There was no change to the 4 1/2 in. wide by 5/8 in. tall by 1/16 in. deep laminar tear present on the south web plate between Diaphragm A and the west bearing stiffener, just west of the plate stiffener.
 - The retrofits to the knee braces and the drilled stress relief holes still function as intended, with no noticeable changes from the prior inspection.
 - The east bearing exhibited a sheared southeast anchor bolt. This is an old comment and has not changed.
- **Pier 2E:**
 - Active corrosion with section loss up to 1/8 in. deep continues on the east interior end plate near the access hatch on the bearing stiffeners. This has not noticeably changed since the prior inspection.
 - Intersecting welds are present on the interior between the fillet welds connecting the cap web and flange plates and the welds connecting web plates to diaphragms or web stiffeners. This is an old condition with no changes for this inspection.
 - The bottom knee braces on Girders J, K, L and M and the top knee brace on Girder H were removed and the fillet welds were ground from the flange plates.
 - There is broken concrete and construction debris left in place between Girders K and M and on girder lower flanges for each girder.
 - Surface corrosion with minor section loss is present along the top flange of the cap east of Girder N on the north and south side of the pier cap. This has not significantly changed since the prior inspection.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Pack rust near the east hatch between the cover and the end plate is bowing the end plate slightly.
- The welded drainage supports have been removed and replaced with bolted connections. This has not changed for this inspection.
- **Pier 2W:**
 - During a prior rehabilitation on the interior, the tack welds were ground smooth inside the cap and backer bars removed (except at Girder F). The bottom flange knee braces were removed from the girder diaphragms and the fillet welds were ground smooth on the cap bottom flange. This has not changed since the prior inspection.
 - On the interior intersecting welds are present between the fillet welds connecting the cap web and flange plates and the welds connecting web plates to diaphragms or web stiffeners. This is an old condition with no changes for this inspection.
 - Retrofits performed on the exterior of the Pier 2W box cap include the replacement of welded lateral bracing connection plates on the south web with bolted connections and the drilling of 1 in. diameter holes at previously noted locations of intersecting welds on the knee braces at the girder to tie plate connections. These have not changed since the prior inspection.
 - The north edge of the bottom flange exhibits several gouges up to 1/8 in. deep over the length of the pier cap, most of which are near Girder D. No change for this inspection.
 - Pigeon nests and construction debris was observed on the south web and girder lower flanges. No change for this inspection.
- **Pier 3W:**
 - Retrofits performed on the interior of the Pier 3W box cap include the removal of numerous tack welds on web plates west of Girder D, removal of welded diaphragm knee braces that have been ground smooth in the tension regions of the top and bottom flanges at Girders C through E, and the drilling of drainage holes in the east end plate of the cap.
 - At Girder EA on the interior, a crack indication was observed, measuring 3 in. on the south brace and 2-1/8 in. on the north brace between the knee braces and the top flange plate. This was tested with magnetic particle and determined to not be a crack.
 - There are two minor bulges in the interior observed in the north web near the top flange between Girders D and E on a stiffener with loss of paint, potentially from deck removal tools. There is a large bulge in the top flange between Girder EA to F with paint loss. These likely were from the prior deck rehabilitation.
 - The intersecting welds on the interior between the web, transverse stiffener, and bottom flanges east of Girder B has been ground smooth and painted.
 - Two errant weld strikes measuring up to 2 in. long were noted on the north and south web of the cap near the east access hatch on the interior.
 - During previous rehabilitation, most cap exterior tack welds between the girder fill plates and pier cap bottom flange were removed. Tack welds remain on the bottom flange at the west edge of the Girder B fill plate, the west edge of Girder E, and at the east edge of the Girder EA fill plates. These are all in tension zones.
 - There are 1/8 in. deep gouges on the south edge of the bottom flange between Girders E and EA. Several small gouges were observed on the north side of the top flange of the cap

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



near Girder E. A 17 in. long up to 3/16 in. deep impact gouge was located on the north side of the cap in the web and flange between Girders D and E.

- **Pier 4W:**

- There are four broken intermittent fillet welds between the interior diaphragms and cap top flange. The broken fillet welds have not changed and are not a significant concern at this time.
- The intermittent tack welds previously noted between the cap top flange and the interior bearing stiffeners at both the west bearing stiffeners have been ground out and removed, but remain on the east side. No change for this inspection.
- Retrofits performed on the interior of the Pier Cap 4W include the removal of tack welds on the web plates, the removal of welded knee braces between the bottom flange and the east face of the interior diaphragms at Girders C and D, and drain holes drilled at the east end.
- On the interior, intersecting welds are typically present between transverse stiffener welds and bottom flange to web welds.
- During a prior rehabilitation, the welded connections between the cap web plates and the drainage support bracket and the lower lateral bracings were removed ground smooth and replaced with bolted connections.
- Tack welds between the girder fill plates and the pier cap bottom flange were removed. Notches, typically 1/8 in.-1/4 in. deep, were present in the west edge of the Girder C and Girder E bottom flange tie plates below the pier cap. No changes for this inspection.

- **Pier 7E:**

- Retrofits performed on the interior of the Pier 7E box cap include the removal of tack welds along backer bars, the removal of isolated tack welds on the interior face of the web plates, and the drilling of stress relief holes adjacent to girder tie plates. These retrofits continue to function as designed.
- Water infiltration continues on the interior through oversized bolt holes on the cap top flange along with no washers for these bolts. This is causing active corrosion and section loss up to 1/16 in. deep on the interior.
- On the interior most tack welds on the backer bars has been removed, and numerous back bars are missing or dislodged. This has not changed for this inspection.
- During a previous rehabilitation, the welded lateral brace connections were removed from the web plates, ground smooth, and replaced with bolted connections. The knee braces at the connections between the pier cap webs and the girder bottom flange tie plates were coped to removed intersecting fillet welds. The web plates were retrofit with drilled stress relief holes connected by vertical saw cuts adjacent to the welded connections of the girder bottom flange tie plates except at Girder G
- Impact damage to the lower lateral bracing between Girders M-N was observed.
- The underbridge lighting for Pier 7E and 8W was not functioning during the inspection. This is due to the broken utility conduit located between Girder M and N north of the cap on the west face of Girder N.
- The underbridge lighting for Piers 7E and 8W were not functioning. There is a utility conduit broken near this area that has caused the lights to not function.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Impact damage previously noted on the pier cap and lateral bracing has not changed.
- There is a bolt for the clip angle on the west side of Girder G that has a gap of 3/4 in. between the bolt and the plate and is broken off on the east face.
- **Pier 8W:**
 - Retrofits performed on the Pier 8W interior box cap include removal of tack welds along backer bars at tie plates, stress relief holes drilled adjacent to girder tie plates, and the interior diaphragm knee braces were removed.
 - There are a few dislodged backer bars and gaps in the backer bars on the interior. These have been previously noted and have not changed for this inspection.
 - Other prior rehabilitation work performed includes: the knee braces at connections between pier cap webs and the girder bottom flange tie plates were coped to remove intersecting fillet welds; the web plates were retrofit with drilled stress relief holes connected by vertical saw cuts adjacent to the tie plates except at Girder F; welded drainpipe and lower lateral bracing connections were removed from the web plates, ground smooth, and replaced with bolts. These all function as designed.
- **Pier 9W:**
 - Previous rehabilitations on the interior removed lower knee braces and ground down the fillet welds. Locations of intersecting welds were coped to mitigate intersecting welds, and tack welds were removed from the interior.
 - On the interior there were locations of intersecting welds for the fillet welds connecting the cap web and flange plates and connecting the diaphragms/stiffeners to the cap web plates.
 - The exterior of the cap was observed to be in Good Condition overall, with minor surface rust noted on the underside of the bottom flange.
 - Rust stains and calcium deposits on the web plates and edge of the top flange indicate seepage between the flange and deck haunch.

Summary of Recommendations:

- Monitor locations of sheared bolts on the cap top flange for water infiltration. In Pier 7E water continues to leak through these holes.
- Monitor the fatigue retrofits performed on the interior and exterior for changes. Currently these retrofits function as intended.
- Monitor the east bearing for Pier 1W for adverse movement. Currently the southeast bolt is sheared off.
- Monitor the cracked intermittent fillet welds between the interior diaphragms and cap top flange at Pier 4W for changes.
- Repair the under-bridge lighting not currently functioning at Piers 7E and 8W.
- Monitor the active corrosion on all piers for additional section loss.
- Monitor locations of intersecting welds for cracks or adverse affects from over restraint.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



NBI Ratings:

Item ID	Description	Condition Rating	Summary
B.C.14	NSTM	6-Satisfactory	Corrosion with minor section loss, steel gouges, broken/cracked stitch welds.

AASHTO National Bridge Element (NBE) Ratings:

Element #	Description	Units	Total	Condition State			
				1	2	3	4
152	Steel Floor Beam	LF	464	40	379	45	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 I-71 Bridge over an interstate ramp, Sentinel Street, Culvert Street, Eggleston Avenue, and several City of Cincinnati owned parking lots in Hamilton County, OH. Collins Engineers, Inc. (Collins) completed the fracture critical pier cap investigation for the Ohio Department of Transportation (ODOT), District 8 on August 1, 2023.

1.2 General Description of the Structure

The HAM-71-0159 Bridge is a ten-span welded steel plate girder structure with a reinforced concrete deck carrying Interstate I-71 over an interstate ramp, Sentinel Street, Culvert Street, Eggleston Avenue, and several City of Cincinnati owned parking lots (See Figure 1). The bridge is divided into West and East units with the West structure carrying the southbound lanes and the East structure carrying the northbound lanes.

There are eight fracture critical caps located at Piers 1W, 2W, 3W, 4W, 8W, and 9W on the West structure and Piers 2E and 7E on the East structure (see Figure 2). All the pier caps are simply supported welded steel box girders with varying span lengths. The pier caps support between six and eight welded steel plate girders. At Piers 2E, 3W, 4W, and 9W, the girder bottom flange tie plates run underneath the bottom of the pier caps. At Piers 1W, 2W, 7E, and 8W, the bottom flange tie plates pass through the webs

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



of the pier caps. The nomenclature and girder designations shown on the design plans were used in the fracture critical inspection of the pier cap. For this report, directions are relative to the roadway stationing for I-71 and not necessarily compass direction. In 2009, the bridge pier caps were rehabilitated to improve areas of corrosion and problematic weld details. In 2017, the bridge deck was replaced due to overall deterioration and poor conditions.

This bridge is inventoried in a roadway south to north direction, and superstructure units are labeled from left to right looking roadway north. Substructure units are labeled as Rear and Forward Abutments (Abutments 1 and 2) and Piers 1 through 9. Refer to Photographs 1 and 2 below for overall views of the bridge superstructure.



1.3 Method of Investigation

On August 1, 2023, Collins Engineers, Inc. concluded an in-depth inspection of the fracture critical pier caps. A two- to three-person team consisting of a professional engineer and NBI team leader (Michael Seal, P.E.) and team members Trent Graham, E.I.T. (Collins), Rob Parker (Gannett Fleming), and Matthew McFadden, E.I.T. (Gannett Fleming) performed an NBI fracture critical inspection of Bridge HAM-71-0248L. A 46 ft. bucket truck was used to access the fracture critical pier cap interiors, perform the arms-length inspection of the exteriors.

Parking lot space closures and traffic control provided by A&A Safety was used to gain access to the pier cap's interior and exterior which consisted of:

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Sentinel Street – Single lane closures between the hours of 8:00 AM and 4:00 PM was necessary to inspect the interior and exterior of the pier caps.
- Southbound IR 471 – Single lane closure between the hours of 11:00 PM and 3:00 AM was necessary to inspect the exterior of the pier caps.

OSHA confined space entry procedures were followed while inspectors were working inside the pier caps. 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. OSHA compliant safety harnesses and lanyards were worn by inspectors when working in the lift bucket. The pier cap hatch covers were removed for the entry and replaced with an impact wrench and resealed with exterior grade silicone caulk after the inspections. Various socket sizes from 1/2 in. to 15/16 in. were required to remove the hatch bolts.

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. Magnetic particle testing was performed at crack locations to verify crack propagation if necessary. 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.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



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

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



2.0 EXISTING CONDITIONS

2.1 Pier Cap Conditions

2.1.1 *Pier Cap 1W*

Pier Cap 1W is in SATISFACTORY Condition [6] (Photograph 3). See the comments below for specifics on the 2023 inspection.



Photograph 3: General Elevation of Pier Cap 1W, Looking Roadway South.

2.1.1.1 *Pier Cap 1W Interior*

The cap interior is in SATISFACTORY Condition [6] with areas of active surface corrosion present along the bottom plate from prior ponding water. This flaking paint and corrosion extends up the web plates for a few inches (no section loss present). The top plates exhibit failed paint and freckling corrosion with no section loss at the webs. The bottom flange on both sides of the east bearing wall was dry at the time of inspection with surface corrosion developing in these areas; prior inspections have noted ponding water in this location. The following items on the interior have not changed since the previous inspection unless otherwise noted:

- A total of 5 bolts were sheared off from the top flange plate during a prior deck rehabilitation. New bolts, washers, and nuts were installed at these locations. These were not leaking for this inspection.

Locations include:

- Two east of Diaphragm E and one west of Diaphragm E
- One east of Diaphragm D
- One east of Diaphragm EA (Photograph 4)

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- All the tack welds between the web plates and backer bars around the bottom flange tie plates were ground out during a previous rehabilitation.
- A 4 1/2 in. wide by 5/8 in. tall by 1/16 in. deep laminar tear is present on the south web plate between Diaphragm A and the west bearing stiffener, just west of the plate stiffener. This is not a significant structural concern.
- The top flange had freckling surface corrosion and corrosion staining, possibly caused from condensation, with no section loss present (Photograph 5).
- There is a cracked excess tack weld on the tip of the north vertical stiffener east of Girder EA (Photograph 6). This is not currently significant.
- Ground down welds were observed at the top of the east end plate (Photograph 7).

<p>Photograph 4: Typical Example of Replaced Bolts and Nuts, Diaphragm EA Shown Looking North.</p>	<p>Photograph 5: Typical Example of Freckling Corrosion Inside Cap, Top Plate East End Shown Looking Southeast.</p>
<p>Photograph 6: View of the Cracked Excess Tack Weld at Tip of North Web Plate Stiffener East of Girder EA, Looking Northeast.</p>	<p>Photograph 7: View of Ground Tack Welds in the North Web Plate Between Diaphragms C and D. Looking North.</p>

2.1.1.2 Pier Cap IW Exterior

The cap exterior is in SATISFACTORY Condition [6]. During a previous rehabilitation, the welded lateral brace connections were removed from the web plates and replaced with bolted connections

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



(Photograph 8). The knee braces at the connections between the pier cap webs and the girder bottom flange tie plates were coped to eliminate intersecting fillet welds. The web plates were retrofit with drilled stress relief holes, connected by vertical saw cuts adjacent to the welded connections of the interior girder bottom flange tie plates (Photograph 9). The holes were sealed with washers and a small bolt. The pier cap bearings have light surface corrosion with no section loss and minor construction debris around them but appear to function properly. The following items on the exterior have not changed since the previous inspection unless otherwise noted:

- There was minor scrape damage to the top of the north web plate between Girder A and B, likely caused by contractors during a prior deck rehabilitation (Photograph 10). Currently there is no section loss or significant steel damage. Insignificant gouges were observed along the south face on the bottom flange plate between Girder EA and F.
- A slight gouge was observed on the north web, between Girder EA and F. A scrape was present in this bay. These are likely from a prior deck rehabilitation.
- The southeast bearing anchor bolt was sheared off at the washer at the east bearing (Photograph 11). Most of the bearing anchor bolt nuts are missing or were not installed originally.



Photograph 8: View of Bolted Lateral Brace Connection Replacing Welded Connection, Looking Southwest.

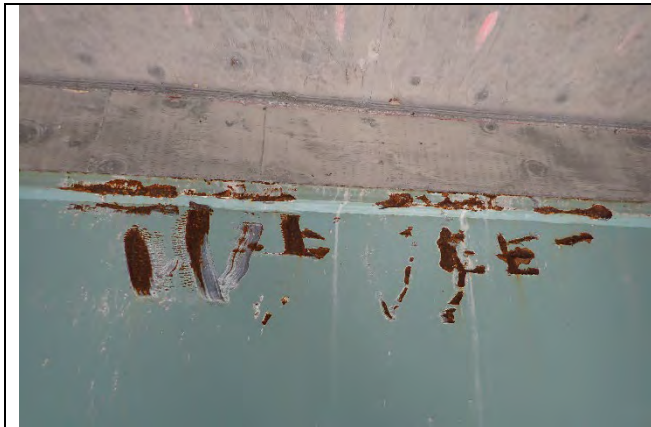


Photograph 9: Typical Example of Drilled Hole Retrofits at Girder Bottom Flanges/Tie Plates.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



Photograph 10: View of Scrape Damage to North Web Plate Between Girders A and B, Looking South.



Photograph 11: Sheared Southeast Anchor Bolt at East Bearing, Looking Roadway Northeast.

2.1.1.3 Pier Cap 1W Fatigue Prone Details

Fatigue Prone Detail 1

- Fillet welds between diaphragms or stiffeners and web or flange 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 web and flange
- Category: C
- Location:
 - One tack weld on interior of top flange at Girder B diaphragm.
 - Two tack welds on interior of north web between Girders D and E.

Fatigue Prone Detail 8

- Intersection of fillet welds.
- Category: E
- Location:
 - Fillet welds of bottom flange and both web plates, intersecting fillet weld of both web plates and Girder C, D and EA diaphragms.
 - Fillet weld of bottom flange and south web plate intersecting fillet weld of south web plate and stiffener between Girders B and C.
 - Fillet welds of Girder EA knee brace and south web intersecting fillet weld of Girder EA bottom flange tie plate and south web (ground but not completely removed)

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



Fatigue Prone Detail 9

- Drilled hole stress relief retrofit in web plates.
- Category: B
- Location: Both web plates on each side of all interior girder connections.

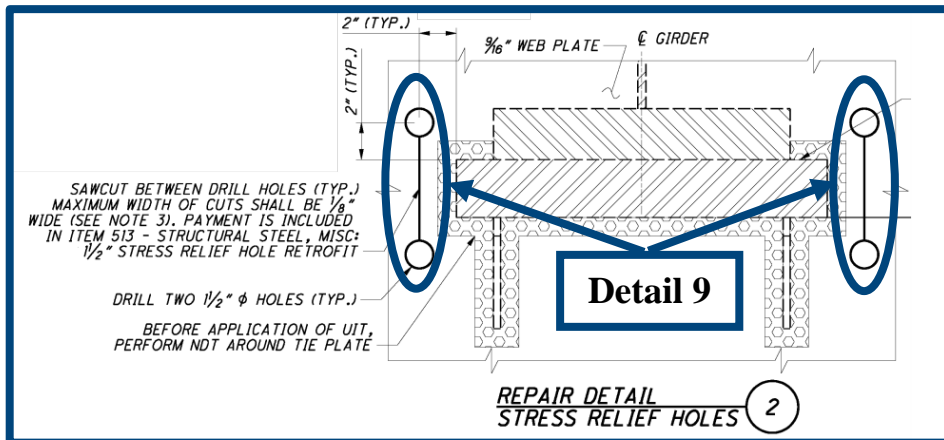


Figure 3: Typical web plate cross section of Pier Cap 1W

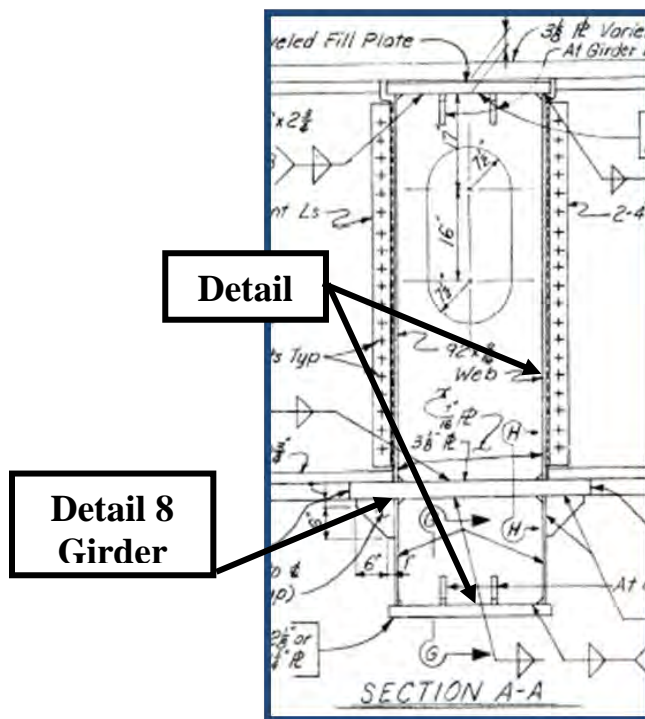


Figure 4: Typical cross section of Pier Cap 1W

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023

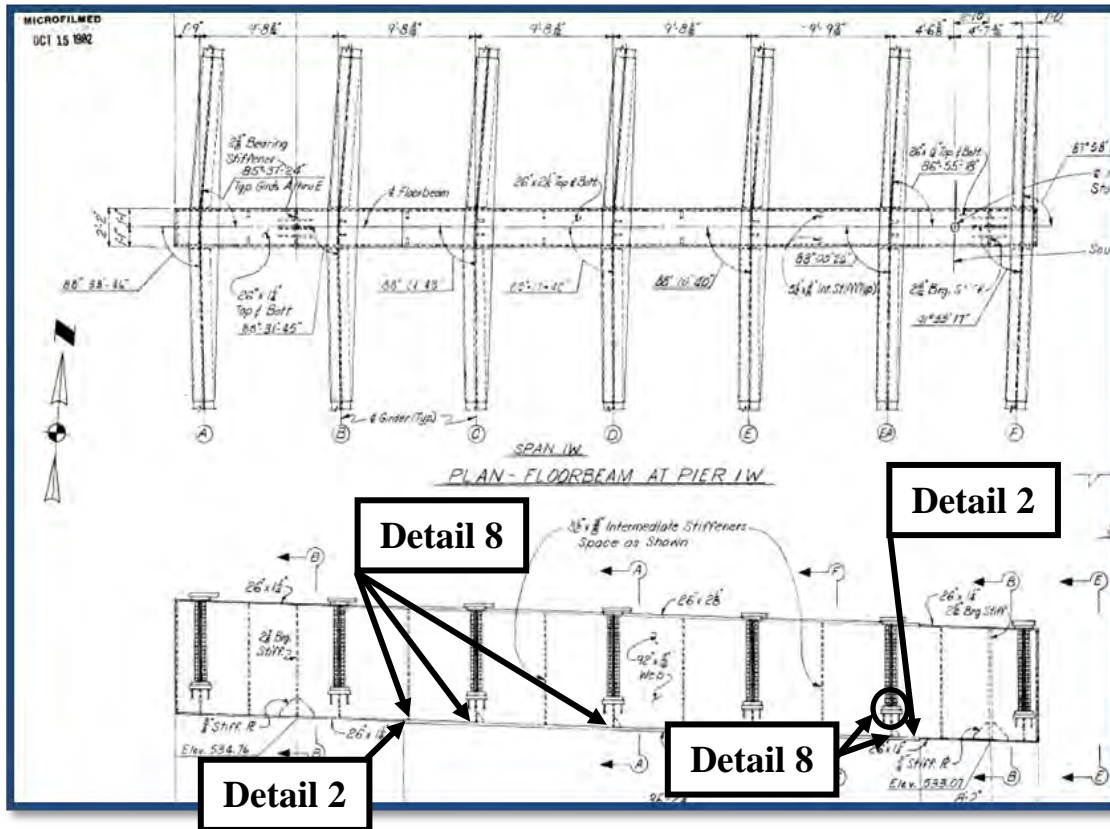


Figure 5: Plan and elevation of Pier Cap 1W



2.1.2 Pier Cap 2E

Pier Cap 2E is in GOOD Condition [7] (Photograph 12). The interior was recently painted. At the time of the inspection there were no signs of moisture inside the cap.



Photograph 12: General Elevation of Pier Cap 2E, Looking Roadway North.

2.1.2.1 Pier Cap 2E Interior

The interior paint is in GOOD Condition [7]. The pier cap interior was cleaned and painted during a recent rehabilitation, though failed paint and active corrosion exists between Diaphragms M and N at the north web plate (Photograph 13). The following items on the interior have not changed since the previous inspection unless otherwise noted:

- Section loss of up to 1/8 in. was observed on the bearing stiffener plate at the east bearing on the east side on the knee braces at the bottom of the stiffener (Photograph 14).
- At several locations in the tension zones, the fillet welds of the web and flange plates intersect the fillet welds of diaphragms or stiffeners (Photograph 15).
- The bottom knee braces on Girders J, K, L and M and the top knee brace on Girder H were removed and the fillet welds were ground from the flange plates (Photograph 16).
- Tack welds previously found on the web and flange plates have been removed; there were no cracks or other structural issues observed.
- There were several small piles of construction debris left in place between Girders K and M.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



Photograph 13: Failed Paint and Active Corrosion on North Web Plate Between Girders M and N, Looking Northwest.



Photograph 14: View of Section Loss to 1/8 in. on Braces Near the East Bearing Stiffener, Looking West.



Photograph 15: Typical Example of Intersection Welds, Lower North Web Plate West side of Diaphragm J Shown Looking Northeast.



Photograph 16: Typical Example of Removed Knee Brace from Interior Diaphragm. Top of Diaphragm H shown. Looking West.

2.1.2.2 Pier Cap 2E Exterior

The exterior of Pier Cap 2E is in SATISFACTORY Condition [6], with active laminating corrosion and pack rust with up to 1/8 in. section loss on the east end plate around the access hatch (Photographs 17 and 18). No additional corrosion or section loss was observed since the previous inspection. The following items on the exterior have not changed since the previous inspection unless otherwise noted:

- Retrofits performed on the exterior of Pier Cap 2E include tack welds removed between the bottom flange plate of the pier cap and the girder bottom flange fill plates. One tack weld remains on Girder H. The welded drainage supports have also been removed and replaced with bolted connections (Photograph 19).

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Surface corrosion along the top flange of the cap is causing minor section loss and rust staining east of Girder N on the north and south side of the pier cap (Photograph 20). Active corrosion exists on the interface between Girder M and the north web, and the drainage brackets on the web.
- The pack rust described above at the outside face of the east end plate is bowing out the hatch slightly (Photographs 17 and 18). Minor pack rust was present between the bottom flange and the tie plate at Girder M.
- Moderate rust staining is present along the top flange and deck interface between Girders K and L on the south side of the cap. Rust staining is present on the south web and bottom flange of the cap. Rust staining was observed running down the length of the north web west of Girder H.
- There is no change in the small impact mark on the northeast side of Girder H. This currently measures 10 in. long and 1/4 in. wide. There is a 1/2 in. deep gouge on the south web between Girders K and L.
- There is no change in the minor area of paint loss (4 in. long by 2 in. tall) on the bottom flange plate at the northwest corner of the cap.
- There is broken concrete and construction debris on girder lower flanges on each girder.



Photograph 17: View of East End Plate Below Hatch. Note Reactivated Corrosion and Section Loss up to 1/8 in. Looking West.



Photograph 18: View of East End Plate At Top of Hatch With Door Removed. Note Corrosion and Section Loss up to 1/8 in. Looking West.



Photograph 19 – View of Bolted Connections that replaced Welded Connections for Drainage System. Looking Southeast.



Photograph 20 – View of Active Corrosion on the Girder Top Flange and Cap Top Flange Plate East of Girder N. Looking North.

2.1.2.3 Pier Cap 2E Fatigue Prone Details

Fatigue Prone Detail 1

- Fillet welds between diaphragms or stiffeners and web or flange plates.
- Category: C'
- Location: All girder diaphragms and web stiffeners.

Fatigue Prone Detail 3

- Tack welds, less than 2 in., on web and flange
- Category: C
- Location:
 - Tack weld on interior of bottom flange between Girders J and K, Girders K and L, and Girders L and M (3 total).
 - Tack weld on interior of each web plate between Girder H and west bearing, west bearing and Girder J, and east bearing and Girder N; tack weld on interior of south web between Girders J and K; tack weld on interior of north web between Girders L and M (8 total).

Fatigue Prone Detail 8

- Intersection of fillet welds.
- Category: E
- Location:
 - Fillet welds of bottom flange and both web plates, intersecting fillet weld of both web plates and Girder J, K, L and M diaphragms.
 - Fillet weld of bottom flange and south web plate intersecting fillet weld of south web plate and stiffener between Girders K and L.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023

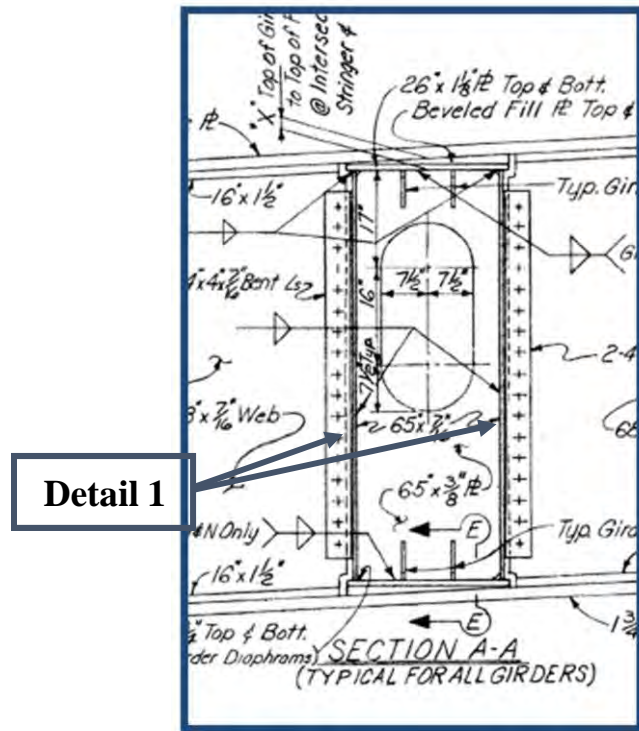


Figure 6: Typical cross section of Pier Cap 2E

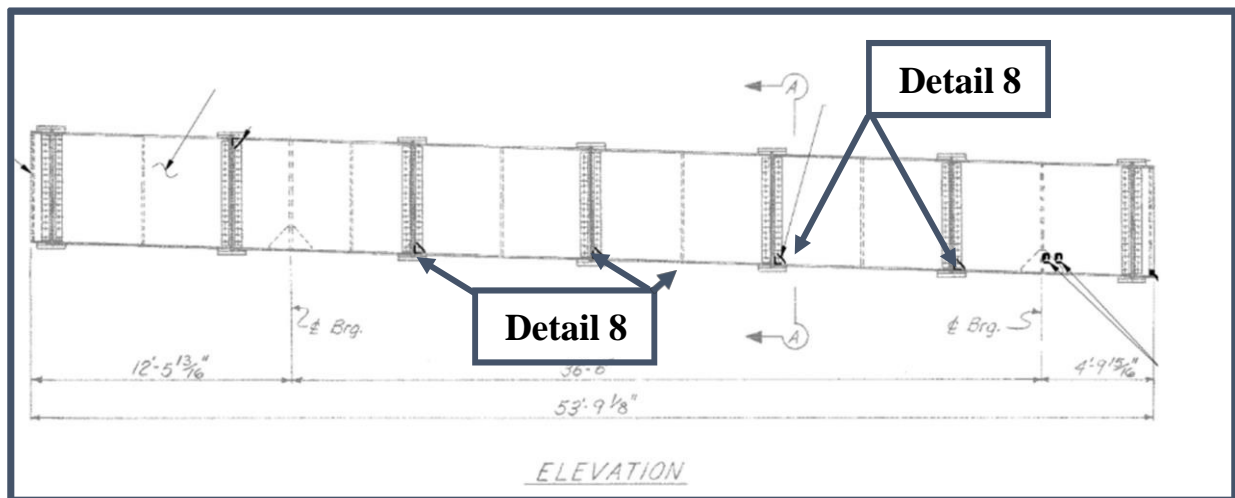


Figure 7: Elevation of Pier Cap 2E



2.1.3 Pier Cap 2W

Pier Cap 2W is in overall GOOD Condition [7] (Photograph 21). Lower portions of the cap interior exhibit paint failure and moderate surface corrosion with no section loss. The interior of the cap was dry at the time of the inspection.



Photograph 21: General Elevation of Pier Cap 2W, Looking Roadway North.

2.1.3.1 Pier Cap 2W Interior

During a previous rehabilitation, miscellaneous tack welds were ground smooth on the interior of the web and flange plates. Tack welds between the web plates and backer bars around the bottom flange tie plates of all girders were removed, except at Girder F. The bottom flange knee braces were removed from the girder diaphragms and the fillet welds were ground smooth on the bottom flange (Photograph 22). The following items on the interior have not changed since the previous inspection unless otherwise noted:

- The fillet welds of the web and flange plates intersect the fillet welds of the diaphragms or stiffeners at several locations, including in tension zones (Photograph 23).
- Minor freckling corrosion was observed throughout. The top flange plate exhibits flaking paint and active corrosion with no section loss. The bottom flange plate exhibits active surface corrosion with no section loss (Photograph 24).
- The discontinuous weld noted on the north web stiffener between Girders A & B is present and no changes were noted for this inspection (Photograph 25).
- A weld remnant was observed to not be ground down on the top plate of Diaphragm C on the east face and at Diaphragm EA.



Photograph 22: Typical Example of Remnants of Knee Brace Connections Removed. East Face of Diaphragm E Shown.



Photograph 23: Typical Example of Intersecting Welds Inside Pier Cap 2W.



Photograph 24: General Example of Flaking Paint and Active Surface Corrosion along the Top Plate. Occurs Randomly but Consistently along the Plate.



Photograph 25: View of Discontinuous Weld Noted on the North Web Stiffener between Girders A and B.

2.1.3.2 Pier Cap 2W Exterior

The exterior of Pier Cap 2W is in GOOD Condition [7] with minor surface rust noted on the underside of the bottom flange (Photographs 26 and 27). The following items on the exterior have not changed since the previous inspection unless otherwise noted:

- Retrofits performed on the exterior of the Pier 2W box cap include the replacement of welded lateral bracing connection plates on the south web with bolted connections and the drilling of 1 in. diameter holes at noted locations of intersecting welds on the knee braces at the girder to tie plate connections (Photographs 28 and 29).
- Deformation and minor section loss up to 1/8 in. was exhibited on plates between the tie plate and girder on the east side of Girder F on the north side of the web (Photograph 30).

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- The north edge of the bottom flange exhibits several gouges up to 1/8 in. deep over the length of the pier cap, most of which are near Girder D (Photograph 31). There is a 1 ft 2 in. long by 1/2 in. wide by 3/16 in. deep impact dent at the top of the web between Girders A and B, north side (Photograph 32). Several scratches were seen throughout on both north and south webs of the pier (Photograph 33). These likely occurred during prior rehabilitation efforts.
- Moderate to heavy fretting rust was noted on the north and south faces of the cap along the top flange to deck interface between Girders C and D (Photograph 34). Pigeon nests and construction debris was observed on the south web and girder lower flanges (Photograph 35). Rust staining is present on the south and north web of the cap (Photograph 36).
- A knee brace with a poor weld toe termination was observed at Girder A on the south side of the cap.
- The protective coating system is in good condition with isolated areas of minor paint failures and peeling along the cap (Photograph 37).
- The bearings are in good condition and appear to be function as designed (Photograph 38). The west bearing exhibits moderate surface corrosion with up to 1/8 in. deep section loss on the masonry plate around the northwest anchor bolt (Photograph 39). The west bearing was constructed with a misaligned sole plate.



Photograph 26: View of the Minor Surface Corrosion Noted on the Bottom Flange of Pier Cap 2W.



Photograph 27: View of the Minor Surface Corrosion Noted on the Bottom Flange of Pier Cap 2W.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



Photograph 28: View of the Retrofits Performed on the Exterior of the Pier 2W Cap.



Photograph 29: View of the Retrofits Performed on the Exterior of the Pier 2W Cap.



Photograph 30: View of the Deformation and Minor Section Loss Exhibited on Plates between the Tie Plate and Girder on the East Side of Girder F on the North Side of the Web.

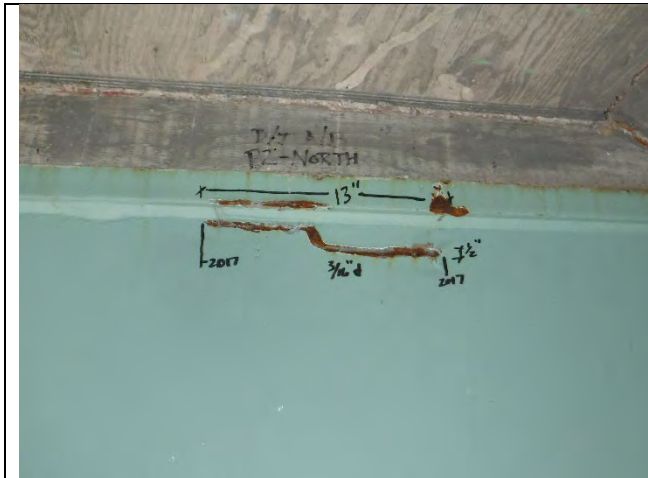


Photograph 31: View of the Gouges at the North Edge of the Bottom Flange over the Length of the Pier Cap, most of which are near Girder D.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



Photograph 32: View of the Impact Dent at the North Side of Top of the Web between Girders A and B.



Photograph 33: View of Scratches seen throughout on Both North and South Webs of the Pier.



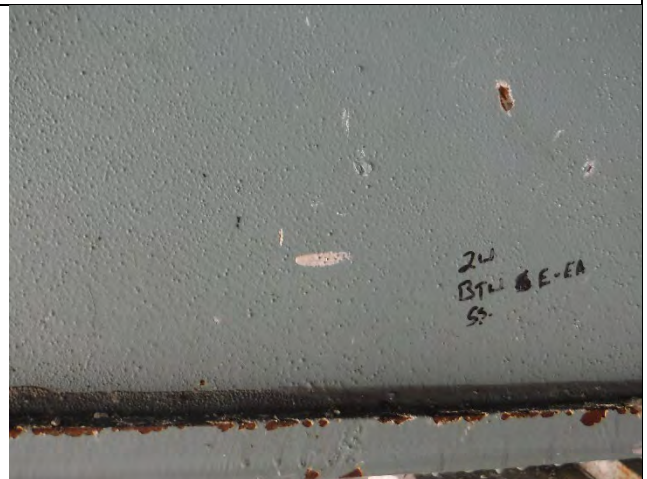
Photograph 34: View of the Moderate to Heavy Fretting Rust on the North and South Faces of the Cap along the Top Flange to Deck Interface Between Girders C and D.



Photograph 35: View of the Pigeon Nests and Construction Debris was Observed on the South Web and Girder Lower Flanges.



Photograph 36: View of the Typical Rust Staining on the South and North Web of the Cap.



Photograph 37: View of the Typical Protective Coating System Condition.



Photograph 38: View of the Typical Bearing Condition.



Photograph 39: View of the West Bearing with Moderate Surface Corrosion and Section Loss Around the Northwest Anchor Bolt.

2.1.3.3 Pier Cap 2W Fatigue Prone Details

Fatigue Prone Detail 1

- Fillet welds between diaphragms or stiffeners and web or flange plates.
- Category: C'
- Location: All girder diaphragms and web stiffeners.

Fatigue Prone Detail 2

- Full penetration groove weld of flange splice.
- Category: B
- Location: One bottom flange splice.

Fatigue Prone Detail 3

- Tack welds, less than 2 in., on web and flange
- Category: C
- Location:
 - Two tack welds on the interior of the bottom flange between Girders B and C; Three tack welds on the interior of the bottom flange at Girder C, Girder D, and Girder E; One tack weld on the interior of the top flange between Girders EA and F (12 total).
 - Three tack welds on the interior of the north web plate between Girders A and B; one tack weld on the interior of the north web plate between Girders E and EA (4 total).

Fatigue Prone Detail 8

- Intersection of fillet welds.
- Category: E
- Location:
 - Fillet welds of bottom flange and both web plates intersecting fillet weld of both web plates and Girder B, C, D, and E diaphragms.
 - Fillet weld of bottom flange and north web plate intersecting fillet welds of north web plate and stiffeners between Girders A and E (4 locations).
 - Fillet weld of bottom flange and south web plate intersecting fillet welds of south web plate and stiffeners between Girders A and B, and between Girders D and E (2 locations).

Fatigue Prone Detail 9

- Drilled hole stress relief retrofit in web plates.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Category: B
- Location: Both web plates on each side of all interior girder connections.

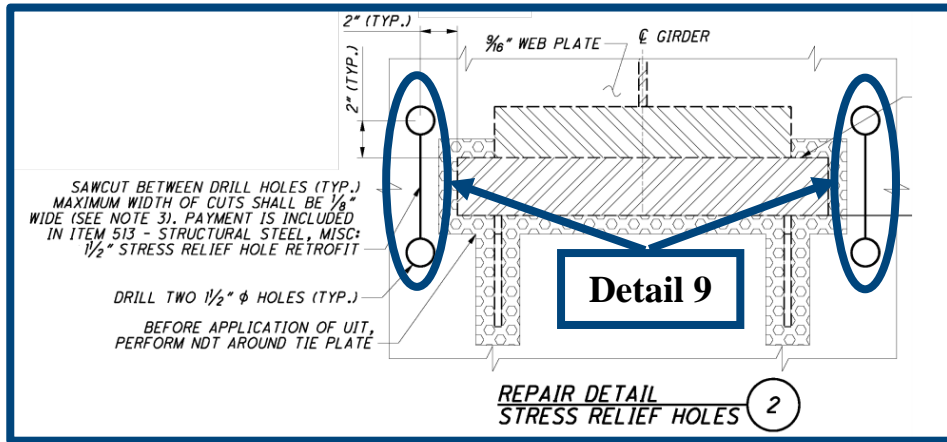


Figure 8: Typical web plate cross section of Pier Cap 2W

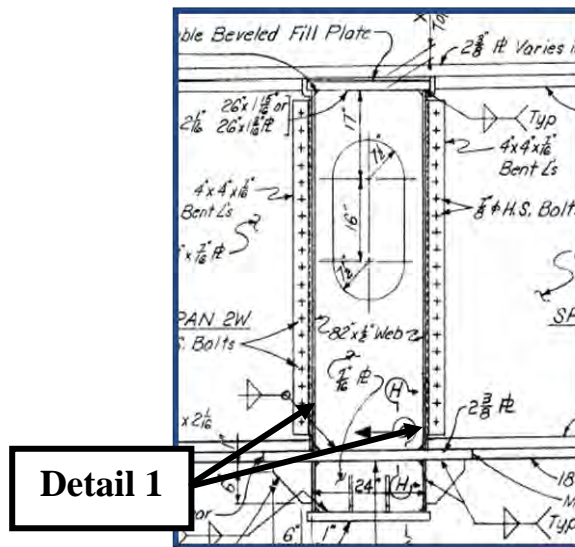


Figure 9: Typical cross section of Pier Cap 2W

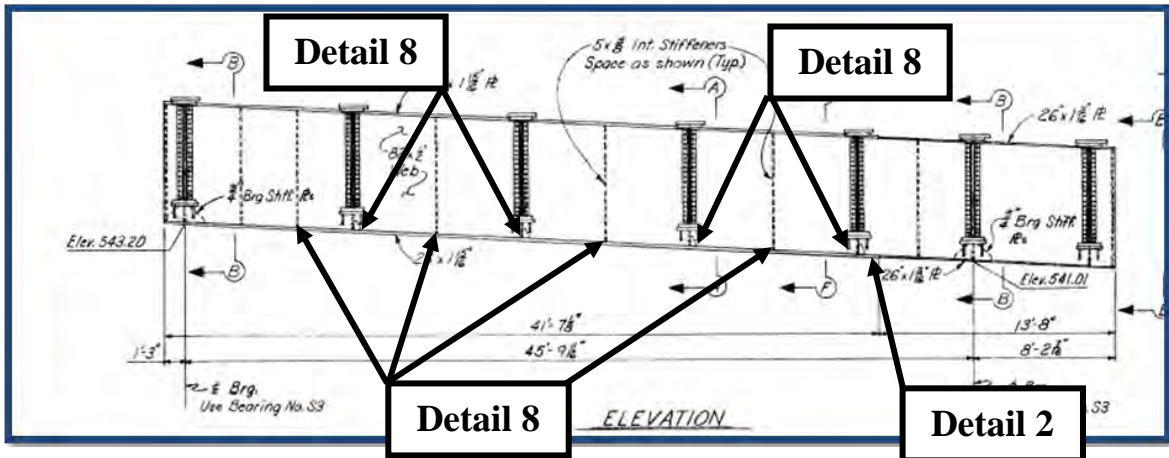


Figure 10: Elevation of Pier Cap 2W

2.1.4 Pier Cap 3W

Pier Cap 3W is in GOOD Condition [7] (Photo 40) with scattered areas of moderate surface corrosion on the interior surfaces. At the time of the inspection the cap interior was dry.



Photograph 40: General Elevation of Pier Cap 3W, Looking North.

2.1.4.1 Pier Cap 3W Interior

The interior of Pier Cap 3W is in GOOD condition. There are isolated locations of surface corrosion present randomly inside the cap, mostly at the ends near the hatches (Photograph 41). The following items on the interior have not changed since the previous inspection unless otherwise noted:

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Retrofits performed on the interior of the Pier 3W box cap include the removal of numerous tack welds on web plates west of Girder D, removal of welded diaphragm knee braces that have been ground smooth in the tension regions of the top and bottom flanges at Girders C through E, and the drilling of drainage holes in the east end plate of the cap.
- At Girder EA a visual crack indication was observed, measuring 3 in. on the south brace and 2-1/8 in. on the north brace, between the knee braces and the top flange plate. This was tested with magnetic particle and was determined to not be a crack. This appears to be the result of an inconsistent weld bead and poor paint conditions (Photograph 42).
- Two out of six bolts were previously missing on the east access hatch but have been replaced. The open holes were caulked and sealed to prevent moisture infiltration (Photograph 43).
- There are two minor bulges observed on a stiffener in the north web near the top flange between Girders D and E (Photograph 44). There is a large bulge in the top flange between Girder EA to F with paint loss (Photograph 45). These likely occurred during a prior rehabilitation project.
- The intersecting weld location between the web, transverse stiffener, and bottom flanges east of Girder B has been ground smooth and painted.
- Gouges up to 1/8 in. deep were typically noted on the edges of the stiffener diaphragms. These gouges are insignificant and not a structural concern. A gouge was observed on the south web between Girders D and E (Photograph 46).
- Two errant weld strikes up to 2 in. long were noted on the north and south web of the cap near the east access hatch (Photograph 47).
- There were two tack welds on the webs between Girders F and EA, with one being on the north web and one on the south web (Photograph 48).
- The protective coating system is in good condition with locations of peeling and flaking paint along the longitudinal flange to web welds and at the bulges. Little to no corrosion is present.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



Photograph 41: Isolated Locations of Surface Corrosion Inside the Cap, Mostly at the Ends Near the Hatches.



Photograph 42: Visual Crack Indication at Girder EA. Indication was Tested with Magnetic Particle and Determined to Not Be A Crack.



Photograph 43: Two out of six bolts were previously missing on the east access hatch but have been replaced. The open holes were caulked and sealed to prevent moisture infiltration.



Photograph 44: Two minor bulges on a stiffener in the north web near the top flange between Girders D and E.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



Photograph 45: View of Large Bulge in the Top Flange between Girder EA to F with Loss of Paint.



Photograph 46: View of Gouges at Stiffener Diaphragms. These Gouges are not a Structural Concern. South Web Between Girders D and E.



Photograph 47: Two Errant Weld Strikes Up to 2 in. Long Located on the North and South Web of the Cap Near the East Access Hatch.



Photograph 48: View of Two Tack Welds on the Webs Between Girders F and EA.

2.1.4.2 Pier Cap 3W Exterior

The exterior paint is in GOOD Condition [7] with minor isolated surface rust and gouges from recent rehabilitation. During a previous rehabilitation most tack welds between the girder fill plates and pier cap bottom flange were removed. Tack welds remain on the bottom flange at the west edge of the Girder B fill plate, the west edge of Girder E, and at the east edge of the Girder EA fill plates (Photograph 49). These are in tension zones. The following items on the exterior have not changed since the previous inspection unless otherwise noted:

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Pack rust is present with up to 1/16 in. section loss on the west side of Girder A between the bottom flange plate and tie plate (Photograph 50).
- There are 1/8 in. deep gouges on the south edge of the bottom flange between Girders E and EA, with several small gouges being observed on the north side of the top flange of the cap near Girder E (Photograph 51). A 17 in. long up to 3/16 in. deep impact gouge was located on the north side of the cap in the web and flange between Girders D and E (Photograph 52).
- Slight corrosion and rust staining was observed on the top flange on the north web just west of Girder C (Photograph 53).
- Both spherical bearings have light surface corrosion but appear to function properly (Photograph 54).
- Various debris was observed scattered throughout at different girders. There is a bird nest at Girder EA (Photograph 55).



Photograph 49: View of the Remaining Tack Welds on the Bottom Flange at the West Edge of Girder B fill Plate, the West Edge of Girder E, and at the East Edge of the Girder EA Fill Plates.



Photograph 50: View of the Pack Rust with Section Loss on the West Side of Girder A Between the Bottom Flange Plate and Tie Plate.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



Photograph 51: View of Gouges on the South Edge of the Bottom Flange between Girders E and EA.



Photograph 52: View of the Impact Gouge Located on the North Side of the Cap in the Web and Flange between Girders D and E.



Photograph 53: View of the Corrosion and Rust Staining Observed on the Top Flange on the North Web just West of Girder C.



Photograph 54: View of the Typical Bearing Condition.



Photograph 55 (left): View of the Bird Nest at Girder EA.



2.1.3.3 Pier Cap 3W Fatigue Prone Details

Fatigue Prone Detail 1

- Fillet welds between diaphragms or stiffeners and web or flange 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 web and flange
- Category: C
- Location:
 - Tack weld on exterior of west side bottom flange at Girder B and east side Girder EA (2 total).
 - One tack weld on the north web between Girder A and the west bearing and between Girder EA and the east bearing; three tack welds on the south web between Girder EA and the east bearing; one tack weld on the south web between the east bearing and Girder F (6 total).

Fatigue Prone Detail 5

- Fillet weld, greater than 4 in., with a connection thickness less than 1 in..
- Category: E
- Location: 5 in. fillet welds connecting (2) 3/8 in. knee braces to the top flange on the east side of Girder B and Girder EA diaphragms.

Fatigue Prone Detail 8

- Intersection of fillet welds.
 - Fillet welds of bottom flange and both web plates, intersecting fillet weld of both web plates and Girder E diaphragms.
 - Fillet weld of bottom flange and both web plates intersecting fillet weld of each web plate and stiffener between Girders C and D.

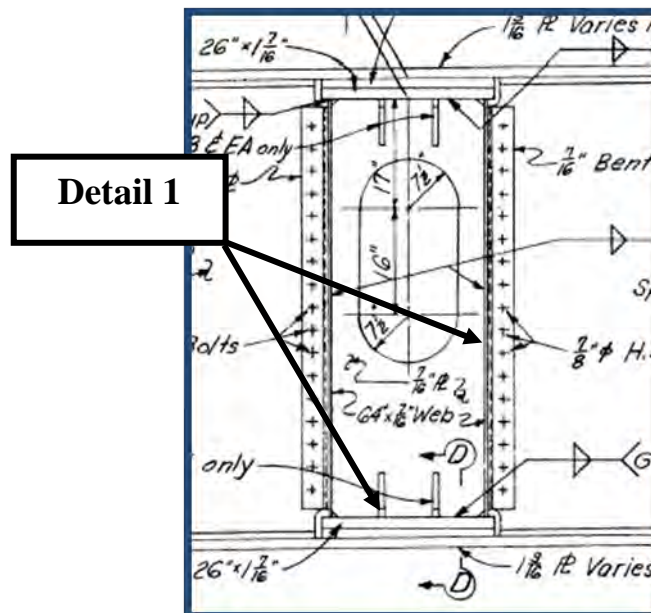


Figure 11: Typical cross section of Pier Cap 3W

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023

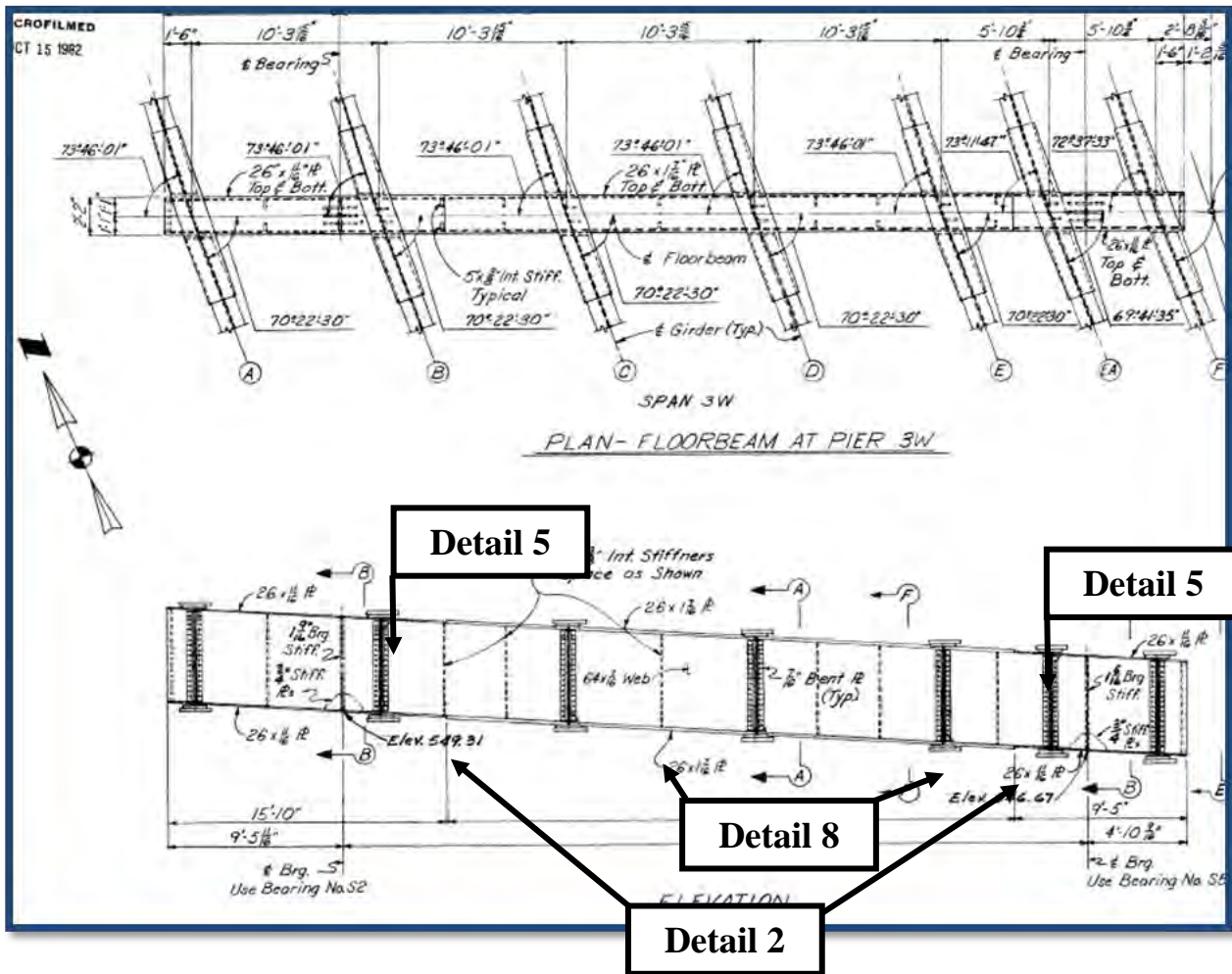


Figure 12: Plan and Elevation of Pier Cap 3W

2.1.5 Pier Cap 4W

Pier Cap 4W is in SATISFACTORY Condition [6]. There was section loss of up to 1/16 in. deep noted at isolated locations on the cap interior web and bottom flange. Four broken intermittent fillet welds between interior diaphragms and top flange have not changed and are not a significant concern at this time. Several retrofits were made in 2010 to address fatigue prone details or deficiencies.

2.1.5.1 Pier Cap 4W Interior

The interior of Pier Cap 4W is in SATISFACTORY Condition [6]. The intermittent tack welds previously noted between the top flange and bearing stiffeners at both the west bearing stiffeners have been ground out and removed (Photograph 56). These are still present on the east side. The following items on the interior have not changed since the previous inspection unless otherwise noted:

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Retrofits performed on the interior of the Pier Cap 4W include the removal of tack welds on the web plates, the removal of welded knee braces between the bottom flange and the east face of the interior diaphragms at Girders C and D (Photograph 56), and drain holes drilled at the east end.
- As noted above, there was isolated section loss up to 1/16 in. deep on the cap. This is not currently problematic.
- Intersecting welds are typically present for the fillet welds connecting the cap web plate and flange plates and fillet welds connecting the web plates to diaphragms/stiffeners.
- Gaps were noted between the web plate vertical stiffeners and the cap top flange of the pier cap when no weld is present; this ranges typically from 1/16 in. to 1/8 in. This is not currently problematic.
- Two of six bolts are missing on the east access hatch. Three of six bolts are missing on the west hatch.



Photograph 56: Example of Ground and Removed Intermittent Tack Welds Between the Top Flange and Bearing Stiffeners at Both West Bearing Stiffeners.



Photograph 57: View of Removed Welded Knee Braces on Cap Interior, and Intersecting Welds Between Cap Web Stiffeners, Bottom Flange, and Web Plates. Girder D Shown.

2.1.5.2 Pier Cap 4W Exterior

The cap exterior is in GOOD Condition [7]. During a prior rehabilitation, the welded connections between the web plates and the drainage support bracket and the lower lateral bracings were removed, ground smooth, and replaced with bolted connections. The following items on the exterior have not changed since the previous inspection unless otherwise noted:

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Tack welds between the Girder fill plates and pier cap bottom flange were removed during prior rehabilitations. Notches, typically 1/8 in. to 1/4 in. deep, were found in the west edge of the Girder C and Girder E bottom flange tie plates below the pier cap.
- Gouges were observed in the top flange and web between Girder E and F, and on the web between Girder B and C on the north side of the cap. This most likely occurred during a prior rehabilitation effort and is not structurally significant.
- There is minor corrosion with no section loss and rust staining along the top flange on the north web.
- Pigeon nests were present on the bottom flange of Girder E on the east face of the cap, at Girder D east face south side, and on the flange of Girder A east face south side of the cap (Photograph 58).
- Both the east and west bearings are clean and appear to function as designed (Photograph 59).



Photograph 58: View of the Typical Pigeon Debris Near End of Girders, East Face of Girder E Shown.



Photograph 59: View of the Typical Bearing, West Bearing Shown.

2.1.5.3 Pier Cap 4W Fatigue Prone Details

Fatigue Prone Detail 1

- Fillet welds between diaphragms or stiffeners and web or flange 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 web and flange
- Category: C
- Location:
 - Two tack welds between the top flange and each bearing stiffener (4 total).



- One tack weld on the north web interior between Girder E and the east bearing (ground, but not completely removed)

Fatigue Prone Detail 4

- Tack welds, greater than or equal to 2 in. and less than or equal to 4 in., on the flange plates.
- Category: D
- Location: One 3 in. tack weld between the top flange and west bearing stiffener; one 4 in. tack weld between the top flange and east bearing stiffener (2 total).

Fatigue Prone Detail 5

- Fillet weld, greater than 4 in., with a connection thickness less than 1 in..
- Category: E
- Location: 5 in. fillet welds connecting (2) 3/8 in. knee braces to the top flange on the east side of Girder B and Girder E diaphragms.

Fatigue Prone Detail 8

- Intersection of fillet welds.
- Category: E
- Location:
 - Fillet welds of bottom flange and both web plates, intersecting fillet weld of both web plates and Girder B, C, D and E diaphragms.
 - Fillet weld of bottom flange and north web plate intersecting fillet weld of north web plate and stiffeners between Girders B and D (2 locations).

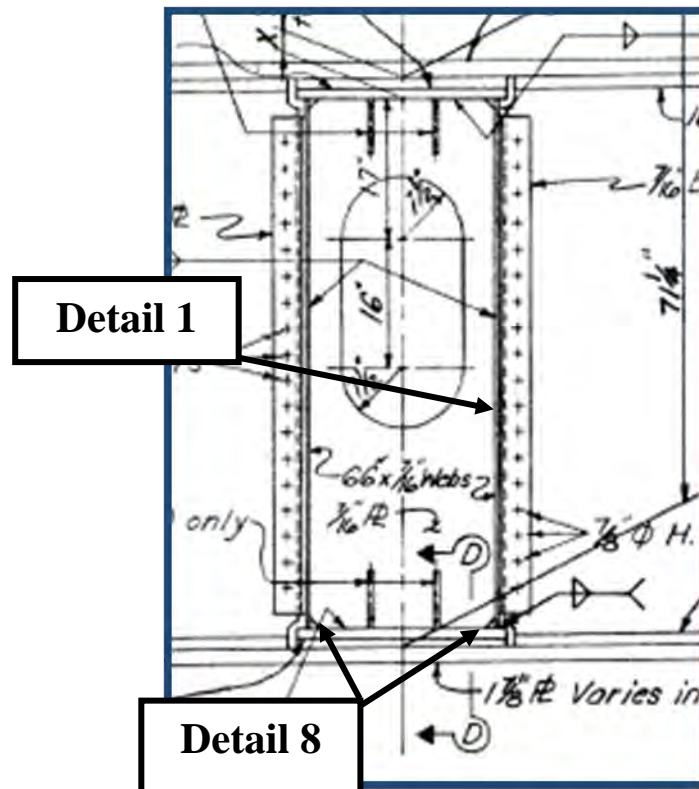


Figure 13: Typical cross section of Pier Cap 4W

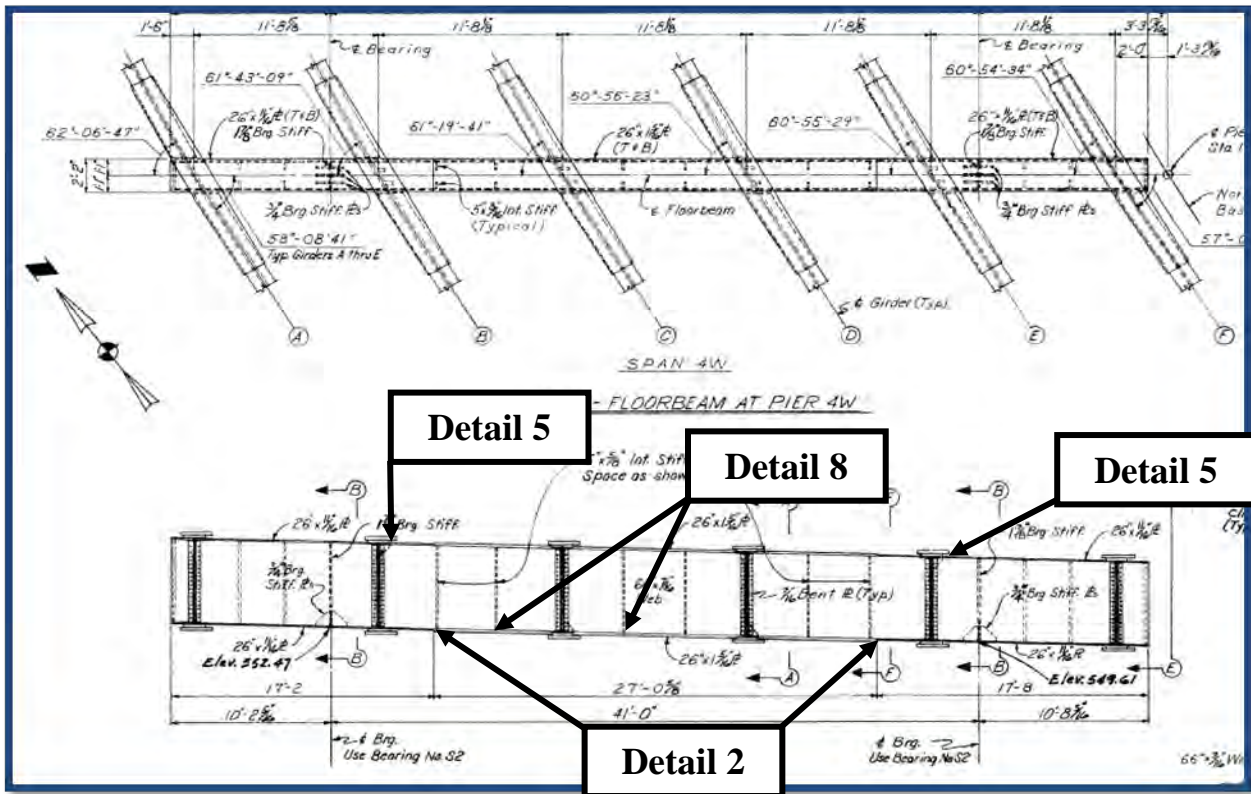


Figure 14: Plan and Elevation of Pier Cap 4W

2.1.6 Pier Cap 7E

Pier Cap 7E is in SATISFACTORY Condition [6] (Photographs 60 and 61). Poor-quality field welds are present inside the pier cap (see below). Paint failure was typical throughout the flange plates, with isolated section loss and rust throughout. Several retrofits were made in 2010 to address fatigue prone details or deficiencies (see below). At the time of inspection, the interior of the pier cap had isolated ponding water at the east end, though much less than noted in the prior inspection report.



Photograph 60: Overall Cap Elevation, Looking Roadway South.



Photograph 61: Overall Cap Elevation, Looking Roadway Northwest.

2.1.6.1 Pier Cap 7E Interior

The interior of the cap is in SATISFACTORY Condition [6]. Retrofits performed on the interior of the Pier 7E box cap include the removal of tack welds along backer bars, the removal of isolated tack welds on the interior face of the web plates, and the drilling of stress relief holes adjacent to girder tie plates. These retrofits continue to function as designed. The following items on the interior have not changed since the previous inspection unless otherwise noted:

- Water infiltration continues inside the cap. Between the west hatch and bearing diaphragm this has caused extensive corrosion and section loss up to 1/16 in. deep (Photograph 62). This moisture is infiltrating from oversized bolt holes in the top flange and no washers at these bolts. Some standing water was observed at the east bearing stiffener and freckling corrosion is typical. Oversized and mis-drilled bolt holes were noted on the top flange of the cap throughout, and water is leaking through some of the openings elsewhere (Photograph 63).
- There is extensive peeling and flaking paint with surface corrosion and no section loss throughout. This is heaviest on the web plates towards the ends and on the top of the tie plates.
- Tack welds on backer bars surrounding the bottom flange tie plates have previously been removed. Numerous backer bars at these locations are either missing or dislodged up to 1/4 in. Miscellaneous tack welds on the web plates have been ground smooth and painted over, although a 1 in. long tack weld remains on the north web and south web between Girders N and P, the first stiffener from P (Photograph 64).

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- An oversized rivet hole was noted on the north web between Girders G and H and another similar oversized rivet hole was observed on the north web between Girders H and J.
- The protective coating system is in fair condition. Paint chalking was noted at isolated locations throughout the cap. Protective coating failures are typical throughout the top flange and at isolated in the pier cap interior.



Photograph 62: General Example of Corrosion and Section Loss from Moisture Infiltrating Cap. Near West Bearing Stiffener Shown Looking West.



Photograph 63: Typical Example of Oversized Bolt Holes on Cap Top Flange Plate, Diaphragm M East Face Shown.



Photograph 64 (left): Weld Remnant not removed, North Web Plate between Diaphragms N and P, First Stiffener from P. Looking North.

2.1.6.2 Pier Cap 7E Exterior

The exterior is in SATISFACTORY Condition [6]. During a previous rehabilitation the welded lateral brace connections were removed from the web plates, ground smooth, and replaced with bolted connections. The knee braces at the connections between the pier cap webs and the girder bottom flange tie plates were coped to removed intersecting fillet welds. The web plates were retrofit with drilled stress relief holes connected by vertical saw cuts adjacent to the welded connections of the girder bottom flange tie plates except at Girder G. The following items on the exterior have not changed since the previous inspection unless otherwise noted:

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- Active surface corrosion with isolated laminating corrosion and pack rust is present around the west bearing and on the top flange over the east bearing. Section loss measuring up to 1/16 in. deep was observed on the exterior stiffeners and web plates above the west bearing (Photograph 65). At the east bearing, a grounding wire is connected to the north web by a tack weld.
- The underbridge lighting for Pier 7E and 8W was not functioning during the inspection. The utility conduit located between Girder M and N north of the cap on the west face of Girder N is broken, causing the lighting outage (Photograph 66).
- Impact damage to the lower lateral bracing between Girders M-N remains (Photograph 67). Impact damage is present between Girders J and K along the top flange and the web (Photograph 68). There are multiple areas of scratches to the cap lower corners with paint loss.
- The cross frames between Girders N and P just north of the cap have been repaired and welded to the stiffeners intentionally.
- A leaking joint is causing water infiltration at the top flange at the west face of the pier cap. This is not currently problematic.
- Tack welds were removed from the north web along the east connection angles of Girders L, M, N, and P. Two tack welds remain between the north web and the east connection angle of Girder K. One tack weld remains on the south web between Girders J and K.
- There is a bolt for the clip angle on the west side of Girder G that has a gap of 3/4 in. between the bolt and the plate. One the east face, this bolt is broken off.



Photograph 65: Example of Painted over Pitting to 1/16 in. Deep on West Bearing Stiffeners.





Photograph 66: No Change to Damaged Conduit on West Face of Girder N, North of the Cap.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



	
Photograph 67: View of No Change to Impact Damage Between Girders M and N, North Face of Cap. Looking South.	Photograph 68: No Change to Impact Damage to Cap, South Face Between Girders J and K Looking North.

2.1.6.3 Pier Cap 7E Fatigue Prone Details

Fatigue Prone Detail 1

- Fillet welds between diaphragms or stiffeners and web or flange 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 web and flange
- Category: C
- Location:
 - One tack weld on the exterior of the south web between Girders J and K; one tack weld between the exterior of the north web and the east connection angle of Girder K (2 total).
 - Two tack welds on the interior of the south web and one tack weld on the interior of the north web between Girders N and P; one tack weld on the interior of the north web between Girder P and east bearing (4 total).

Fatigue Prone Detail 8

- Intersection of fillet welds.
- Category: E
- Location:
 - Fillet welds of bottom flange and south web plate intersecting fillet weld of south web plate and stiffener between Girders L and M.
 - Fillet welds of bottom flange and both web plates intersecting fillet welds of both web plate and stiffeners between Girders M and N.

Fatigue Prone Detail 9

- Drilled hole stress relief retrofit in web plates.
- Category: B
- Location: Both web plates on each side of all interior girder connections, except for Girder G.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023

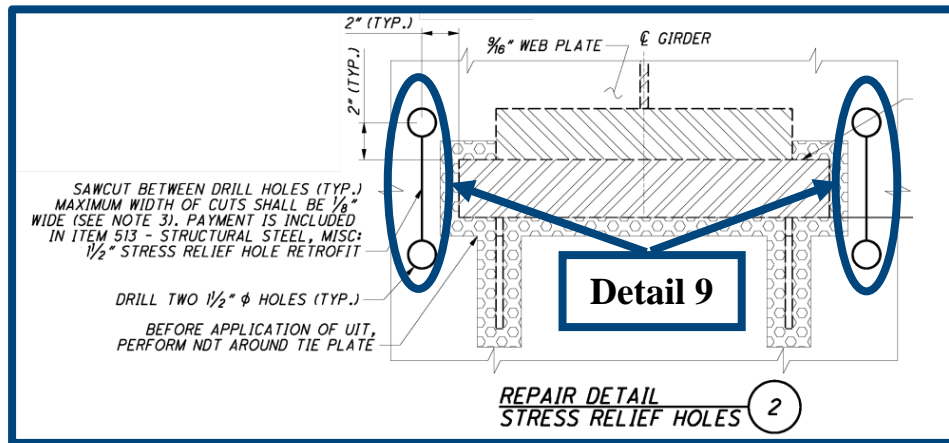


Figure 15: Typical web plate cross section of Pier Cap 7E

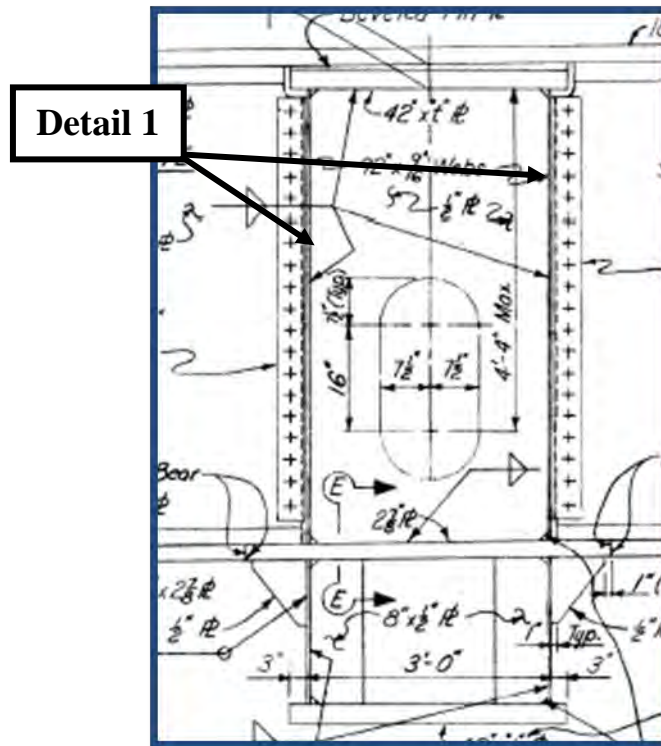


Figure 16: Typical cross section of Pier Cap 7E

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023

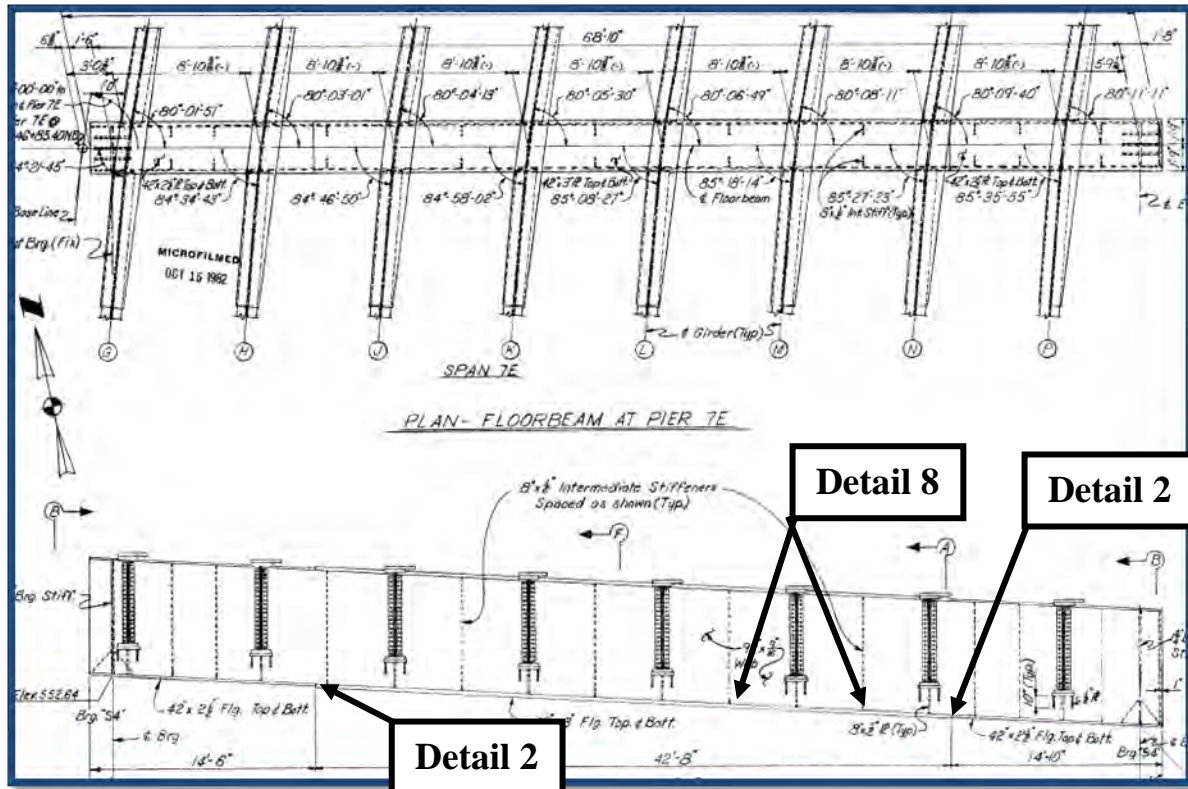
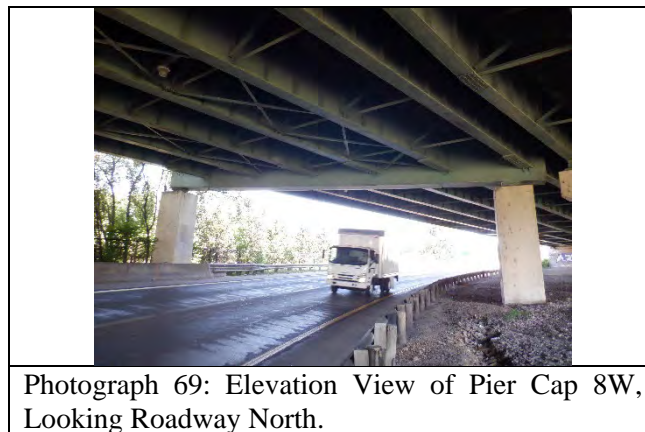


Figure 17: Plan and Elevation of Pier Cap 7E

2.1.7 Pier Cap 8W

Pier Cap 8W is in GOOD Condition [7] (Photograph 69) with no major defects and poor-quality field welds throughout the interior. Several retrofits were made in 2010 to address fatigue prone details and other deficiencies. At the time of inspection, the interior of the pier cap was dry.



Photograph 69: Elevation View of Pier Cap 8W, Looking Roadway North.

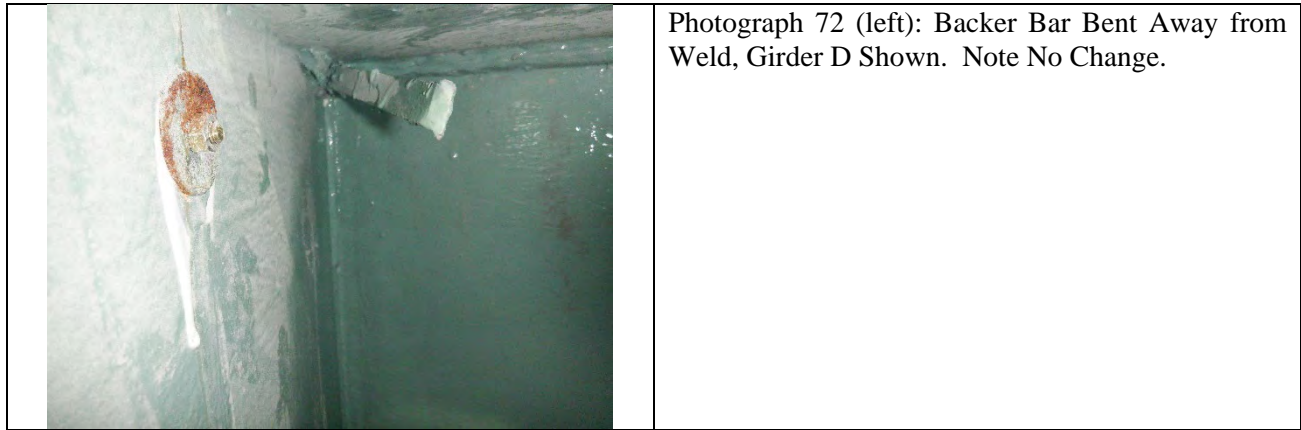


2.1.7.1 Pier Cap 8W Interior

The pier cap interior is in GOOD Condition [7] with poor quality welds that exhibit slag, uneven throat thickness, and up to 1/16 in. deep undercutting of base metal along the welds. The following items on the interior have not changed since the previous inspection unless otherwise noted:

- Aside from the retrofits described in the exterior cap portion below, retrofits performed on the Pier 8W box cap include removal of tack welds along backer bars at tie plates, stress relief holes drilled adjacent to girder tie plates, and the interior diaphragm knee braces were removed (Photographs 69 and 70). The dog bone retrofit west of Girder B is starting to rust along the vertical cut; this is likely due to improper and depressed fitment of the outer dog bone retrofit connection seals.
- The backer bar on the north web on the west side of Girder D below the tie plate is dislodged from the web (Photograph 71). There is a gap in the backer bar east face of Girder B north web. The pier cap web to girder bottom flange backer bar welds on both faces of Girders B, C, and D exhibit paint cracking. No weld cracks are present at this location.
- There is an incomplete weld between the west side of the Girder E diaphragm and the top flange at the south web plate. This area is painted over and no distress was observed.
- The west neoprene hatch seal is still present on the floor of the cap in the west end bay.

<p>Photograph 70: General Example of Knee Brace Removal and Drilled Cope Retrofit at Bottom Connections. Girder E Shown.</p>	<p>Photograph 71: Typical Example of Drilled Hole Retrofits at Tie Plates. Girder D Shown.</p>



2.1.7.2 Pier Cap 8W Exterior

The exterior paint is in GOOD Condition [7]. Rust staining to the cap and efflorescence to adjacent concrete indicate seepage between the flange and deck haunch. The following items on the exterior have not changed since the previous inspection unless otherwise noted:

- During previous rehabilitations, the following work has been performed on the pier cap:
 - The knee braces at the connections between the pier cap webs and the girder bottom flange tie plates were coped to remove intersecting fillet welds.
 - The web plates were retrofit with stress relief drilled holes connected by vertical saw cuts adjacent to the welded connections of the girder bottom flange tie plates, except at Girder F.
 - The welded connections of the drainpipe support brackets and the lower lateral bracing, were removed from the web plates, ground smooth, and replaced with bolted connections.

These retrofits are functioning as designed. Several of the dog bone seals are corroded and the neoprene seals cracked (Photograph 73). Overall, the seals are functioning as designed with no evidence that water or humidity are entering the cap.

- A light scrape from impact damage was located on the north web at the top of web plate between Girder D and E. There are several locations of impact damage located on the lower flange (Photograph 74). The marks and gouges on the corner are likely construction damage or contractor damage rather than from an overheight vehicle.
- Previous inspections noted a transverse tack weld on the north edge of the bottom flange between Girders A and B. This is still present. Previous inspections noted two tack welds on the north web between the west bearing and Girder A. These are still present.
- The bearings exhibit active surface corrosion with no section loss. They function as designed.
- The rubber gasket seal and several anchor bolts are missing from each access hatch.



<p>Photograph 73: Typical Example of Dog Bone Retrofit Seals With Active Corrosion. North Cap Face, East Side of Girder B Shown.</p>	<p>Photograph 74: Typical Example of Scrape on Cap Bottom Flange, Scrape at Girder D Shown Looking South.</p>

2.1.7.3 Pier Cap 8W Fatigue Prone Details

Fatigue Prone Detail 1

- Fillet welds between diaphragms or stiffeners and web or flange 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 web and flange
- Category: C
- Location:
 - Two tack welds on the exterior of the north web between the west bearing and Girder A.
 - One tack weld on the interior of the bottom flange between the west bearing and Girder A and between Girder E and east bearing (2 total).

Fatigue Prone Detail 4

- Tack welds, greater than or equal to 2 in. and less than or equal to 4 in., on the flange plates.
- Category: D
- Location:
 - One 2 in. transverse stack weld on the north edge of the bottom flange between Girders A and B.
 - One 2 in. tack weld on the interior of the bottom flange between Girders A and B

Fatigue Prone Detail 8

- Intersection of fillet welds.
- Category: E
- Location:
 - Fillet welds of bottom flange and both web plates intersecting fillet welds between all girder diaphragms and both web and bottom flange plates.
 - Fillet welds of bottom flange and both web plates intersecting fillet welds between all stiffeners and both web and bottom flange plates.



Fatigue Prone Detail 9

- Drilled hole stress relief retrofit in web plates.
- Category: B
- Location: Both web plates on each side of all interior girder connections, except for Girder E.

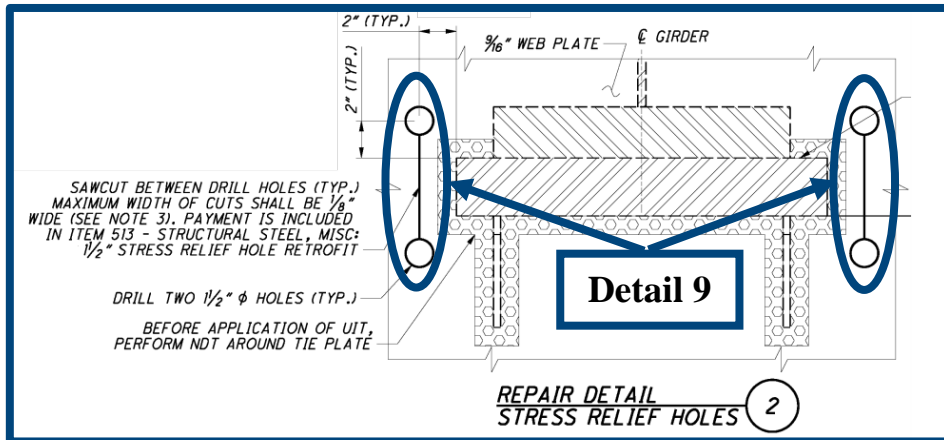


Figure 18: Typical web plate cross section of Pier Cap 8W

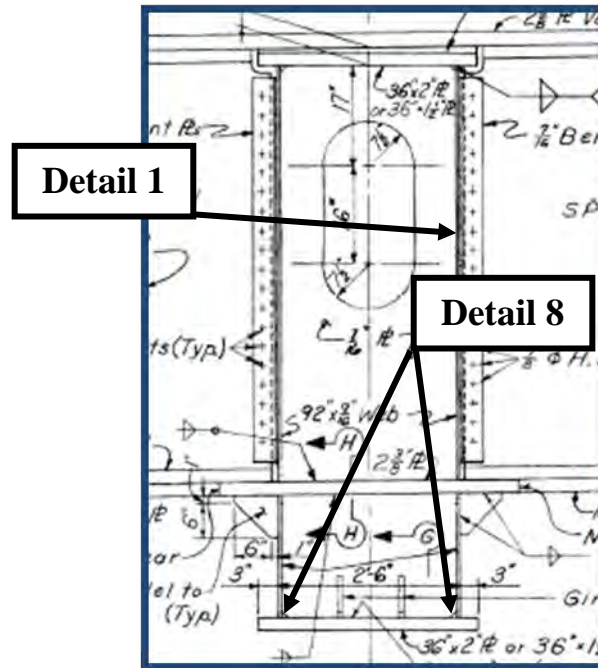


Figure 19: Typical cross section of Pier Cap 8W

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023

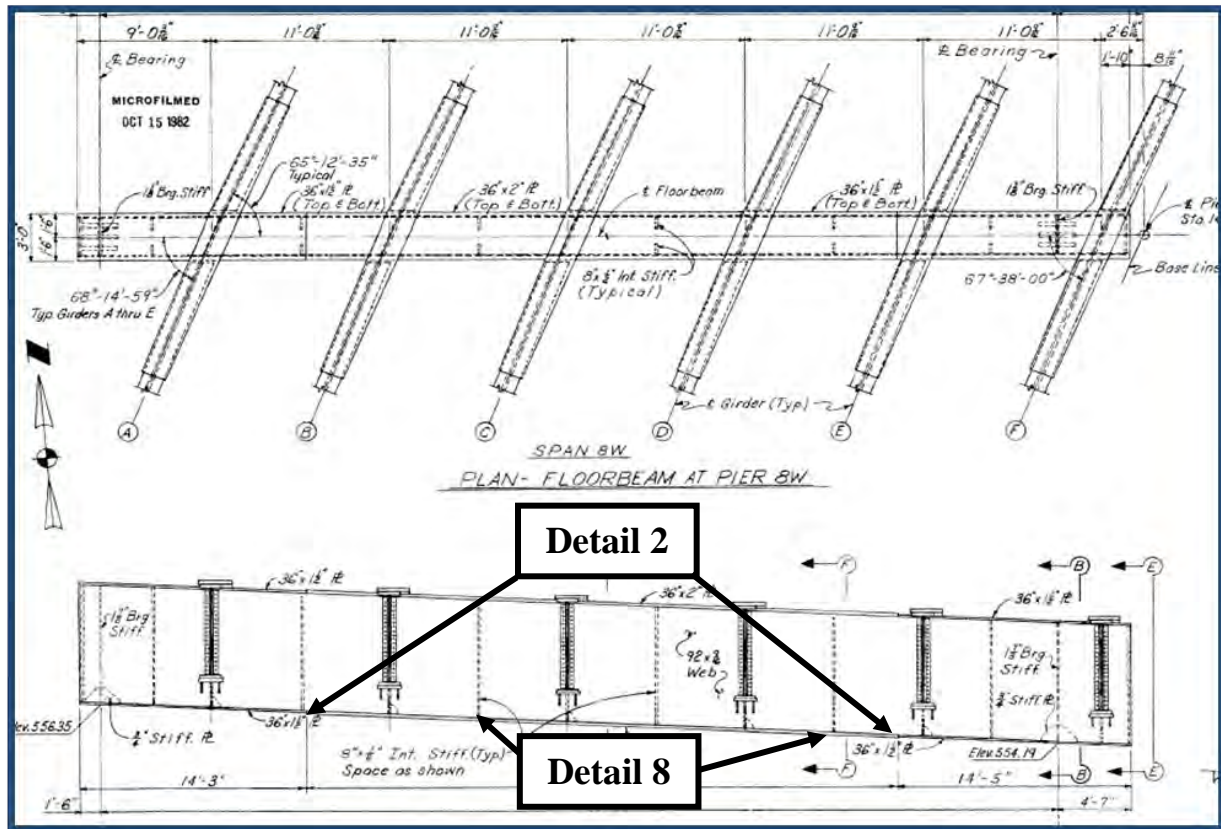


Figure 20: Plan and Elevation of Pier Cap 8W

2.1.8 Pier Cap 9W

Pier Cap 9W is in GOOD Condition [7], with no significant problems observed. At the time of the inspection, the interior of the cap was dry.

2.1.8.1 Pier Cap 9W Interior

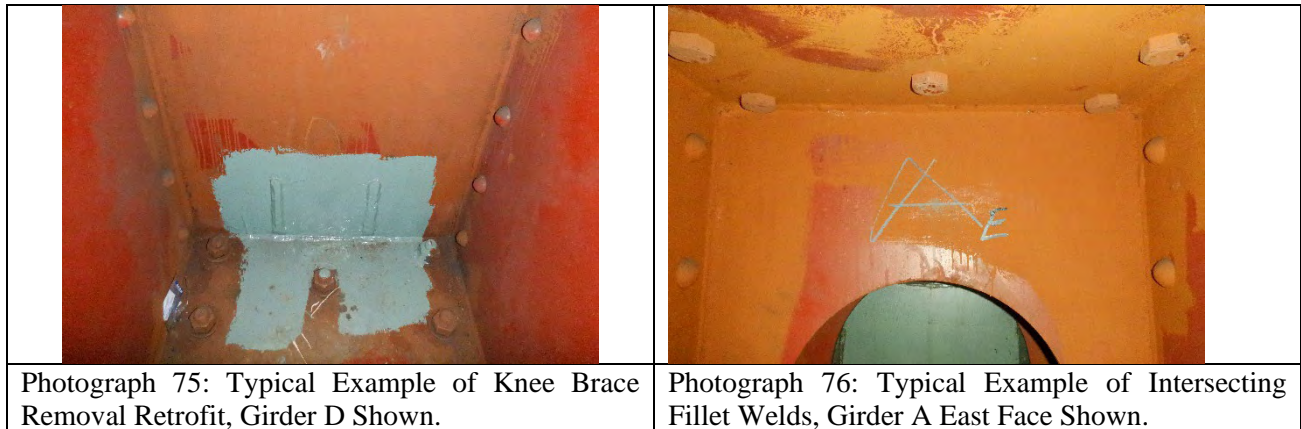
The cap interior is in GOOD Condition [7] with little to no corrosion observed. This area was clean overall, though locations of unpainted cap were present. The following items on the exterior have not changed since the previous inspection unless otherwise noted:

- During previous rehabilitations, the bottom knee braces on Girders D and E and the top knee braces on Girder B were removed and the fillet welds were ground down from the flange plates (Photograph 75). Between Girders D and E, the bottom fillet welds between the web stiffener and the bottom flange plate



were coped to remove the intersection with the fillet welds connecting the cap web and bottom flange plates. Additionally, several miscellaneous tack welds were removed from the web plates.

- There are several locations where the fillet welds connecting the cap web and flange plates intersect the fillet welds connecting the cap web plates and girder diaphragms. This often occurs in both compression and tension zones (Photograph 76).
- On the west side of the Girder B diaphragm, a 1 in. long, 1/4 in. wide separation was noted between the north web and the top flange fillet weld. The gap is likely a gouge produced by grinding tools during the removal of a tack weld.
- A 4 in. diameter bulge with paint flaking was observed in the north web, east of Girder A. This likely occurred during prior rehabilitation work.



2.1.8.2 Pier Cap 9W Exterior

The exterior steel and paint of Pier Cap 9W is in GOOD Condition [7] with minor surface corrosion present along the bottom flange plate. The following items on the exterior have not changed since the previous inspection unless otherwise noted:

- Rust staining and minor efflorescence indicate seepage occurring between the cap top flange and deck haunch.
- During previous rehabilitations, the following work was accomplished:
 - The welded connection of a drainpipe support bracket was removed from the north web and replaced with a bolted connection.
 - An abandoned support bracket was removed from the north web and the connecting fillet welds on the web plate were ground smooth.
 - Transverse tack welds between pier cap bottom flange and the girder fill plates were removed.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



- The spherical bearings are clean and function as designed (Photograph 77).



Photograph 77: Typical Bearing Condition, East Bearing Shown.

2.1.8.3 Pier Cap 9W Fatigue Prone Details

Fatigue Prone Detail 1

- Fillet welds between diaphragms or stiffeners and web or flange 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 8

- Intersection of fillet welds.
- Category: E
- Location:
 - Fillet welds of bottom flange and both web plates intersecting fillet welds between Girders C, D and E diaphragms and both web and bottom flange plates.
 - Fillet welds of top flange and both web plates intersecting fillet welds between Girder B and C diaphragms and both web and top flange plates.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023

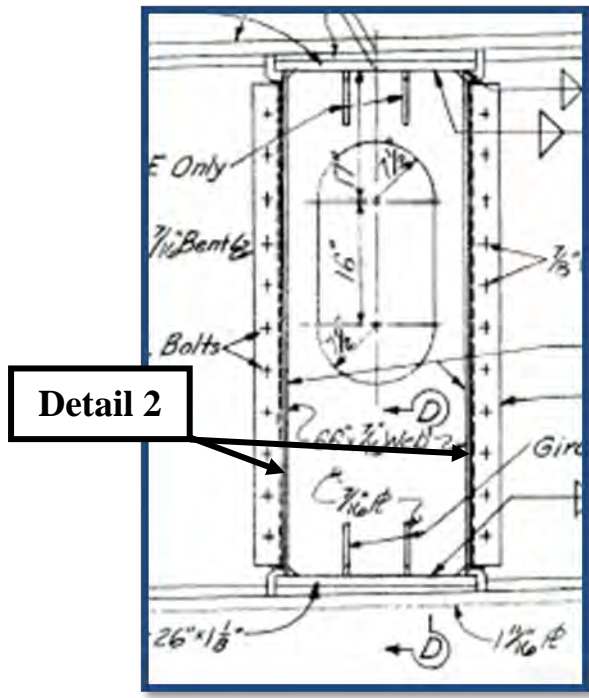


Figure 21: Typical cross section of Pier Cap 9W

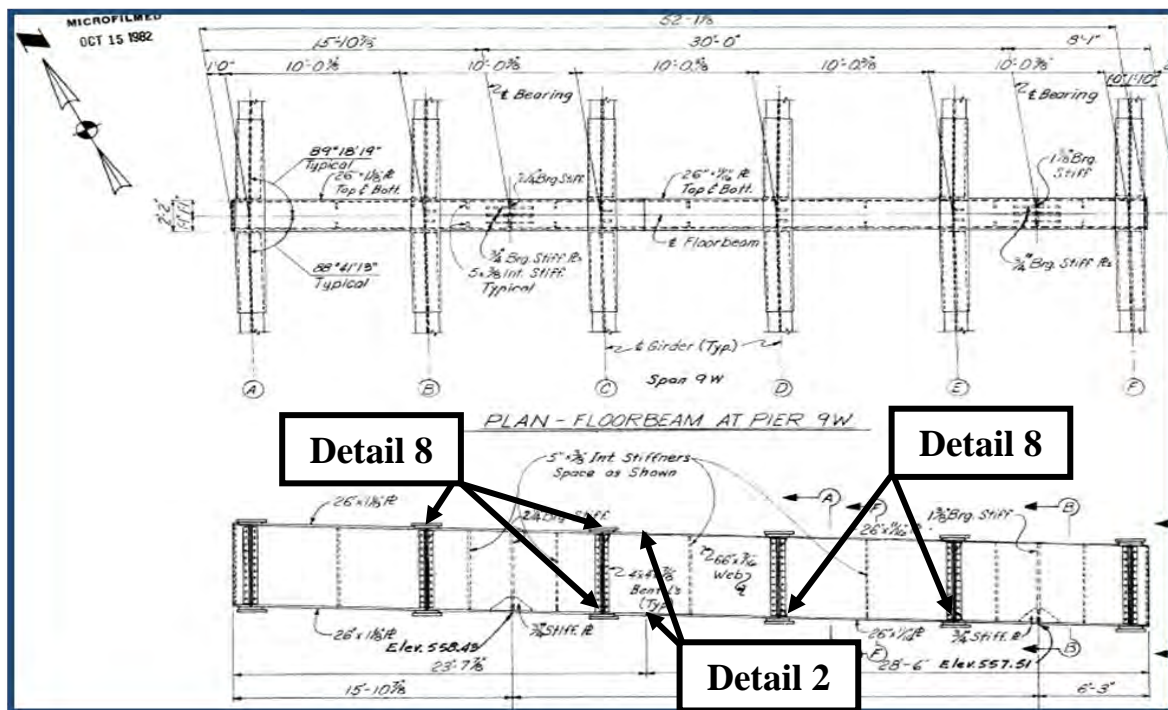


Figure 22: Plan and Elevation of Pier Cap 9W

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



3.0 EVALUATION AND RECOMMENDATIONS

Based on the fracture critical inspection, the fracture critical pier caps of Bridge No. HAM-71-0159, and its associated fatigue prone details, the rating for the pier caps remains SATISFACTORY [6] condition overall. There overall have been no major changes since the prior inspection. Areas of active corrosion continue but no additional section loss was noted. Retrofits performed to improve fatigue resistance continue to function as designed.

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.

FRACTURE CRITICAL INSPECTION

I-71 over LOCAL STREETS/I-471 RAMP SB • SFN3106608 (HAM-71-0159)

Hamilton County, OH • August 2023



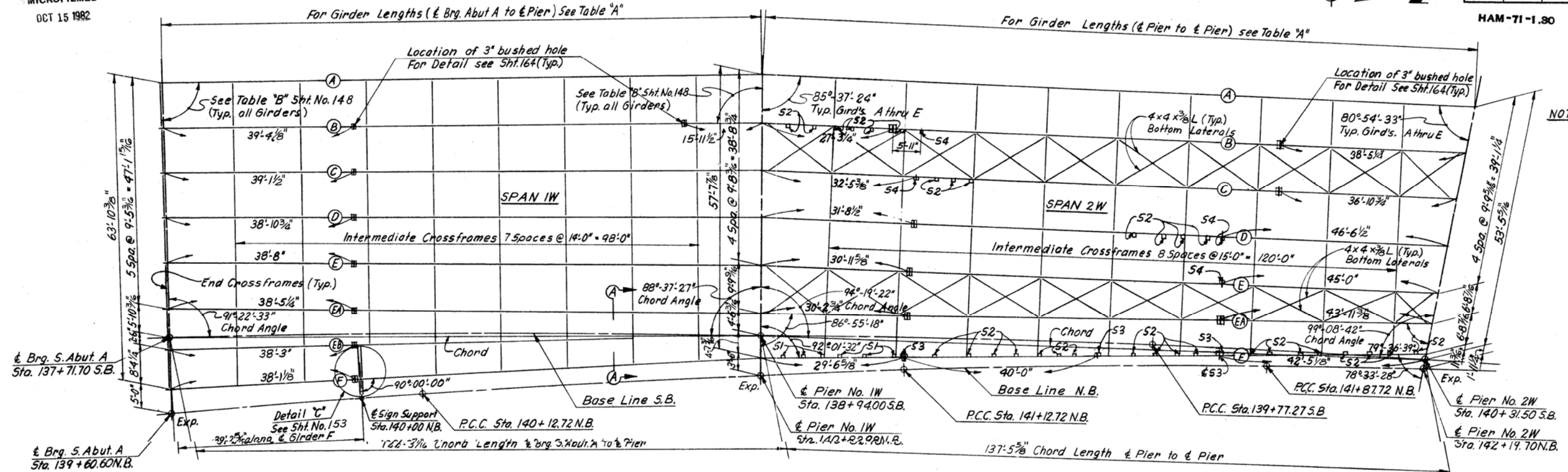
EXHIBIT 1 – EXISTING PIER PLANS

MICROFILMED
OCT 15 1982

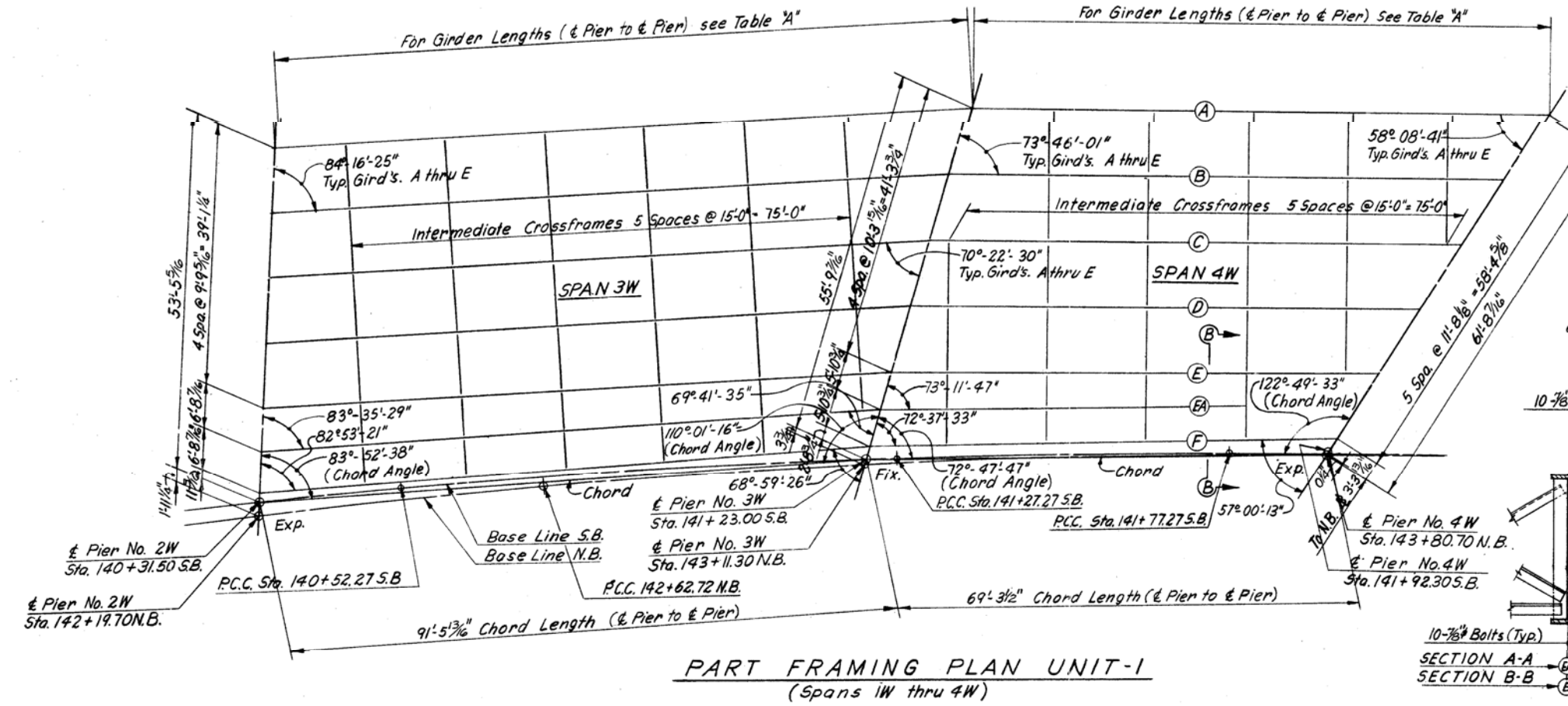
FED. RD. DIV.	STATE	PROJECT	FISCAL YEAR
2	OHIO		

147
210

HAM-71-1.80

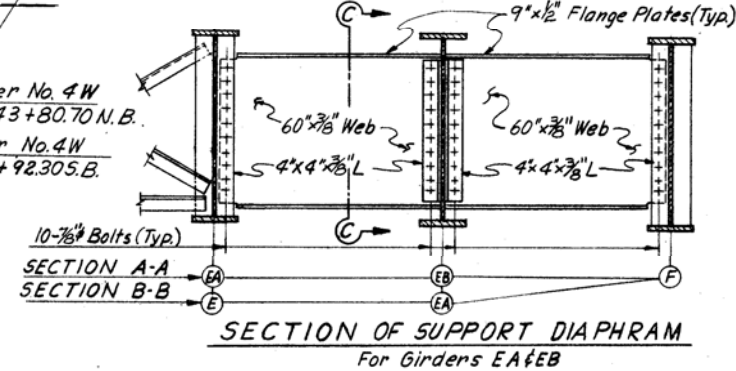
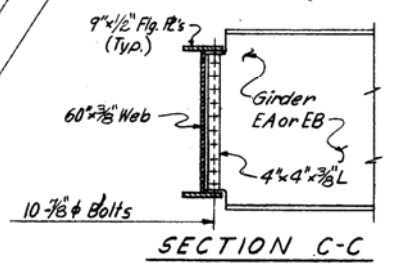


NOTE: For Beam Clamp Details See Sht. No. 99



Girder	Span 1W	Span 2W	Span 3W	Span 4W	Span 4W to Pier 4W	Span 4W to Pier 3W	Span 6W
A	122'-3 3/16"	149'-11 1/2"	104'-10 11/16"	86'-2 13/16"	102'-8 1/2"	21'-10 1/16"	69'-8 5/16"
B	122'-3 3/16"	147'-8 5/16"	102'-4 13/16"	82'-11 1/2"	103'-1'	21'-10 1/16"	69'-8 5/16"
C	122'-3 3/16"	145'-4 7/8"	99'-10 7/8"	79'-8 3/16"	103'-5 5/8"	21'-10 1/16"	69'-8 5/16"
D	122'-3 3/16"	143'-1 1/2"	97'-4 15/16"	76'-4 7/8"	103'-10 1/4"	21'-10 1/16"	69'-8 5/16"
E	122'-3 3/16"	140'-10 1/8"	94'-1'	73'-1 5/16"	103'-10 7/8"	21'-1'	69'-11 7/16"
EA	122'-3 3/16"	139'-0 7/8"	93'-7 3/8"				
EB	122'-3 3/16"	137'-4 3/16"	92'-3 3/8"	70'-3 3/8"	103'-10 5/8"	22'-0 1/8"	70'-2 7/8"

Girder Lengths



REQUIRED: Conduit Support Type S1 = 6
Conduit Support Type S2 = 32
Junction Box Support Type S3 = 3
Junction Box Support Type S4 = 4
For Details of Conduit and Junction Box Supports see Sht. No. 99
The arrow for the conduit on Junction Box Support, points to the girder side to which they must be fastened.

HAZELET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

**STRUCTURAL STEEL DETAILS
UNIT I**

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISION
T/G & J/g	HAS		CHH	JHO 3/22/65	
	10-1-65		2-1-65		

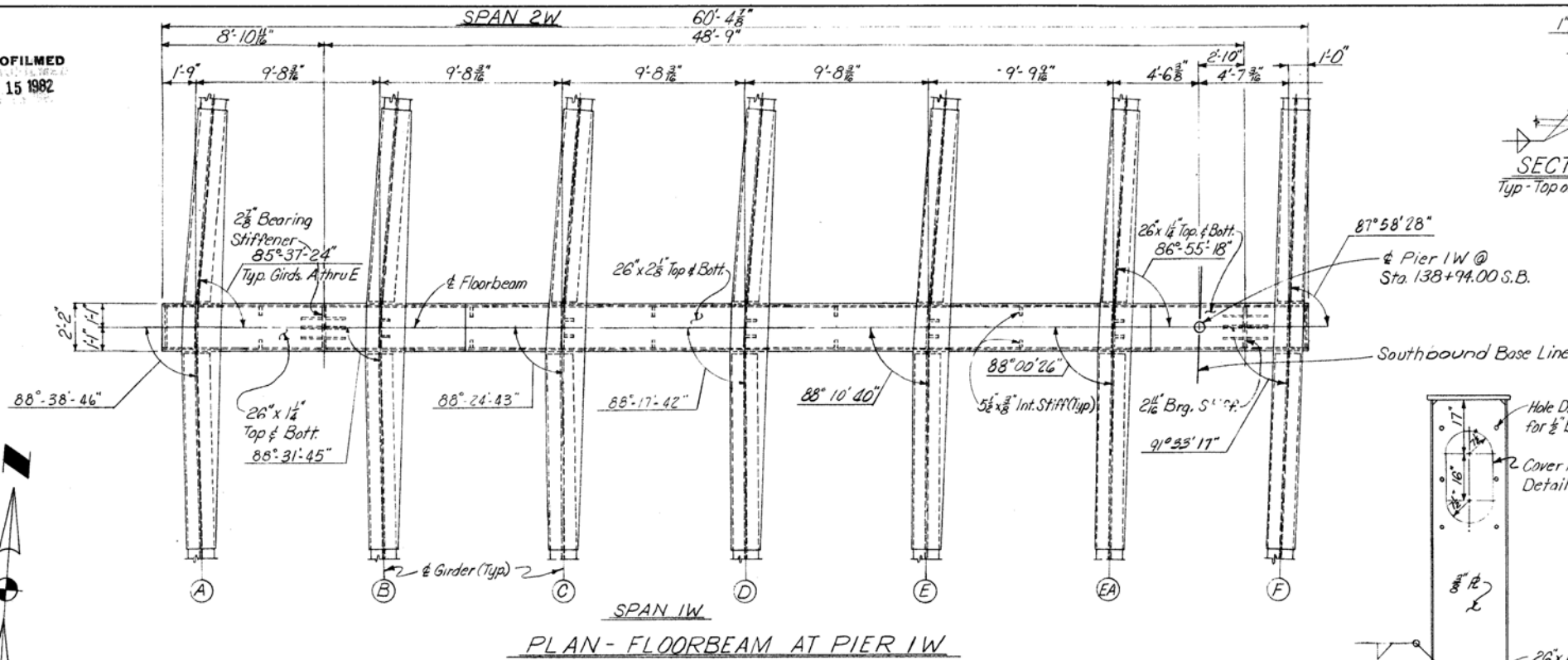
MICROFILMED
OCT 15 1982

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

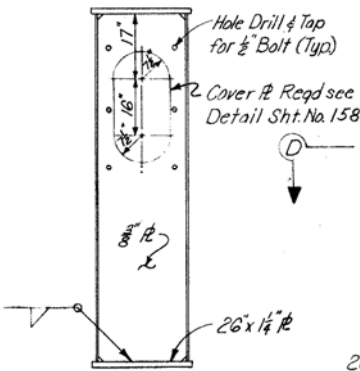
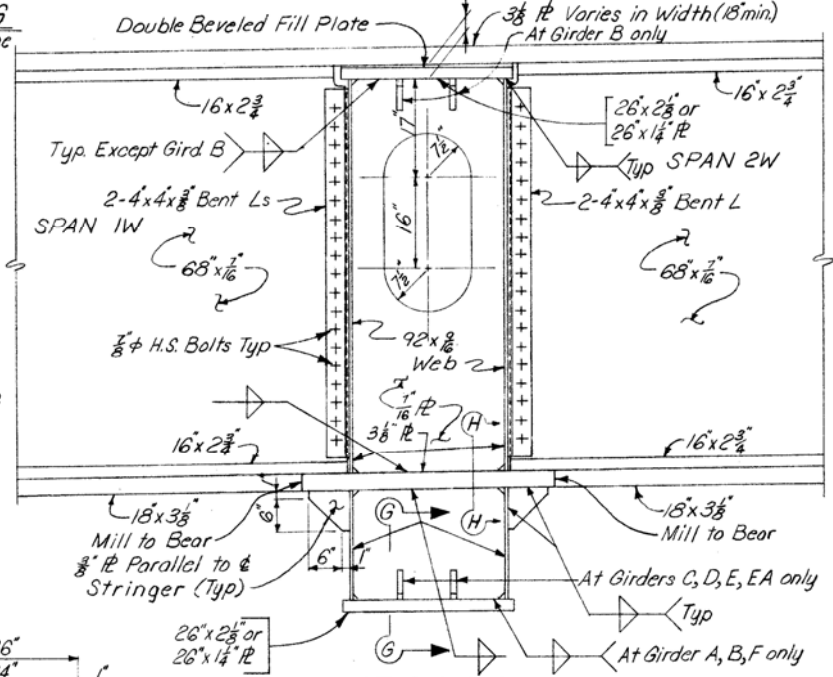
149
210

HAM-71-1.80

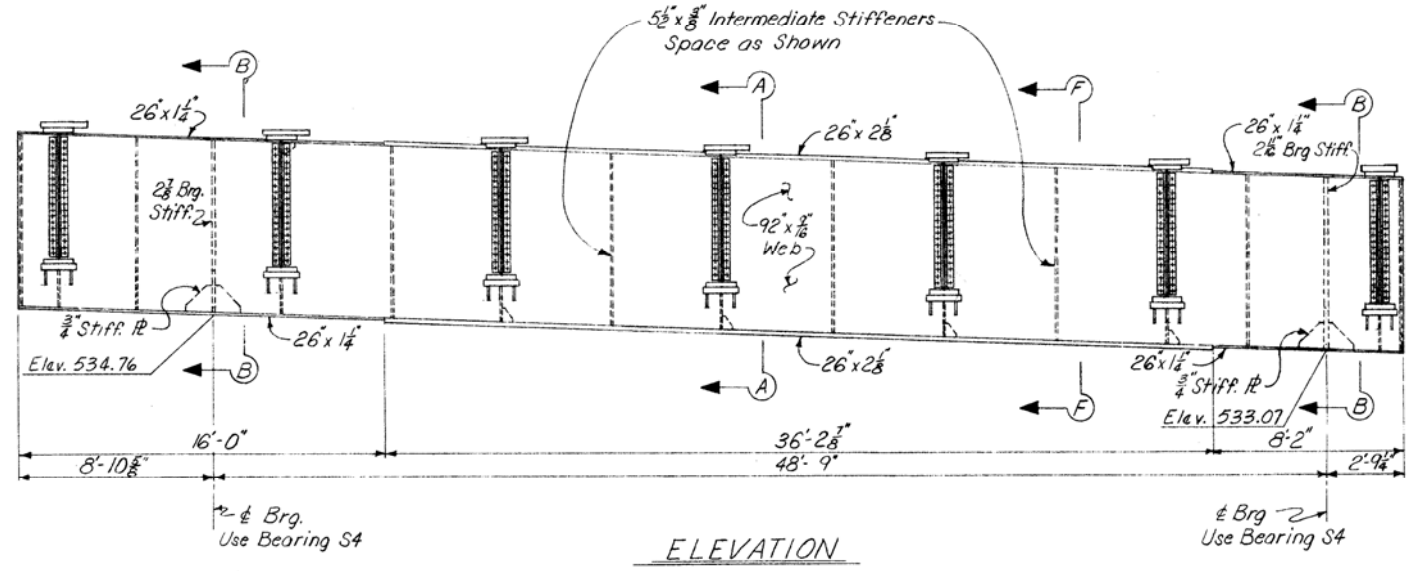
Stringer	A	B	C	D	E	EA	F
Dimension X	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 1/2	3 3/8



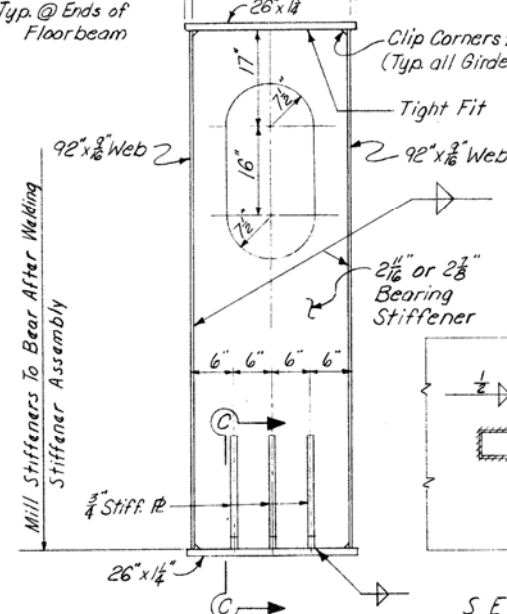
SECTION G-G
Typ - Top or Bott. Flange



SECTION E-E
Typ @ Ends of Floorbeam

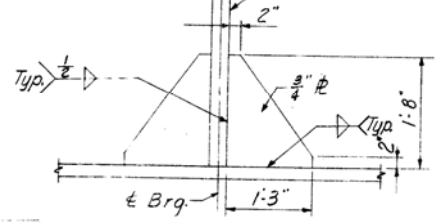


ELEVATION

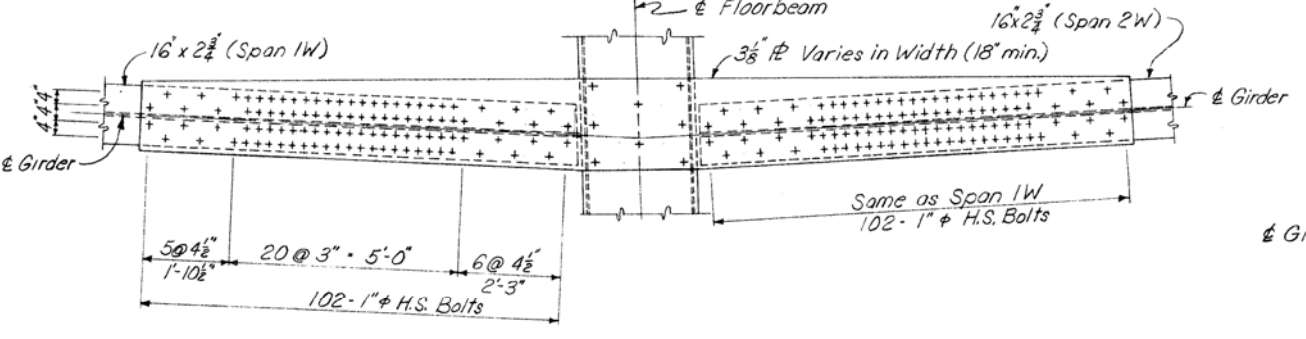


SECTION B-B

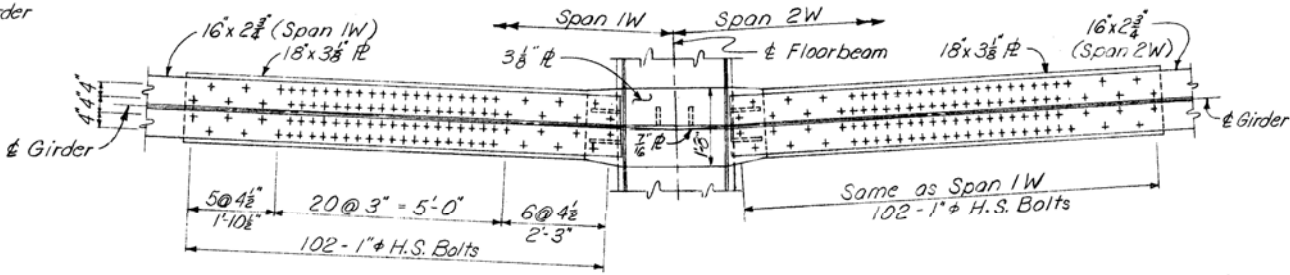
NOTE: Milled ends of compression splice plates on bottom flanges of girders shall be brought to full bearing against milled ends of pier girder brackets before bolts are tightened.



SECTION C-C



PLAN OF TOP SPLICE PLATE



SECTION D-D

Note: For Cover Plate Details and Section F-F See Floorbeam 2E, Sht. No. 158
For fillet weld sizes not shown, see TABLE OF FILLET WELD SIZES Sht. No. 164
For Bearing Details see sht. No. 165

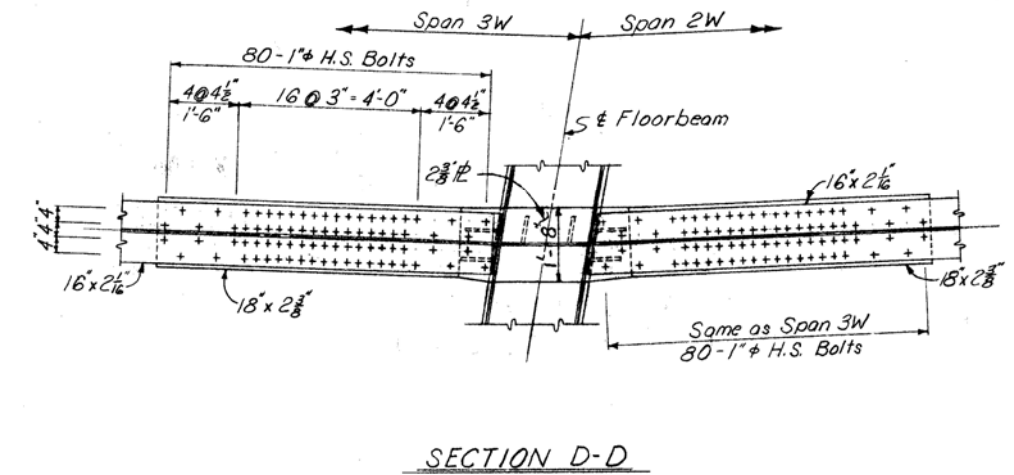
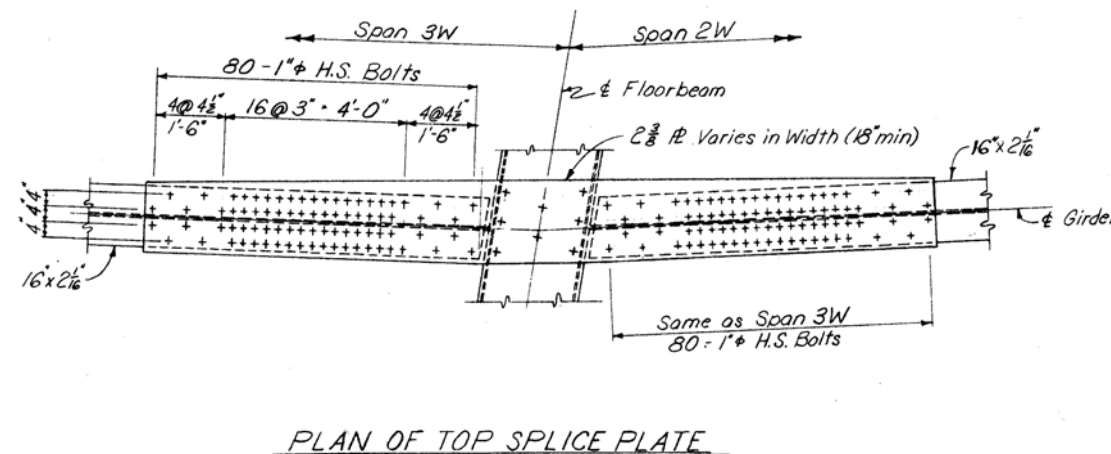
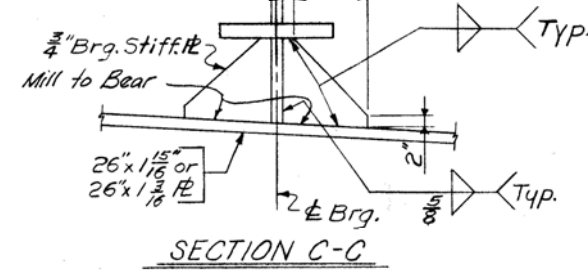
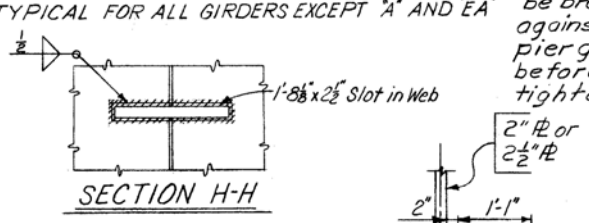
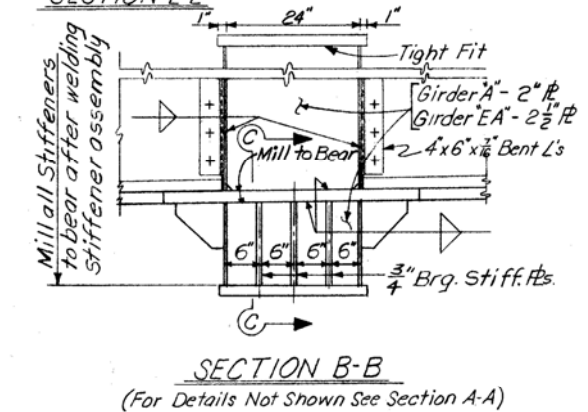
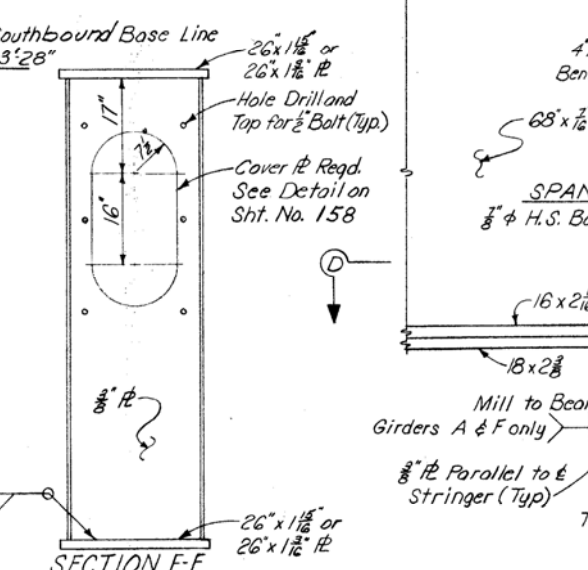
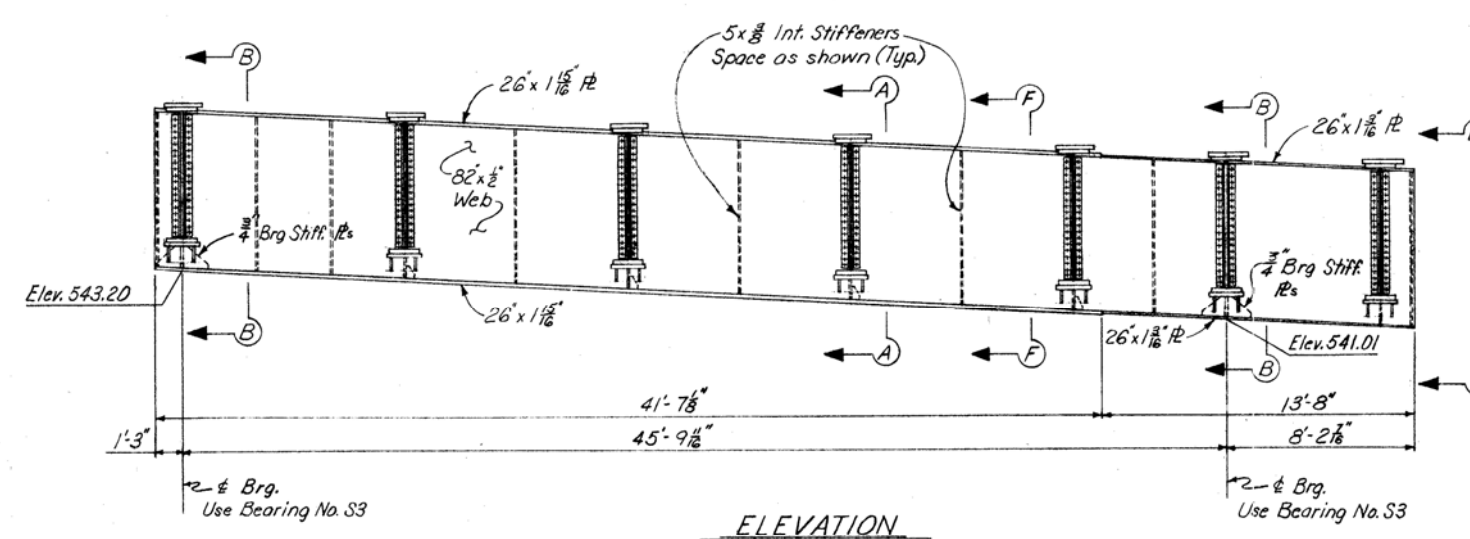
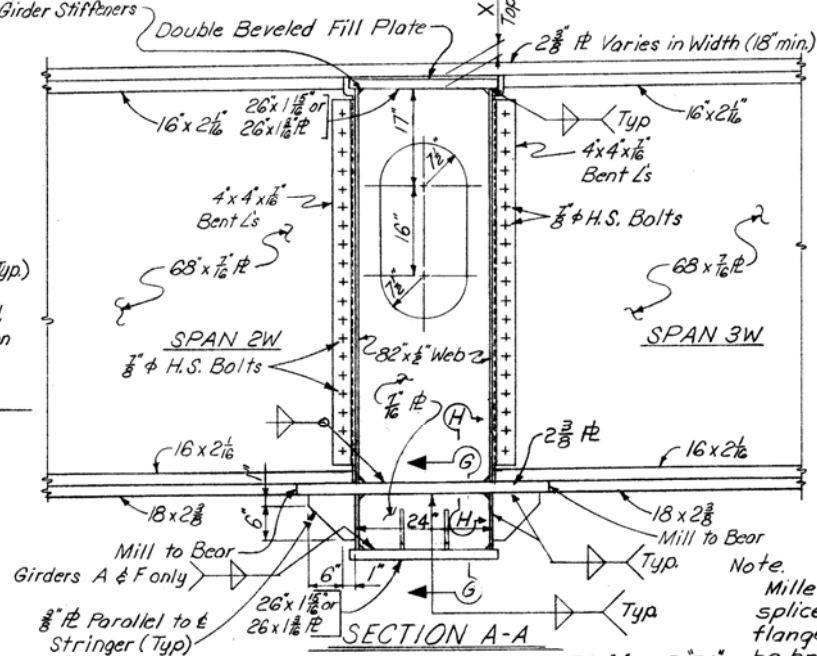
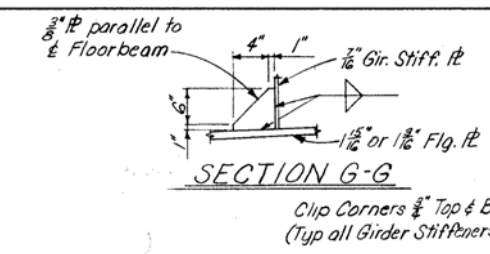
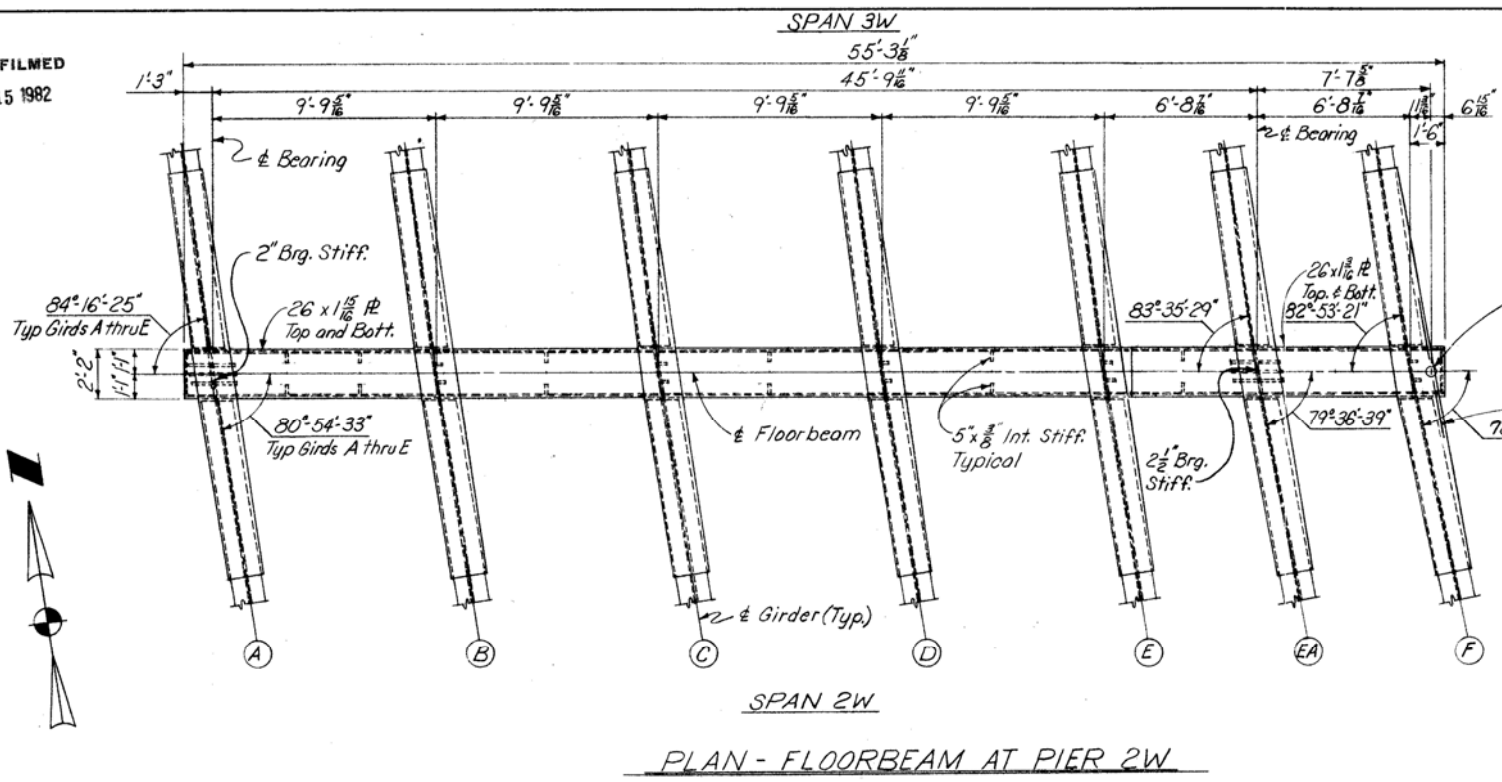
HAZLET & ERDAL CONSULTING ENGINEERS CINCINNATI, OHIO					
STRUCTURAL STEEL DETAILS					
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISION
DMB	W.R.T.		J.H.O.	3/22/65	

MICROFILMED
OCT 15 1982

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

HAM-71-1.80

	A	B	C	D	E	EA	F
DIMENSION	X	3/16	3/16	3/8	3/8	3/16	3/8

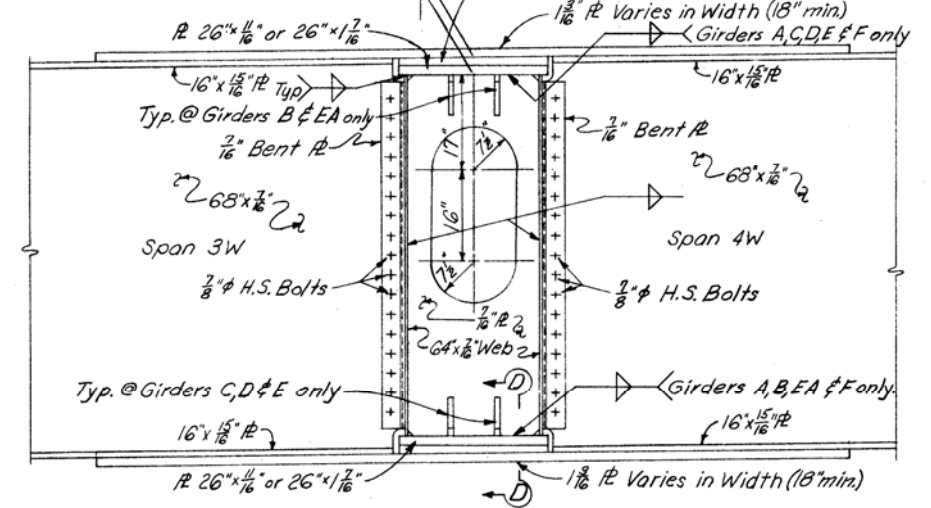
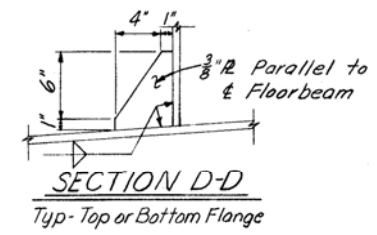
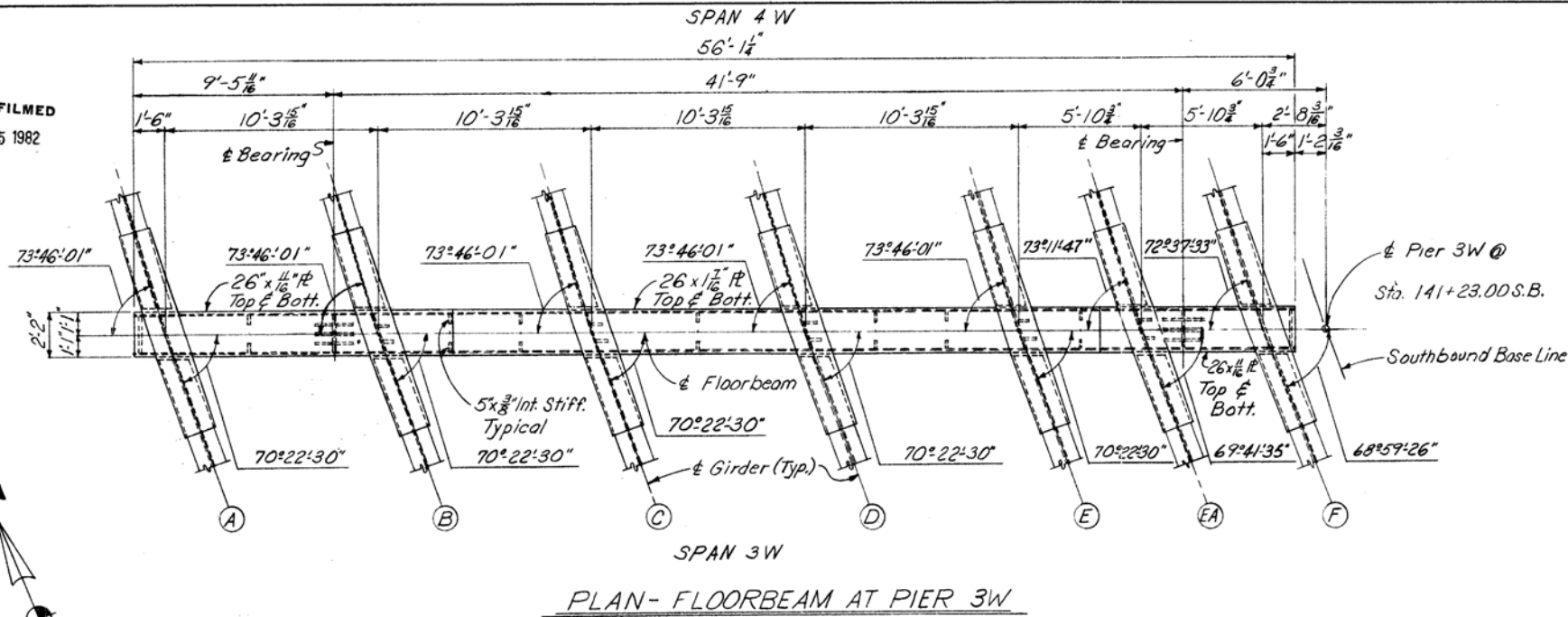


Note:
For Cover Plate Details and Section F-F
See Floorbeam 2E, Sht. No. 158
For fillet weld sizes not shown
see TABLE OF FILLET WELD SIZES
Sht. No. 164
For Bearing Details see Sht. No. 165

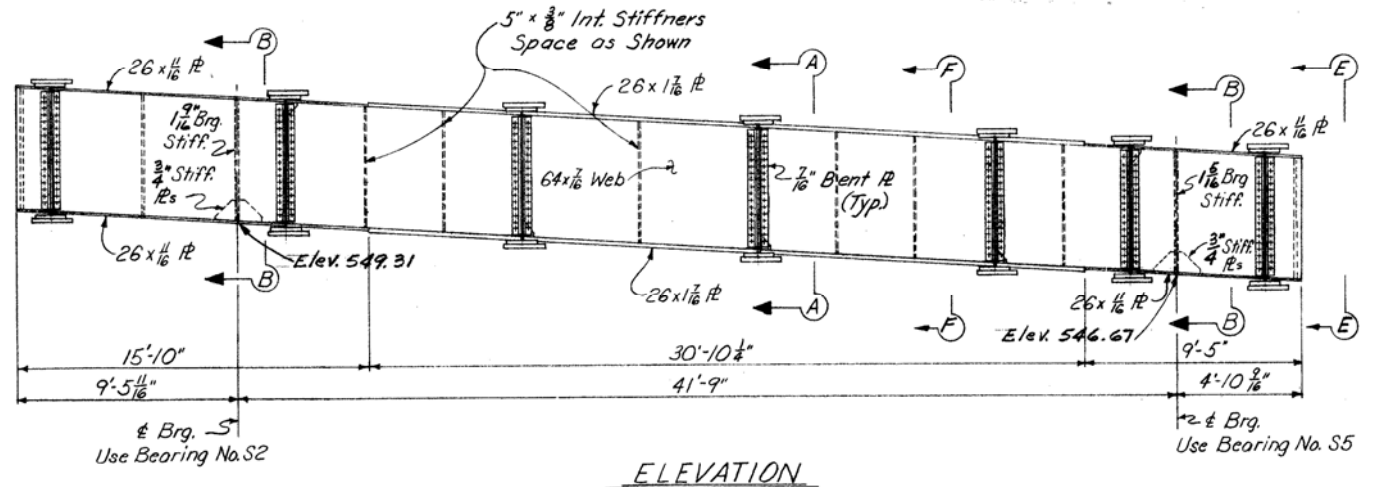
HAZLET & ERDAL CONSULTING ENGINEERS CINCINNATI, OHIO					
STRUCTURAL STEEL DETAILS					
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
D.M.B.	W.R.T.	J.P.G.	J.P.G.	J.H.O. 3/22/65	

HAM-71-1.30
 306 Red
 151-210
 Please see sample

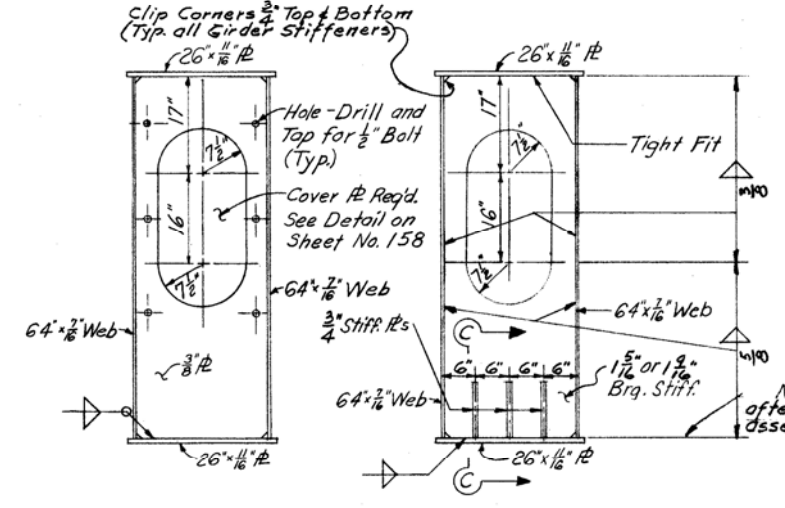
MICROFILMED
 OCT 15 1982



SECTION A-A

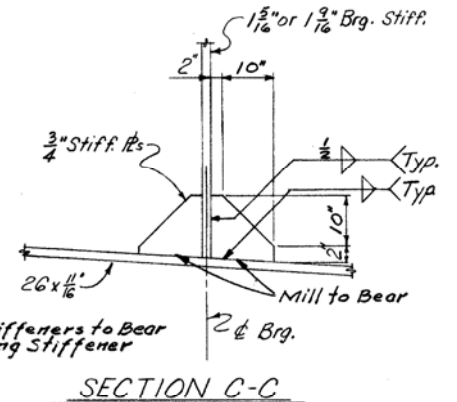


ELEVATION

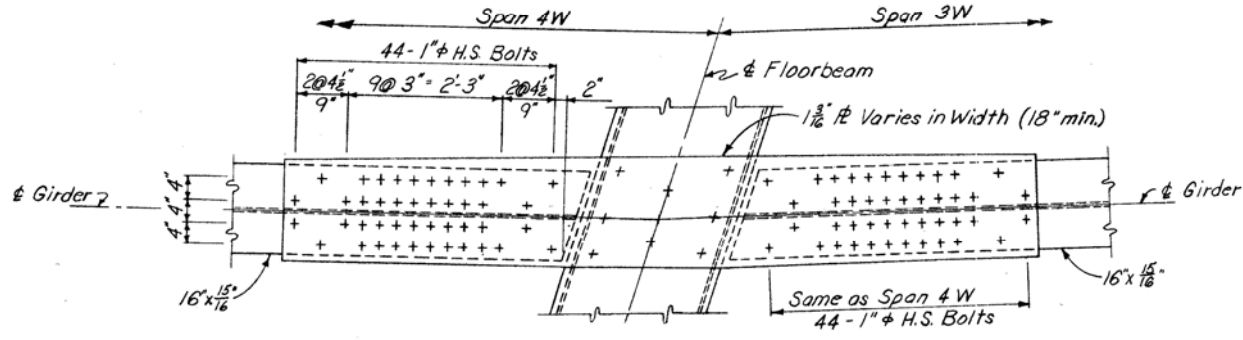


SECTION E-E
 (Typ. @ Ends of Floor Beam)

SECTION B-B



SECTION C-C



SPlice PLATE DETAIL

Note:
 For Cover Plate Details and Section F-F See Floorbeam 2E Sht. No. 158
 For Fillet Weld Sizes not shown, See TABLE OF FILLET WELD SIZES Sht. No. 164
 For Bearing Details see sht. No. 165

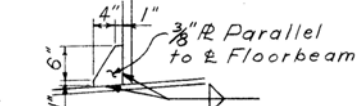
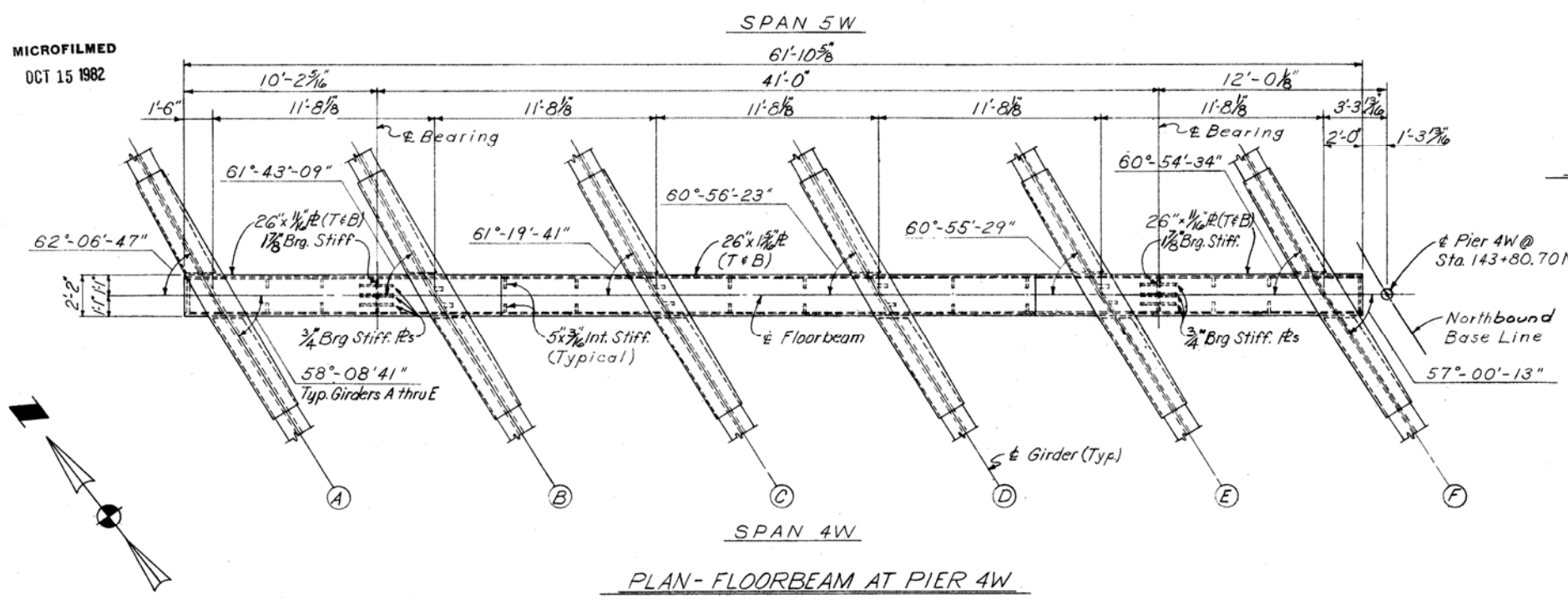
HAZLET & ERDAL
 CONSULTING ENGINEERS
 CINCINNATI, OHIO

STRUCTURAL STEEL DETAILS

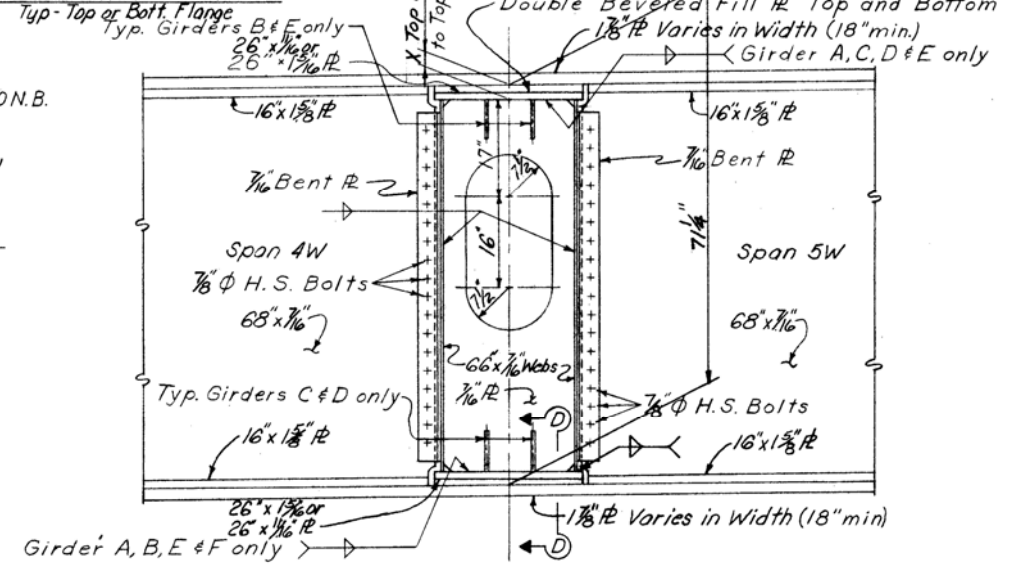
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
C.W.R.	W.R.T.		Jag	JHO 3/22/65	

MICROFILMED
OCT 15 1982

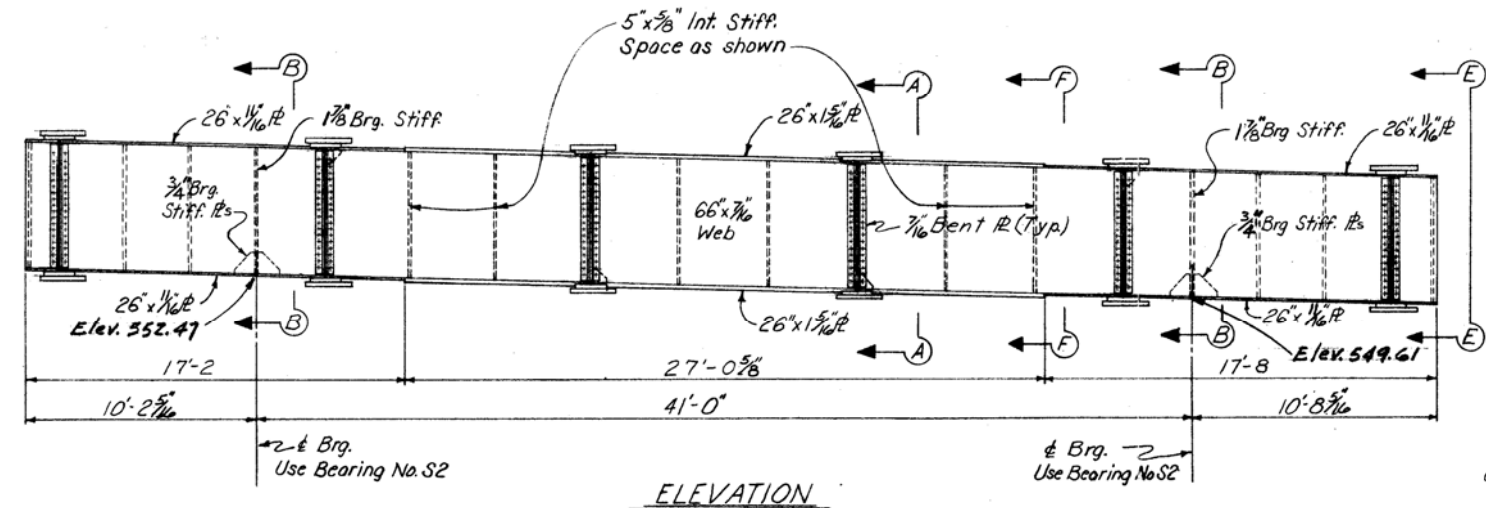
HAM-71-1.80



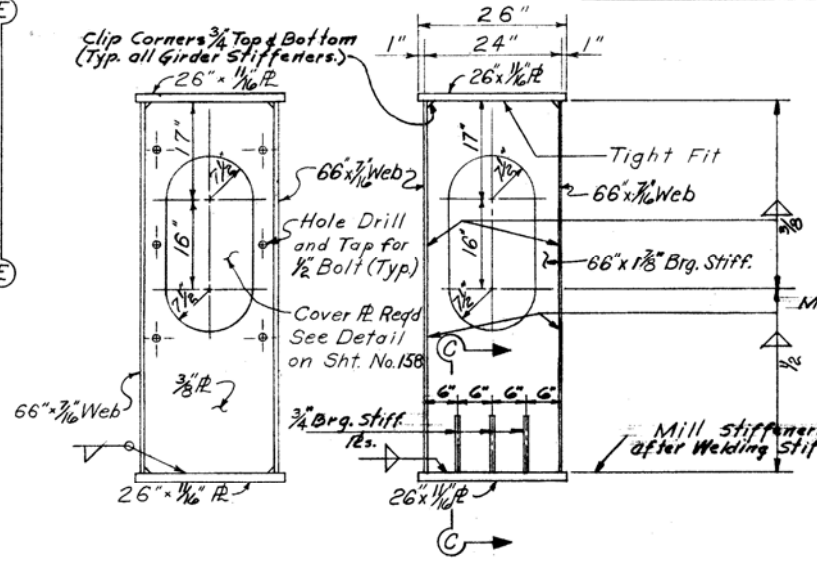
SECTION D-D
Typ. Top of Bolt Flange
Typ. Girders B & F only



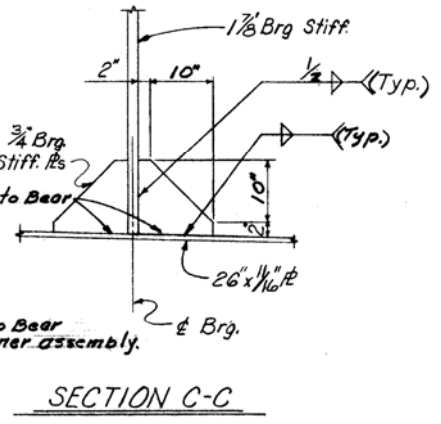
SECTION A-A (Typical @ all Girders)



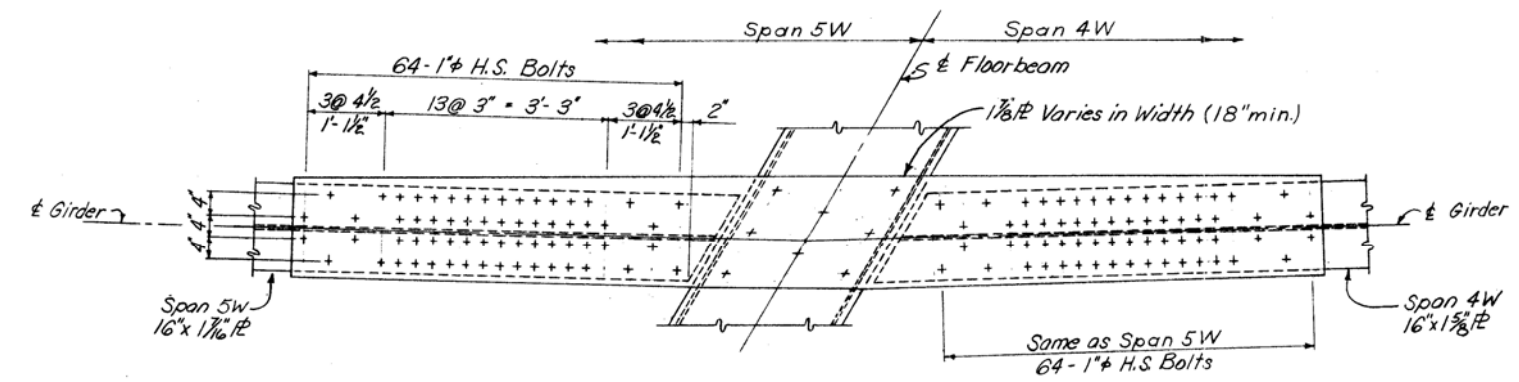
ELEVATION



SECTION E-E SECTION B-B
(Typ. @ Ends of Floor beam)



SECTION C-C



SPlice PLATE DETAIL

Note:
For Cover Plate Details and Section FF
See Floor Beam 2E Sht. No. 158
For fillet Weld Sizes not shown, See TABLE
OF FILLET WELD SIZES Sht. No. 164
For Bearing Details see sht. no. 165

HAZLET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

STRUCTURAL STEEL DETAILS

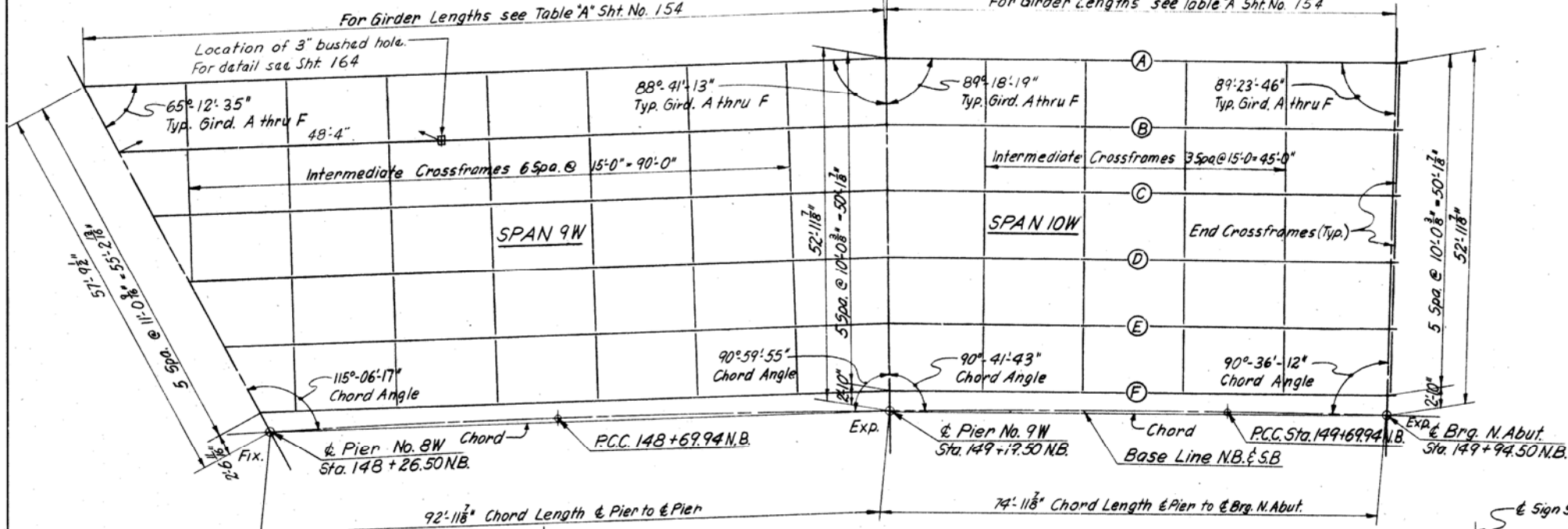
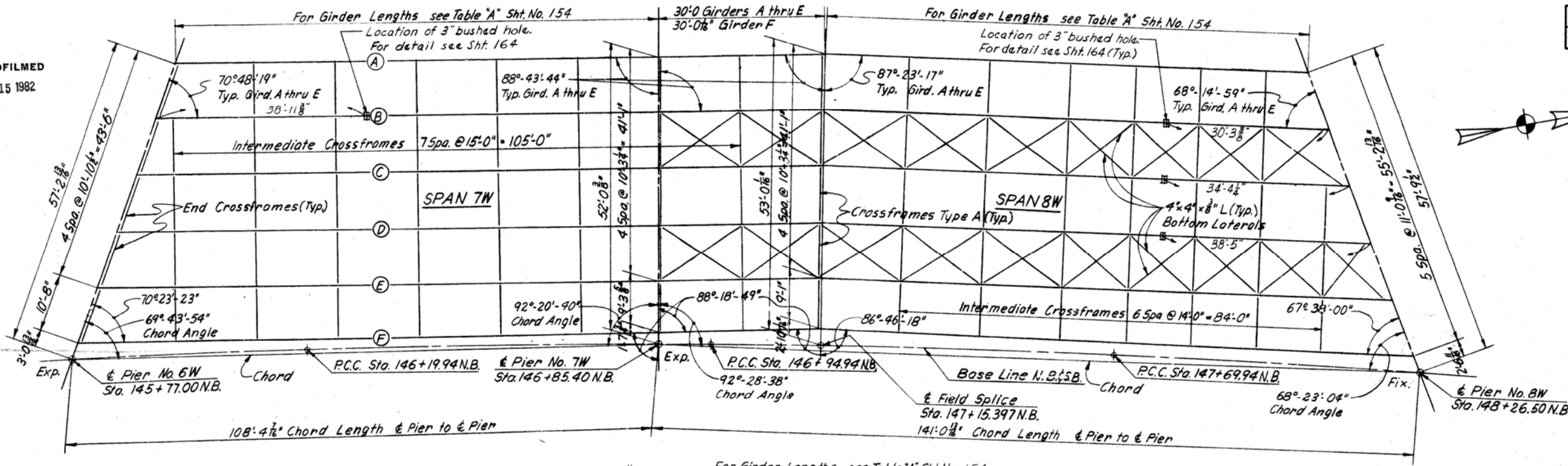
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
D.M.B.	W.R.T.		J.g.g.	J.H.O.	
	1-25-65		2-2-65	3/22/65	

MICROFILMED
OCT 15 1982

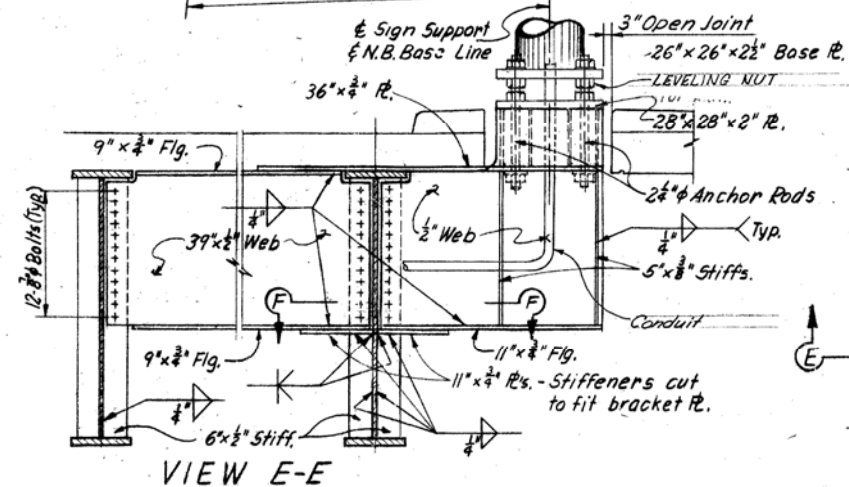
FED. RD. DIV.	STATE	PROJECT	FISCAL YEAR
2	OHIO		

153
210

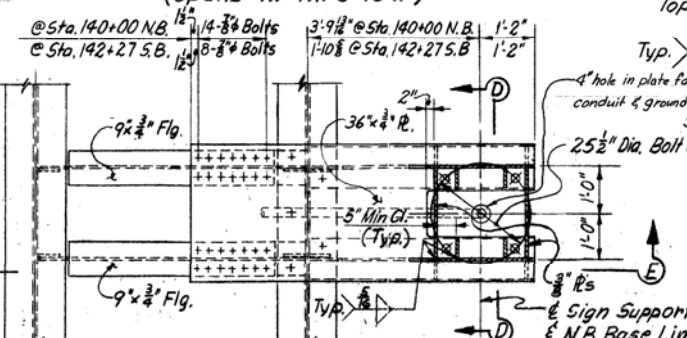
HAM-71-1.30



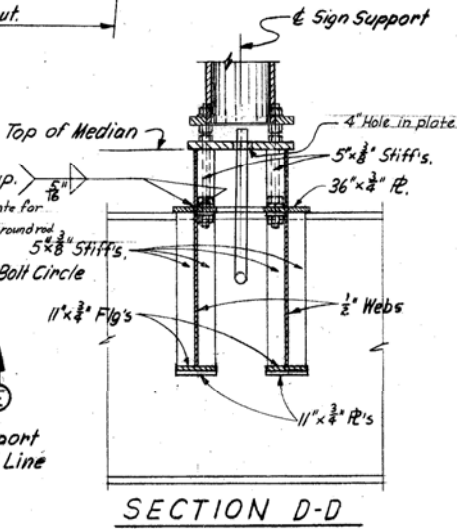
NOTES:
 Web Plate is $68 \times \frac{1}{8}$ " for Flange Plate, Bearing Stiffener and Intermediate Stiffeners see Sht. No. 154
 Piers 7W, 9W and Brg. N. Abut. are Radial
 Field Splice and Pier 7W are Parallel
 All girders Unit 2 parallel, except girder F in Span 7W and Span 8W.
 For Bearing details see Shts. No. 165 & 166
 For Field splice details see Sht. No. 165
 For inlet framing see Shts. No. 187 & 188
 For typical girder elevations and details see Sht. No. 164
 For detail of end crossframes and End Dam at N. Abut. see Ohio Standard Drawing No. SD.-1-63 Sht. 2
 For End Crossframes and End Dam details at Pier 6W see Sht. No. 168
 For detail of Intermediate Crossframes see Sht. No. 164
 For Type A Crossframe details see Sht. No. 164
 For Bottom Lateral Bracing see Sht. No. 164



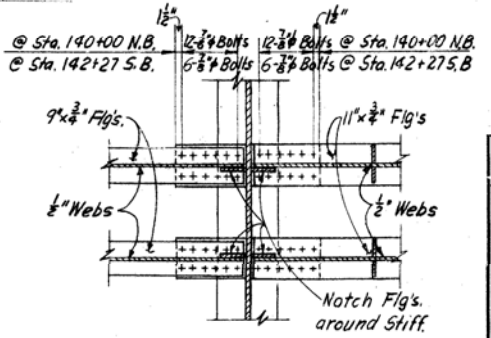
FRAMING PLAN UNIT 2
(Spans 7W thru 10W)



DETAIL C-C
See Shts. No. 147 & 148



SECTION D-D



SECTION F-F

HAZELET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

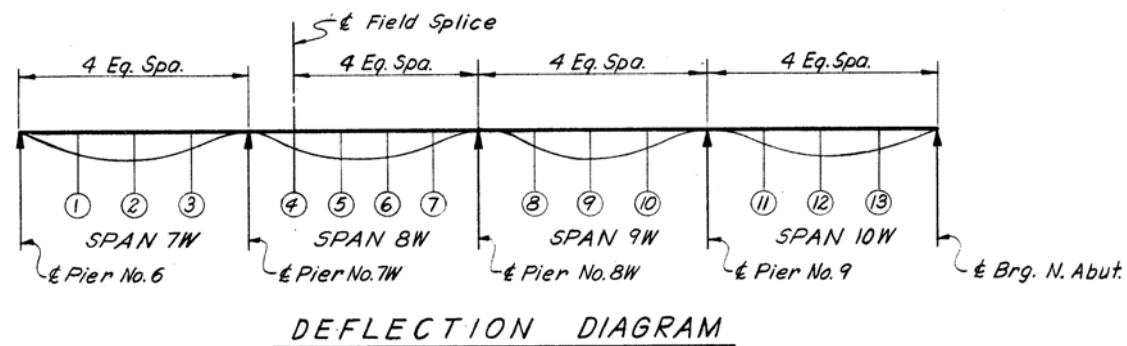
**STRUCTURAL STEEL DETAILS
UNIT 2**

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
MDC	HAS		CHH	JAO 3/22/65	

DEFLECTION AND CAMBER

GIRDER	A													B													C													D													E													F												
	7W			8W			9W			10W			7W			8W			9W			10W			7W			8W			9W			10W			7W			8W			9W			10W																																
SPAN	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11	12	13
LOCATION																																																																														
Deflection due to weight of steel	[Values in 1/16 increments]																																																																													
Deflection due to remaining dead load	[Values in 1/16 increments]																																																																													
Convexity (See Note below)	[Values in 1/16 increments]																																																																													
Sum of deflection and convexity (Camber)	[Values in 1/16 increments]																																																																													

NOTE: Camber required for Spans 7W and 8W, Girders A thru F.
No Camber required for Spans 9W and 10W.
Convexity includes variations due to superelevation horizontal and vertical Curvature.



Top Flange Stress	Comp.			Ten.			Comp.			Ten.			Comp.			Ten.			Comp.					
	Span	Loc	Val	Span	Loc	Val	Span	Loc	Val	Span	Loc	Val	Span	Loc	Val	Span	Loc	Val	Span	Loc	Val			
	7W	L7W	.69	8W	L8W	.31	9W	L9W	.58	10W	L10W	.20	7W	L7W	.49	8W	L8W	.20	9W	L9W	.29	10W	L10W	.71

Flg. Pls (Top & Bottom)	Girder	Span 7W		Span 8W		Span 9W		Span 10W	
		Top	Bot	Top	Bot	Top	Bot	Top	Bot
	Girder A	16"x1 1/16"	16"x2 1/8"	16"x1 1/2"	16"x1 1/8"	16"x1 1/8"	16"x3/4"	16"x1 3/8"	16"x1/16"
	Girder B	16"x1 1/16"	16"x2 1/8"	16"x1 1/4"	16"x1 1/8"	16"x1 1/8"	16"x3/4"	16"x1 3/8"	16"x1/16"
	Girder C	16"x1 1/8"	16"x2 3/8"	16"x1 3/8"	16"x1 1/8"	16"x3/8"	16"x3/8"	16"x1 3/8"	16"x1/16"
	Girder D	16"x1 1/8"	16"x2 3/8"	16"x1 3/8"	16"x1 1/8"	16"x3/4"	16"x3/4"	16"x1 3/8"	16"x3/4"
	Girder E	16"x1 1/4"	16"x2 3/8"	16"x1 3/8"	16"x1 1/8"	16"x1/2"	16"x1/2"	16"x1 3/8"	16"x3/4"
	Girder F	16"x1 1/4"	16"x2 3/8"	16"x1 3/8"	16"x1 1/8"	16"x1/2"	16"x1/2"	16"x1 3/8"	16"x3/4"

TABLE OF FLANGE PLATES AND SPLICES

Span	Intermediate Stiffeners (6"x3/8" Flt)					
	Span 7W	Span 8W	Span 9W	Span 10W	Span 10W	
Conn. Angle or Brq. Stiff.	54"	68"	68"	59"	50"	45"
Span 7W	43"	50"	63"	68"	53"	45"
Span 8W	47"	54"	68"	68"	57"	48"
Span 9W	51"	57"	68"	68"	68"	59"
Span 10W	1/6	1/6	1/6	1/6	1/6	1/6

MAX. INTERMEDIATE STIFFENER SPACING

GIRDER		A	B	C	D	E	F
FLOOR BEAM 8W	Steel Weight	1/16	1/8	1/8	1/8	1/16	0
	Remain. D.L.	1/8	1/4	5/16	5/16	1/8	0
FLOOR BEAM 9W	Steel Weight	0	0	0	0	0	0
	Remain. D.L.	1/4	1/6	0	0	0	0

NOTE: All Zero's indicate a negligible amount of deflection.

Girder	Pier 6W to Pier 7W	Splice to Pier 8W	Pier 8W to Pier 9	Pier 9 to Brq. N. Abut.
A	90'-8 1/4"	92'-1 1/16"	118'-5 1/4"	76'-2 5/16"
B	94'-0 1/16"	95'-8 3/16"	113'-6 7/8"	75'-11 9/16"
C	97'-4 5/8"	99'-4 1/16"	108'-8 3/16"	75'-8 13/16"
D	100'-8 3/4"	102'-11 9/16"	103'-10 3/16"	75'-6 1/8"
E	104'-0 3/16"	106'-7 1/16"	98'-11 1/8"	75'-3 7/8"
F	107'-4 9/16"	110'-3 5/16"	94'-1 1/2"	75'-0 5/8"

Girder Length

HAZELET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

STRUCTURAL STEEL DETAILS

UNIT 2

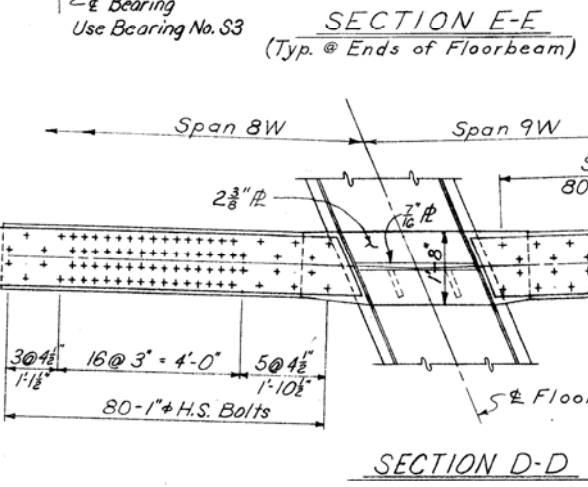
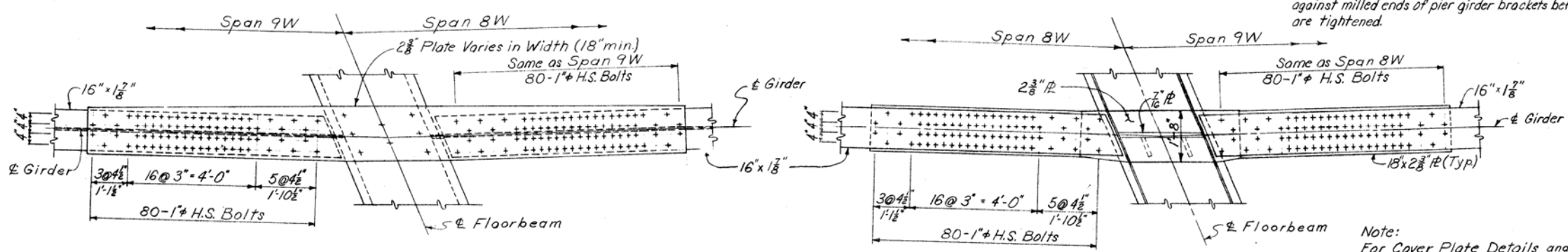
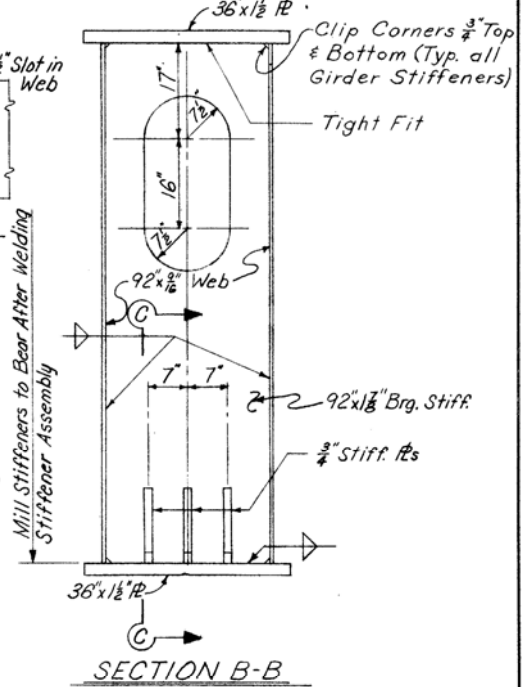
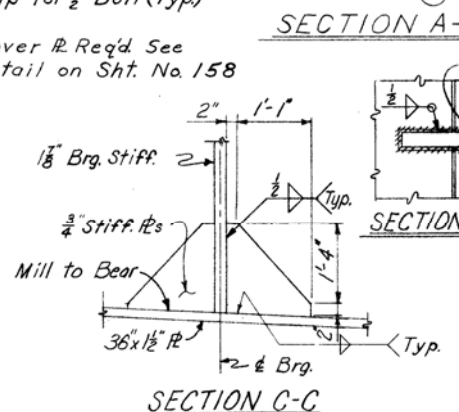
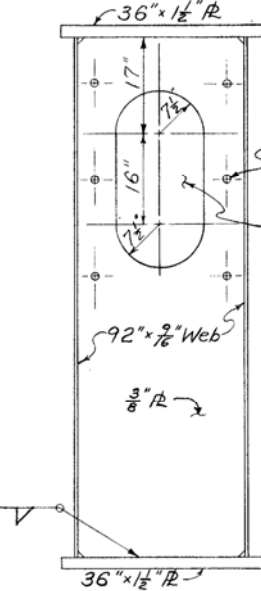
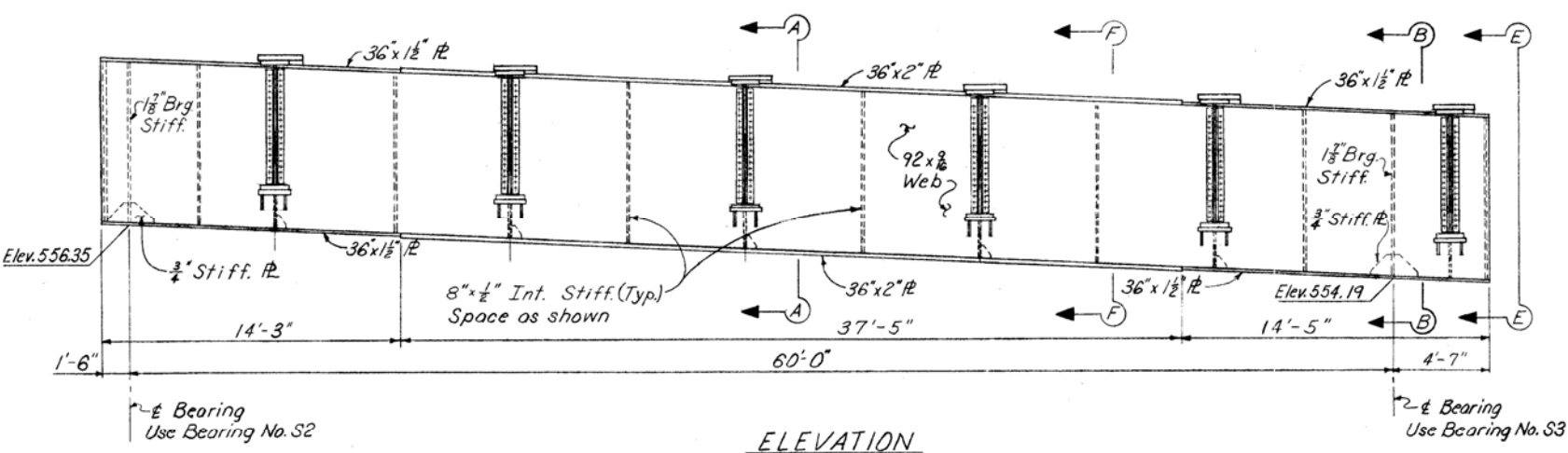
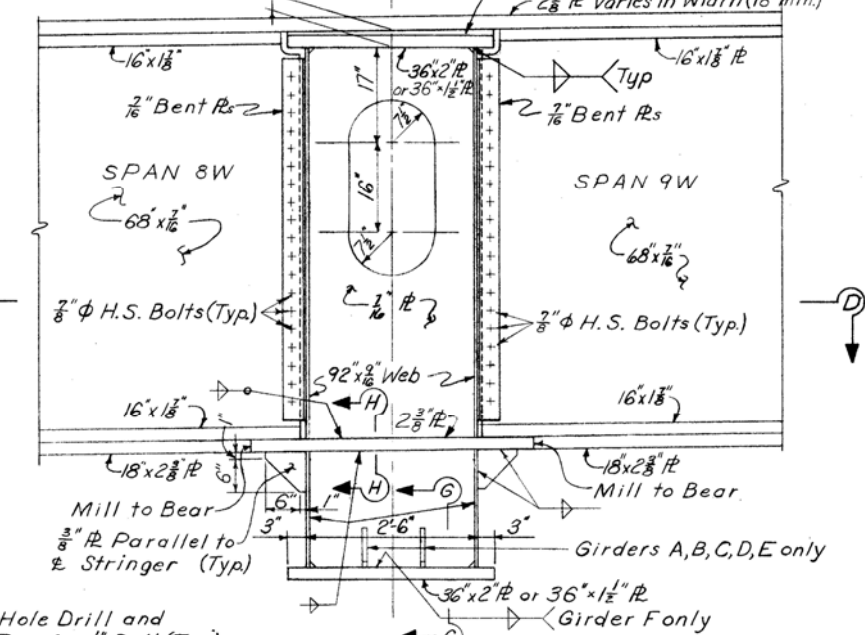
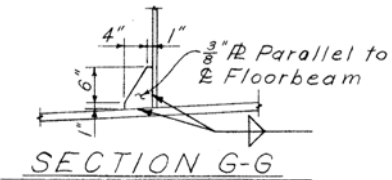
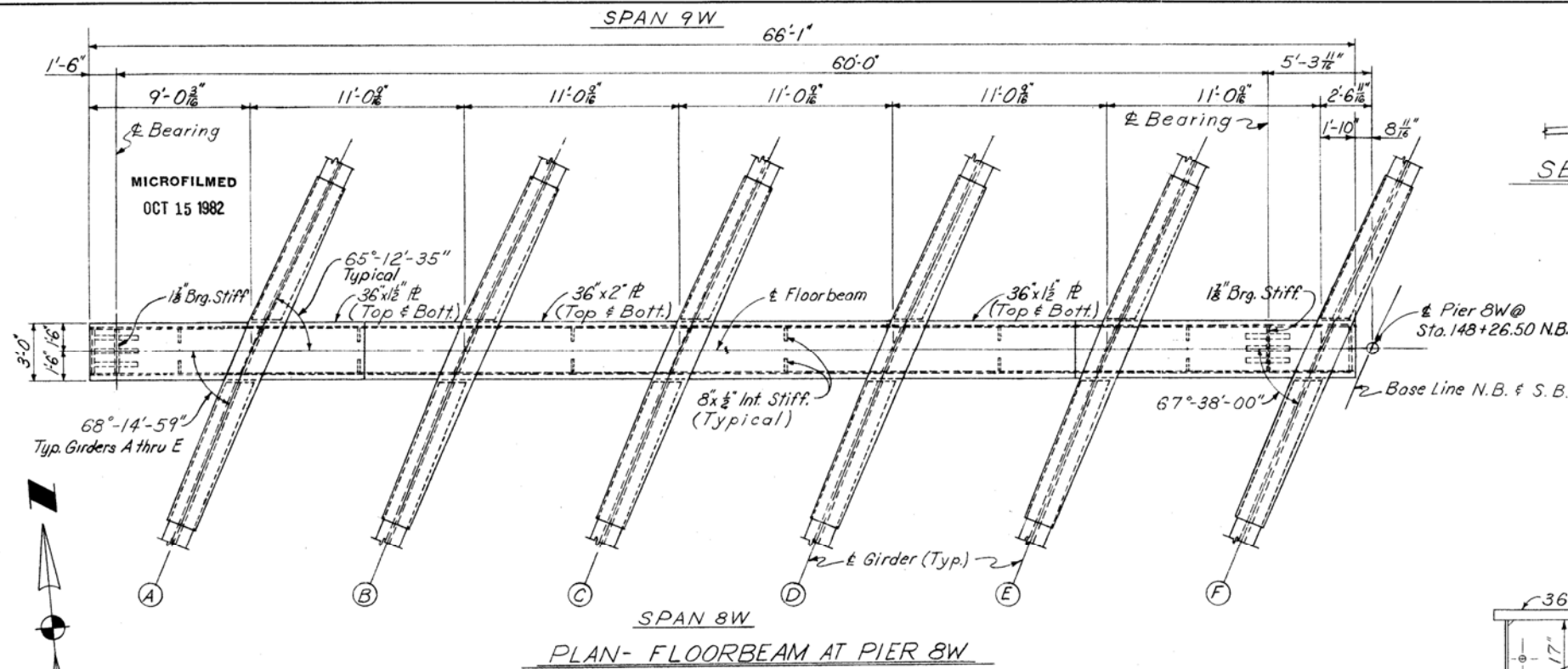
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISION
MJC	HAS 11-5-64		C.M.H. 2-1-65	J.Ho 3/22/65	

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

155
210

HAM-71-1.30

Stringer	A	B	C	D	E	F
Dimension X	3 3/8"	3 3/8"	3 3/8"	3 3/8"	3 3/8"	3 3/8"



Note: Milled ends of compression splice plates on bottom flanges of girders shall be brought to full bearing against milled ends of pier girder brackets before bolts are tightened.

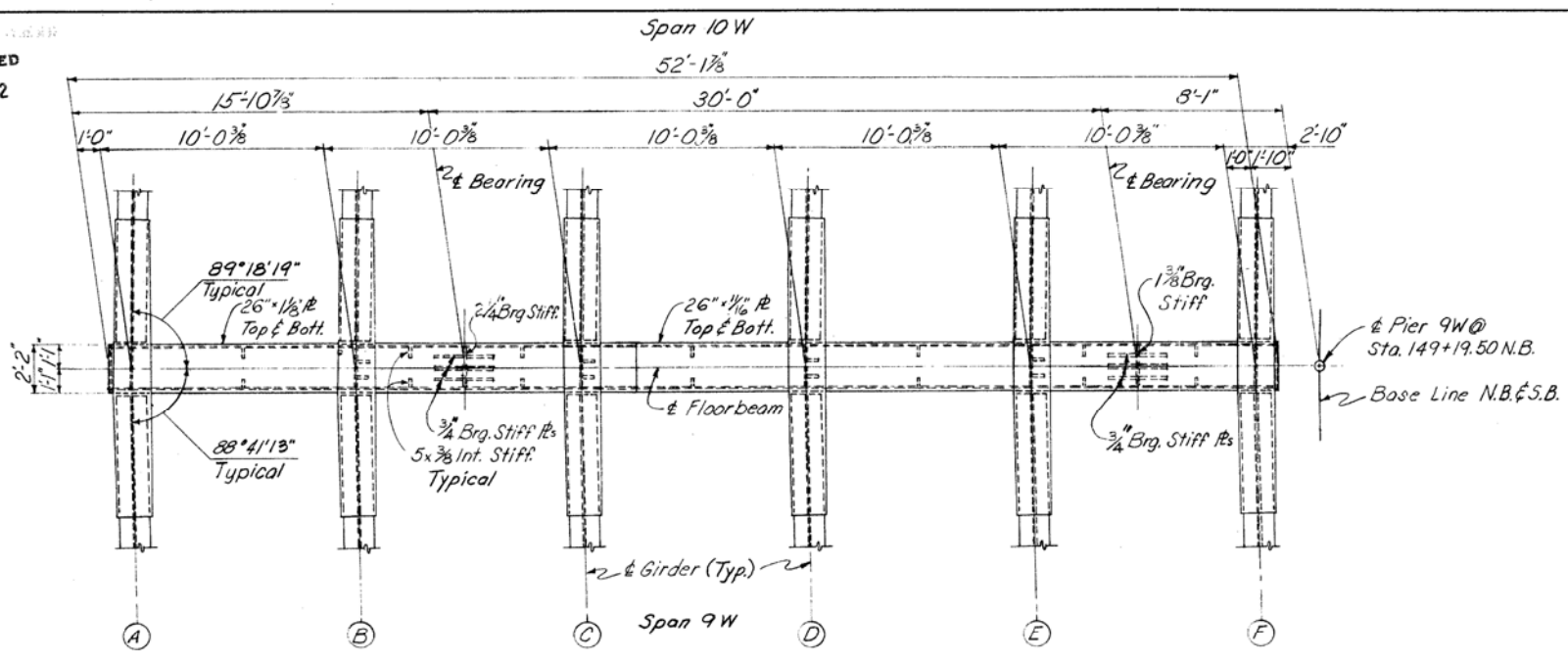
Note:
For Cover Plate Details and Section FF See Floorbeam 2E Sht. No. 158
For fillet Weld Sizes not shown see "TABLE OF FILLET WELD SIZES" Sht. No. 164
For Bearing Details see sht. 165

HAZLET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

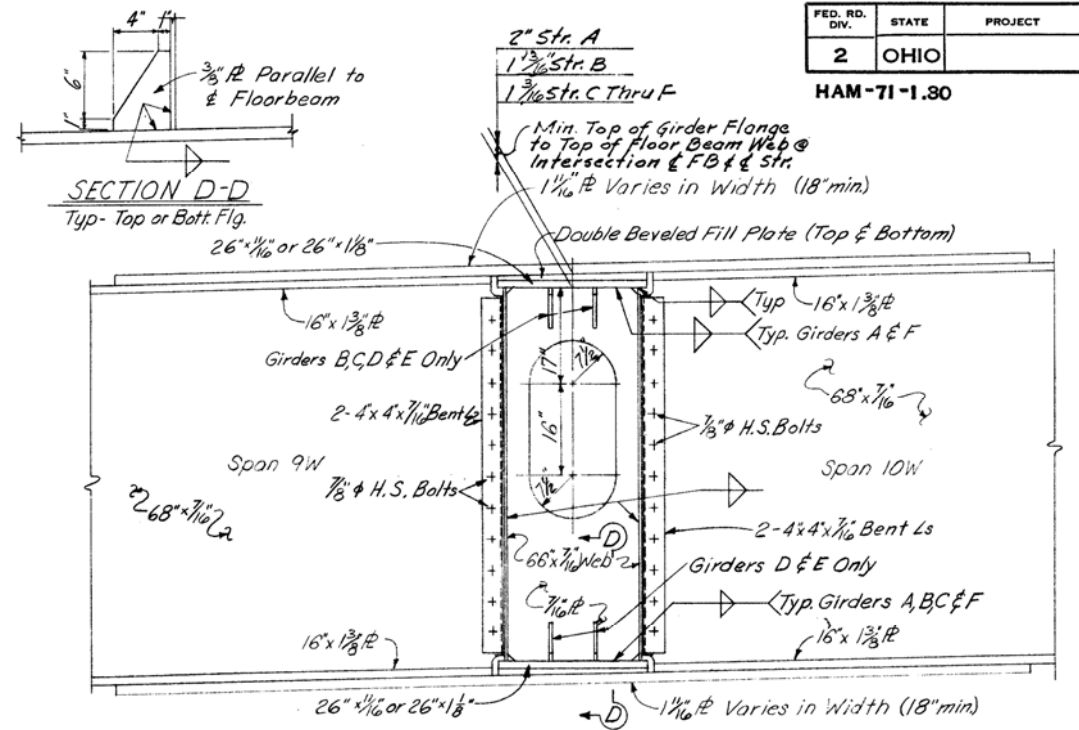
STRUCTURAL STEEL DETAILS

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
Jag	W.R.T. 12-18-64		Jag 2-2-65	JH 3/22/65	

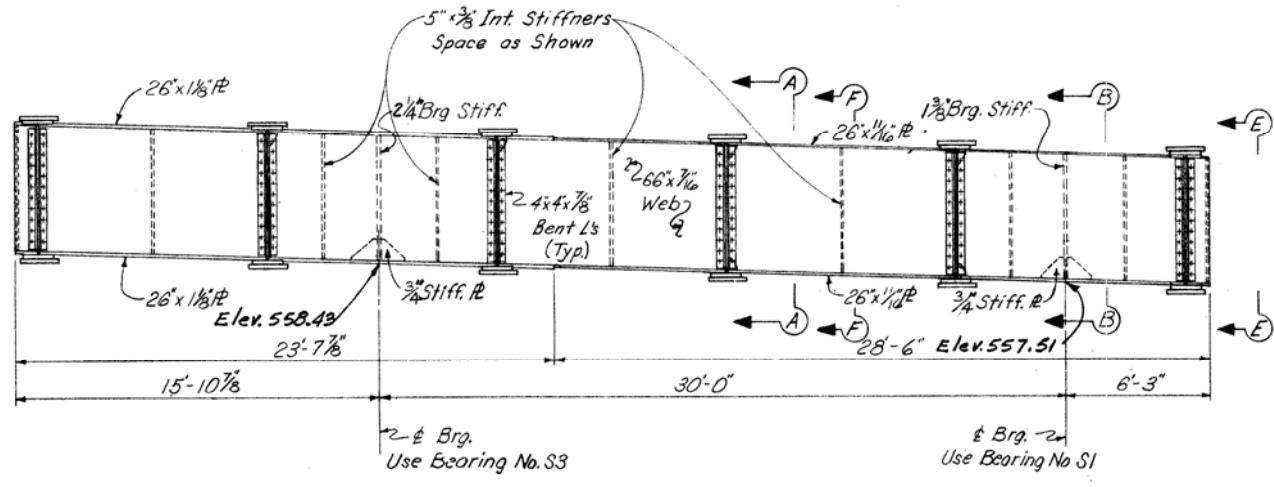
MICROFILMED
OCT 15 1982



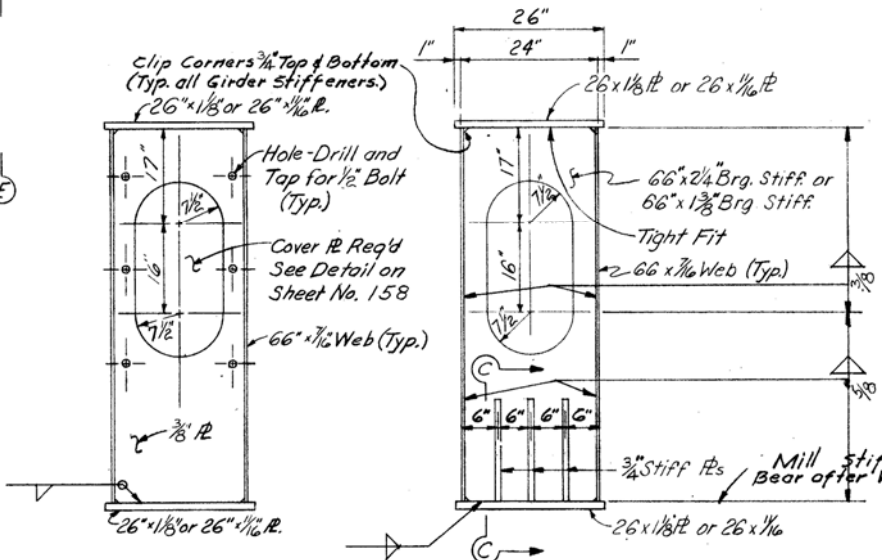
PLAN - FLOORBEAM AT PIER 9W



SECTION A-A

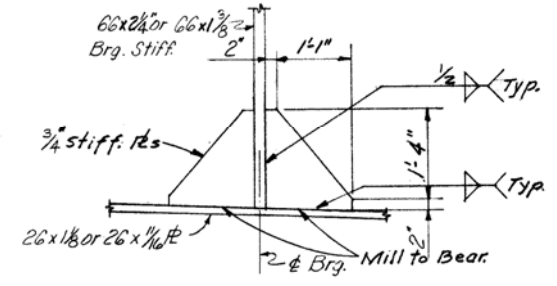


ELEVATION

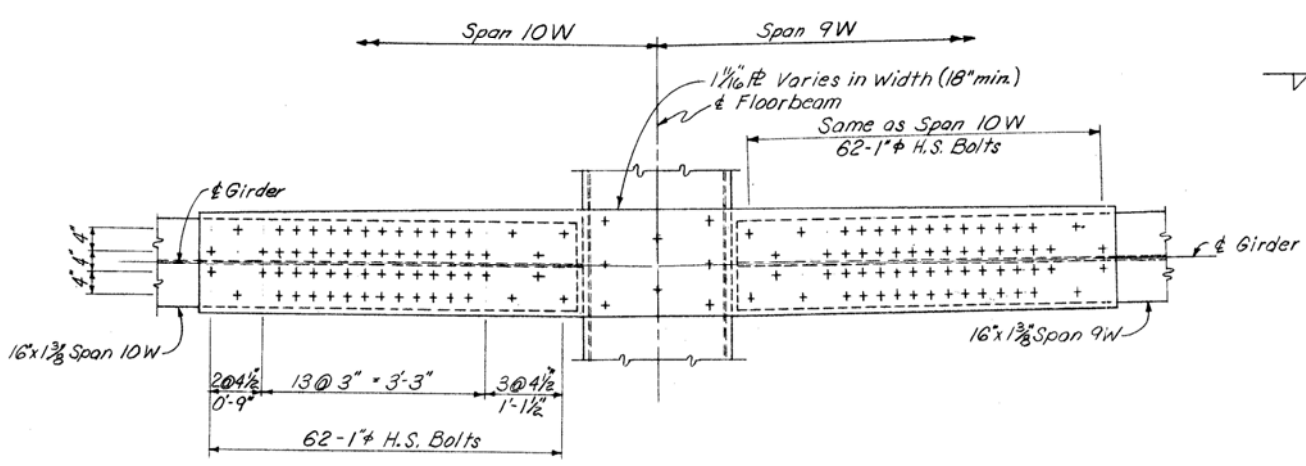


SECTION E-E

SECTION B-B



SECTION C-C



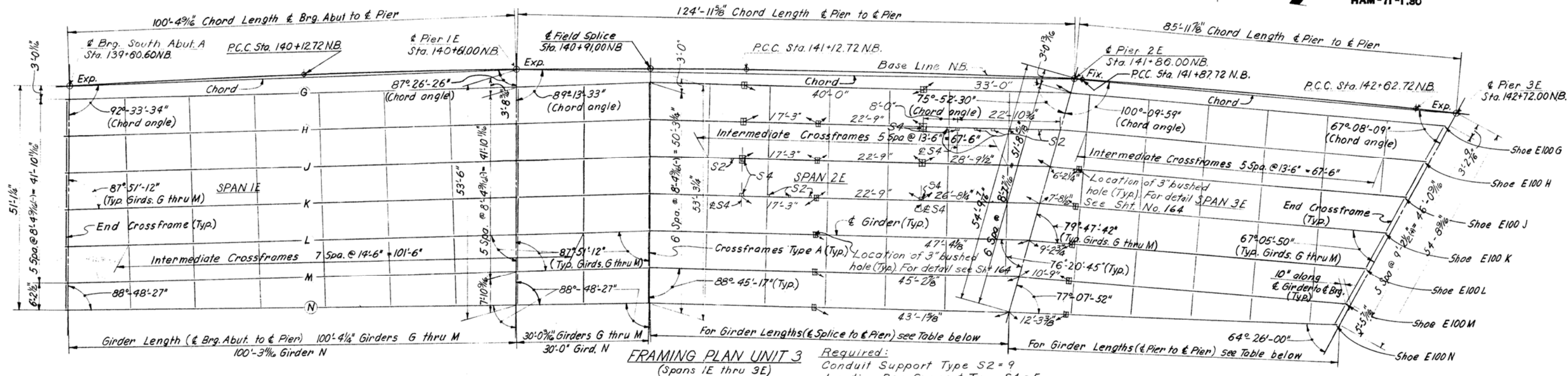
SPLICE PLATE DETAIL

Note:
For Cover Plate Details and Section F-F see Floorbeam 2E Sht. No. 158
For Fillet Weld Sizes not shown, See "TABLE OF FILLET WELD SIZES" Sht. No. 164
For Bearing Details see sht. No. 165

HAZELET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

STRUCTURAL STEEL DETAILS

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
ELW	WRT		Jag	1/40 3/22/65	



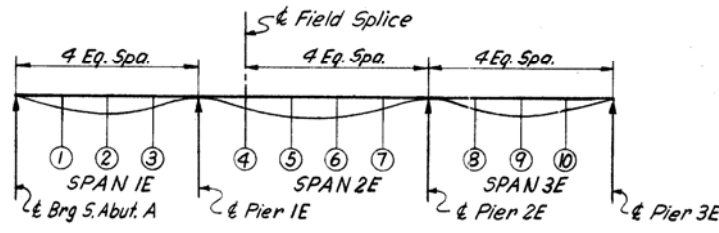
NOTES:

- For Bearing details see Shts No. 165 & 166
- For Field Splice details see Sht. No. 165
- For inlet framing see Shts. No. 187 & 188
- For typical girder elevations and details see Sht. No. 164
- For detail of end crossframes at S. Abut. A see Ohio Standard Dwg. No. S.D.-1-63. Sht. 2
- For detail of end crossframe at Pier 3E see Sht. No. 163
- For detail of intermediate crossframes see Sht. No. 164
- For Type A crossframes see Sht. No. 165
- All girders in Unit 3 are parallel, except girder N from S. Abut. A to Field Splice and from Pier 2E to Pier 3E.
- South Abutment A, Pier 1E and & Field Splice are parallel.
- Web Plate is 68" x 7/16"
- For Flange R's, Bearing Stiff, and intermediate Stiffeners see details this Sht.

DEFLECTION AND CAMBER

Girder	Span 1E									Span 2E									Span 3E								
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Location	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Deflection due to weight of steel.	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
Deflection due to remaining dead load.	7/16	1/2	1/4	1/4	9/16	1/4	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
Convexity (See note below)	-3/16	-1/4	-1/4	-5/16	-5/16	-1/4	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8	-1/8
Sum of deflection and convexity	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8

NOTE: No Camber required for Spans 1E, 2E and 3E
Convexity includes variations due to super elevation, horizontal and vertical curvature.

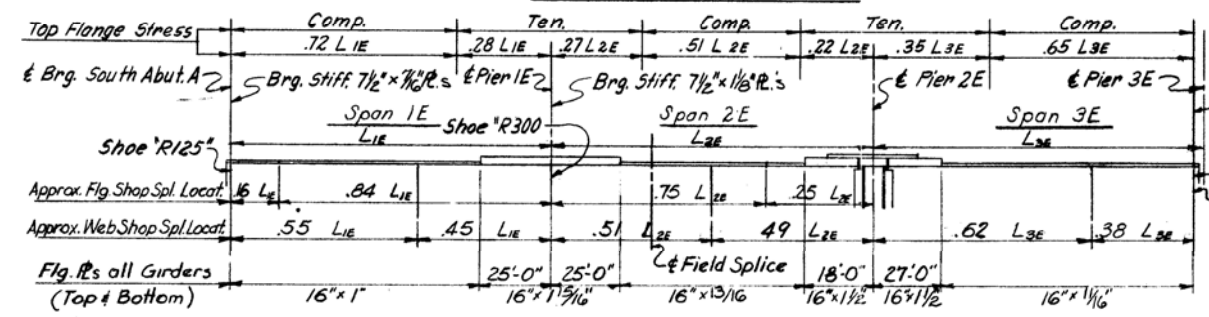


MAX. INTERMEDIATE STIFFENER SPACING

Span	Span 1E	Span 2E	Span 3E
Span 1E	59" Spacing	68" Spacing	68" Spacing
Span 2E	50" Spacing	59" Spacing	68" Spacing
Span 3E	54" Spacing	61" Spacing	68" Spacing

GIRDER LENGTHS

Girder	& Splice to & Pier 2E	Span 3E
G	94'-2 3/8"	85'-3 3/8"
H	91'-11 7/8"	83'-2 3/4"
J	89'-9 1/8"	81'-2 1/16"
K	87'-6 3/16"	79'-1 3/8"
L	85'-3 1/16"	77'-0 1/16"
M	83'-1 5/16"	75'-0"
N	80'-10 3/4"	74'-5 13/16"



DEFLECTION OF FLOOR BEAM

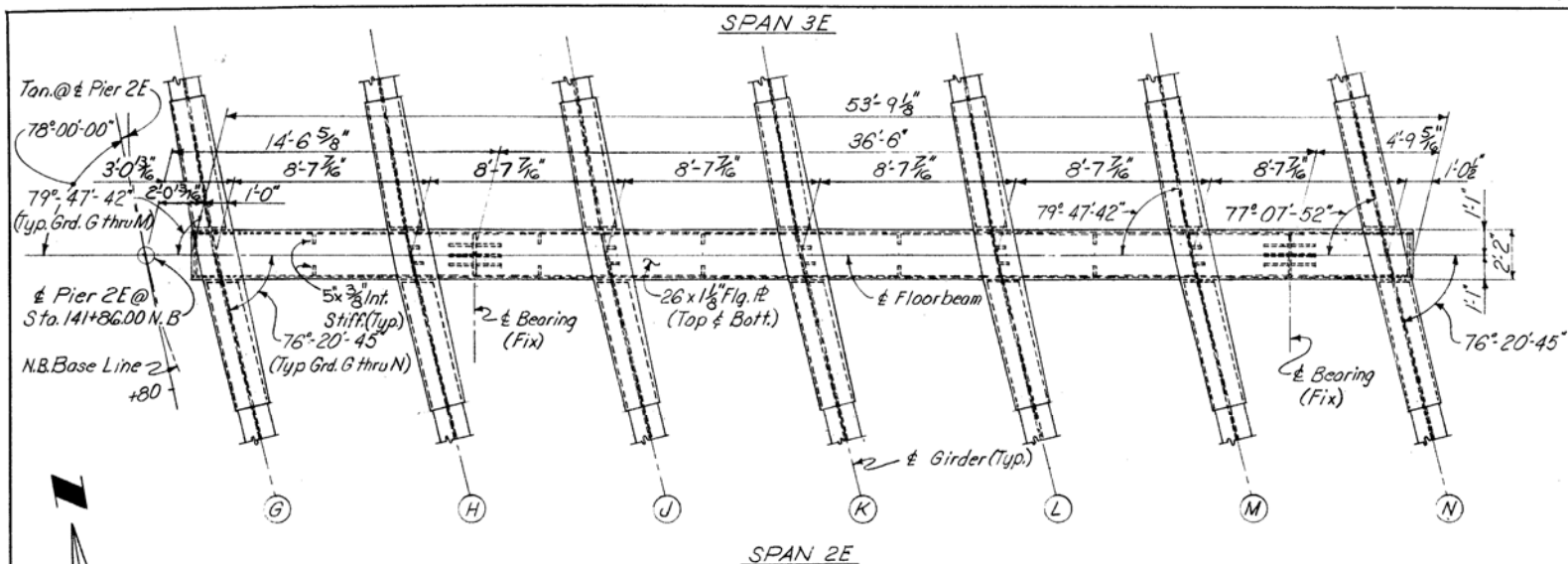
GIRDER	G	H	J	K	L	M	N
FLOOR BEAM 2E	Steel Weight	0	0	0	0	0	0
	Remain. D.L.	1/16	0	0	1/16	1/16	0

NOTE: All Zero's indicate a negligible amount of deflection

HAZLET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

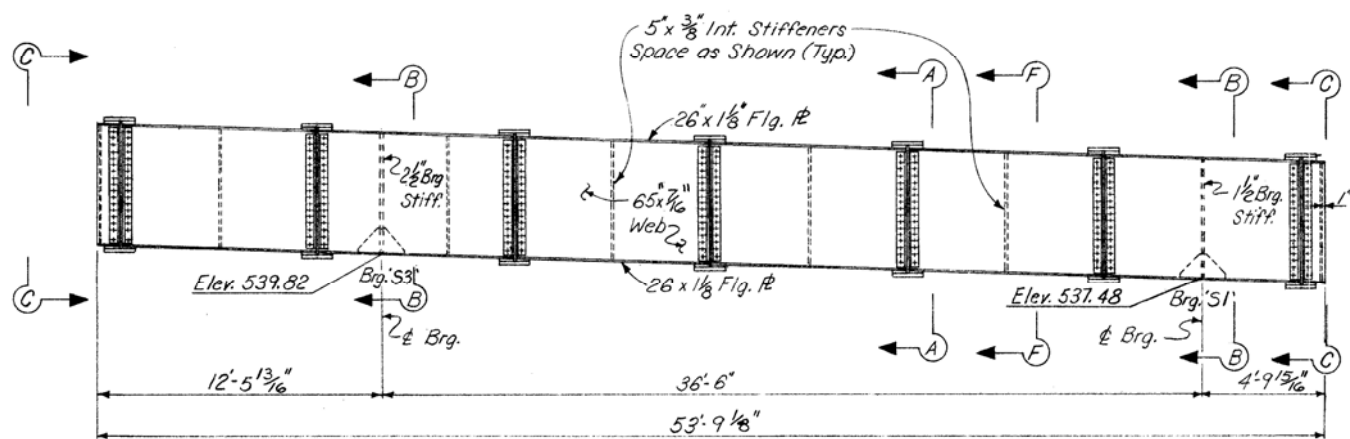
**STRUCTURAL STEEL DETAILS
UNIT 3**

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
MDC	SPH	HAZ	CHH	JH0 3/22/65	

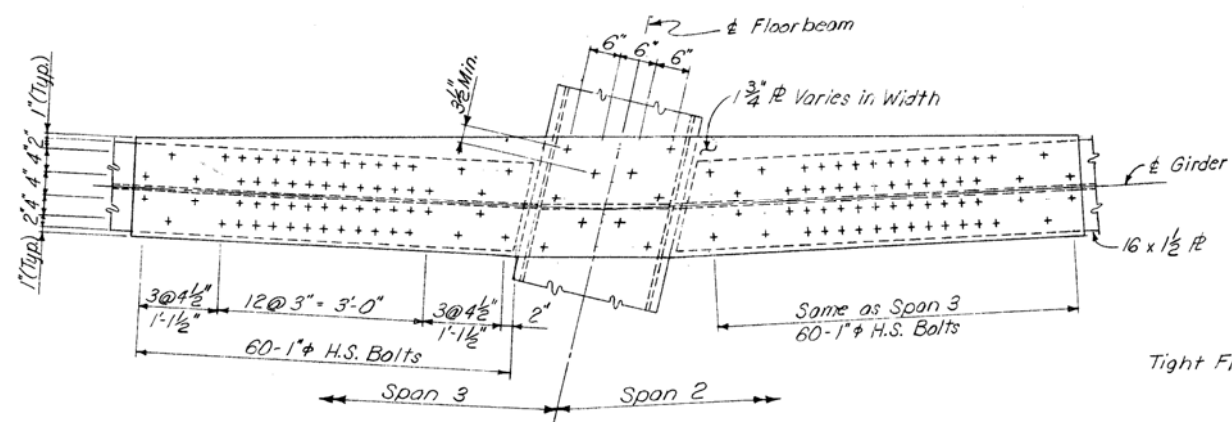


PLAN - FLOORBEAM AT PIER 2E

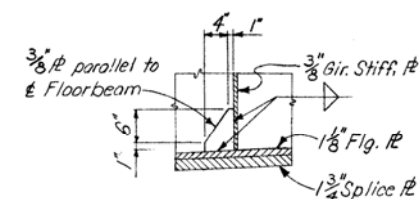
MICROFILMED
OCT 15 1982



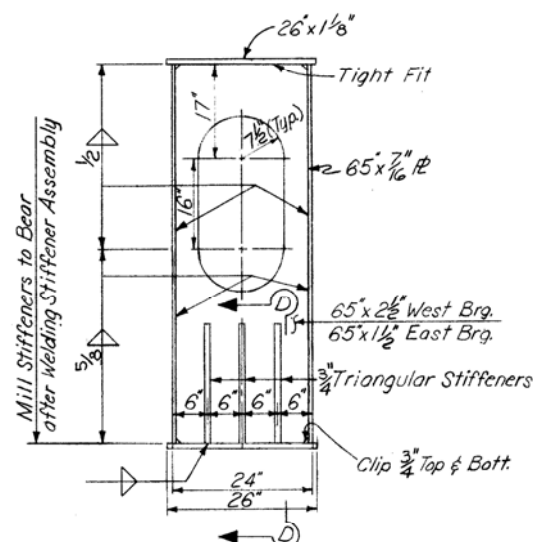
ELEVATION



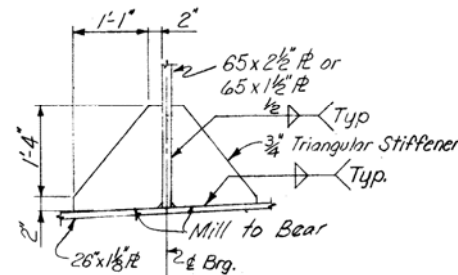
SPLICE PLATE DETAIL
SHOWING TOP SPLICE
(Typ. Bottom)



SECTION E-E
(Typ. Top and Bottom)



SECTION B-B
SHOWING BEARING STIFFENER



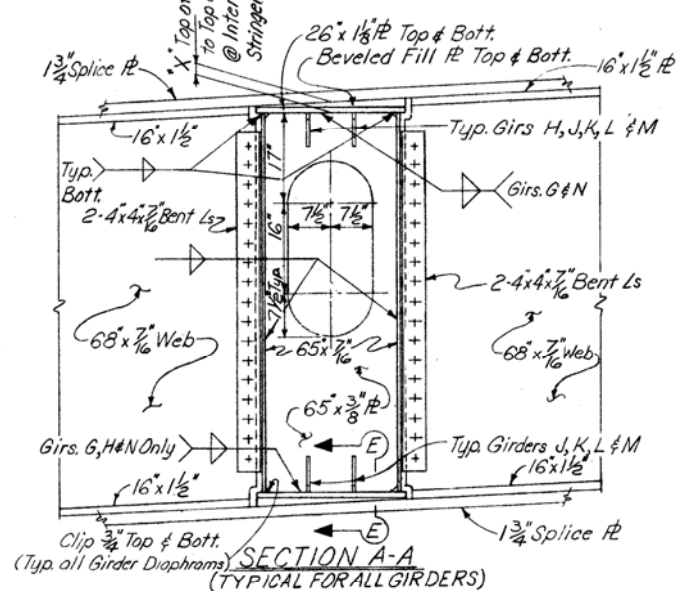
SECTION D-D

Stringer	G	H	J	K	L	M	N
Dimension	3 3/16"	3"	2 7/8"	2 7/8"	2 13/16"	2 3/4"	3 1/8"

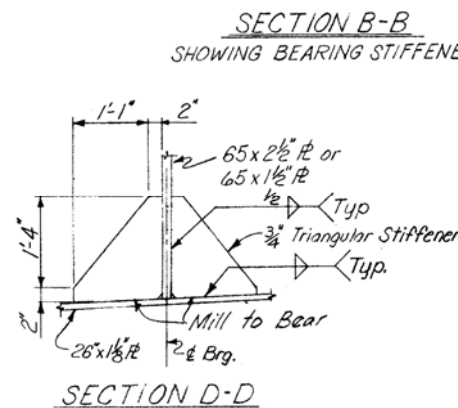
FED. RD. DIV.	STATE	PROJECT	FISCAL YEAR
2	OHIO		

HAM-71-1.30

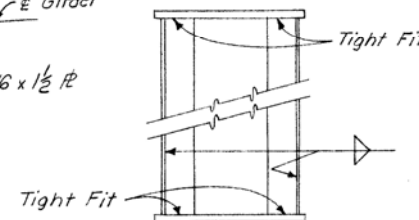
158
210



SECTION A-A
(TYPICAL FOR ALL GIRDERS)



SECTION C-C



SECTION F-F
TYP. ALL INTERMEDIATE STIFFENERS

NOTE:
For fillet weld sizes not shown see
"TABLE OF FILLET WELD SIZES" sheet no. 164

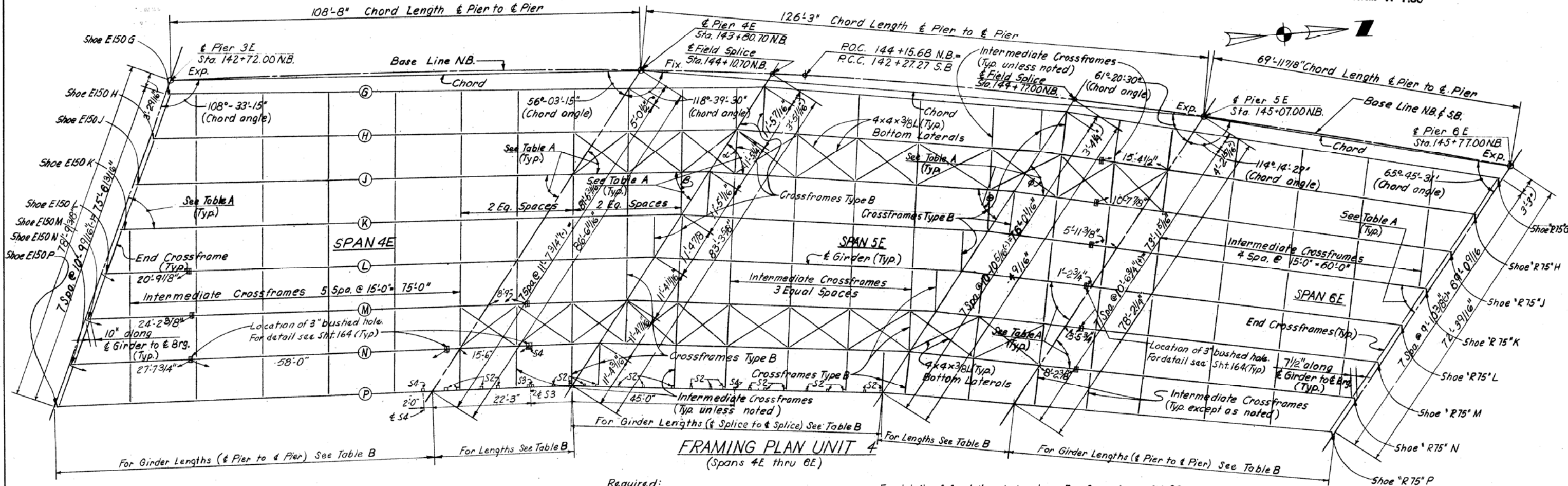
HAZELET & ERDAL CONSULTING ENGINEERS CINCINNATI, OHIO				
STRUCTURAL STEEL DETAILS				
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE
PME	W.R.T. 10-4-68		CHH 2-8-65	JH 3/22/65

MICROFILMED
OCT 15 1982

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

159
210

HAM-71-1.80



DEFLECTION AND CAMBER

Girder Span	G										J										L										M										N										P												
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10			
Deflection due to weight of steel	1/8	1/8	1/16	1/16	1/8	1/8	0	0	0	1/8	1/8	1/16	1/16	1/8	1/8	0	0	0	1/8	1/8	1/16	1/16	1/8	1/8	0	0	0	1/16	1/16	0	1/8	1/4	1/8	0	0	0	1/16	1/16	0	1/8	1/4	1/8	0	0	0	1/16	1/16	0	1/8	1/4	1/8	0	0	0	1/16	1/16	0	1/8	1/4	1/8	0	0	0
Deflection due to remaining dead load	7/16	1/2	3/8	3/16	1/4	3/8	7/16	1/2	0	7/16	1/2	3/8	3/16	1/4	3/8	7/16	1/2	0	7/16	1/2	3/8	3/16	1/4	3/8	7/16	1/2	0	1/16	1/16	0	1/8	1/4	1/8	0	0	0	1/16	1/16	0	1/8	1/4	1/8	0	0	0	1/16	1/16	0	1/8	1/4	1/8	0	0	0									
Convexity (See note below)	5/8	7/8	5/8	21/16	27/16	13/8	5/4	3/2	3/2	5/8	7/8	5/8	21/16	27/16	13/8	5/4	3/2	3/2	5/8	7/8	5/8	21/16	27/16	13/8	5/4	3/2	3/2	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3																
Sum of deflection and convexity (Camber)	13/16	1/2	3/8	3/8	3/16	3/4	3/8	3/8	13/16	13/16	1/2	3/8	3/8	3/16	3/4	3/8	3/8	13/16	13/16	1/2	3/8	3/8	3/16	3/4	3/8	3/8	13/16	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3	1/2	2/3																

NOTE: Camber shall be equal to the sum of deflection and convexity ordinates shown above.
 Camber Girders by cutting webs to a smooth curve.
 Convexity includes variations due to superelevation, horizontal and vertical curvature.

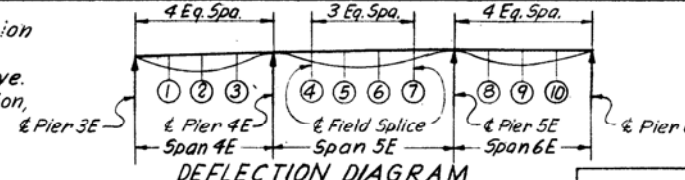


TABLE-A

Girder	Pier 3E		Pier 4E		Splice		Splice		Pier 5E		Pier 6E	
	Span 4E	Span 4E	Span 4E	Span 5E	α	θ	α	θ	Span 5E	Span 6E	Span 6E	
G	72°03'-19"	56°39'-50"	Same as shown for Span 4E @ Pier 4E.	Same as shown for Span 4E @ Pier 4E.	61°18'-04"	60°49'-10"	65°01'-14"	64°30'-23"	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	
H	71°45'-25"	56°21'-56"	Same as shown for Span 4E @ Pier 4E.	Same as shown for Span 4E @ Pier 4E.	60°23'-06"	59°57'-55"	63°59'-48"	63°29'-29"	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	
J	71°26'-25"	56°02'-56"	Same as shown for Span 4E @ Pier 4E.	Same as shown for Span 4E @ Pier 4E.	60°23'-06"	59°57'-55"	63°59'-48"	63°29'-29"	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	
K	71°06'-13"	55°42'-44"	Same as shown for Span 4E @ Pier 4E.	Same as shown for Span 4E @ Pier 4E.	59°33'-38"	59°10'-22"	62°59'-22"	62°29'-3"	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	
L	70°44'-43"	55°21'-14"	Same as shown for Span 4E @ Pier 4E.	Same as shown for Span 4E @ Pier 4E.	58°48'-09"	58°27'-05"	62°00'-4"	61°30'-3"	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	
M	70°21'-47"	54°58'-18"	Same as shown for Span 4E @ Pier 4E.	Same as shown for Span 4E @ Pier 4E.	58°27'-05"	58°04'-09"	61°30'-3"	61°04'-09"	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	
N	69°57'-16"	54°33'-46"	Same as shown for Span 4E @ Pier 4E.	Same as shown for Span 4E @ Pier 4E.	58°04'-09"	57°41'-09"	61°04'-09"	60°41'-09"	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	
P	69°30'-59"	54°07'-30"	Same as shown for Span 4E @ Pier 4E.	Same as shown for Span 4E @ Pier 4E.	57°41'-09"	57°18'-09"	60°41'-09"	60°18'-09"	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	Same as shown for Angle @ Splice.	

Angles from & Girder to & Pier or & Brg. or & Field splice (See Plan)

TABLE-B

Girder	Span 4E	& Pier 4E to & Splice	& Splice to & Splice	& Splice to & Pier 5E	Span 6E
G	106'-10 1/16"	30'-10"	66'-4 1/16"	29'-7 7/16"	70'-4 7/8"
H	103'-9 1/16"	30'-11 5/16"	66'-7 1/2"	29'-8 5/16"	70'-8 1/16"
J	100'-8 7/8"	31'-0 1/16"	66'-10 9/16"	29'-10 1/2"	71'-0 1/16"
K	97'-8 1/16"	31'-2 1/8"	67'-2 5/16"	30'-0 1/16"	71'-3 3/16"
L	94'-7 5/16"	31'-3 3/4"	67'-5 1/16"	30'-1 5/8"	71'-7 1/16"
M	91'-6 6/8"	31'-5 1/2"	67'-8 1/16"	30'-3 1/4"	71'-11 1/16"
N	88'-5 1/8"	31'-7 1/16"	68'-0 1/16"	30'-4 7/8"	72'-3 3/8"
P	85'-5 3/8"	31'-9 1/2"	68'-3 1/8"	30'-6 9/16"	72'-7 5/16"

Girder Lengths

NOTES:
 For Notes see Sht. No. 160 (Unit 5)
 All girders in Unit 4 are flared.
 Piers 4E, 5E, 6E & & Splices are all parallel.
 For Flange R, Brg Stiff and Inter. Stiff. See Sht. No. 161
 For End crossframes at Piers 3E and 6E see Sht. No. 168
 Web R is 68" x 7/16".

HAZELET & ERDAL
 CONSULTING ENGINEERS
 CINCINNATI, OHIO

**STRUCTURAL STEEL DETAILS
 UNIT 4**

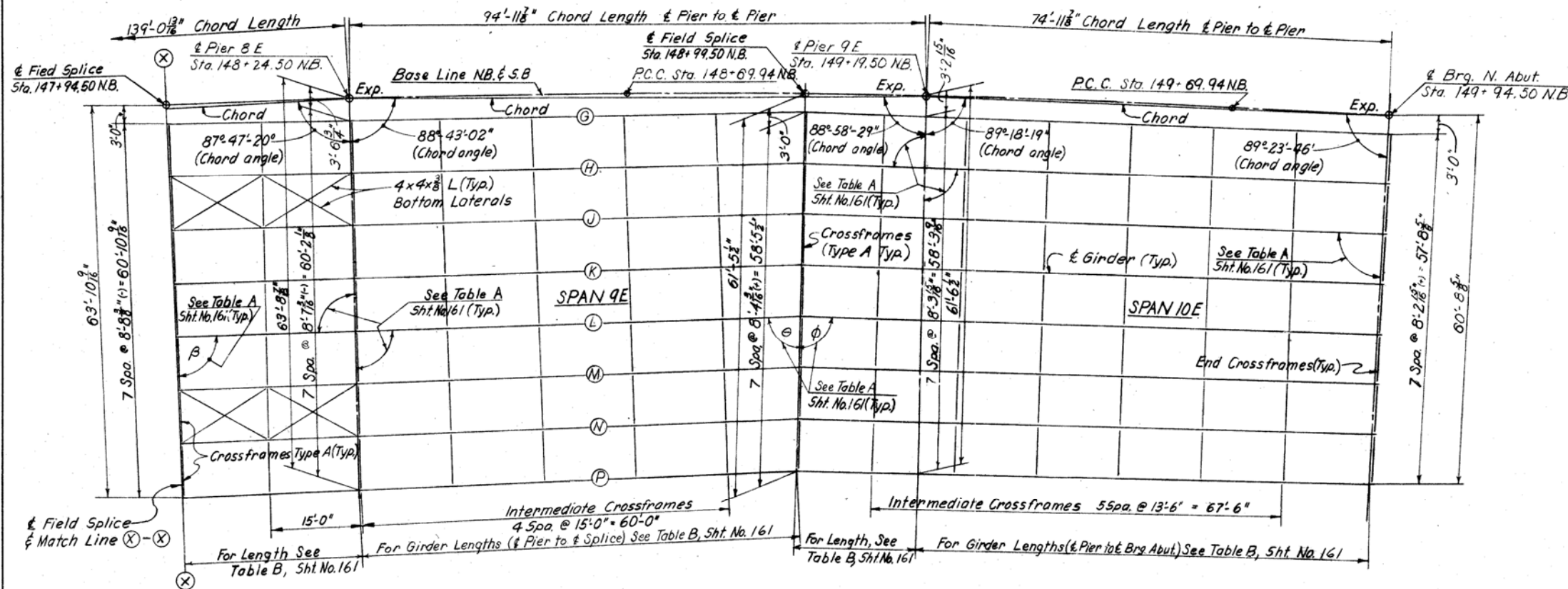
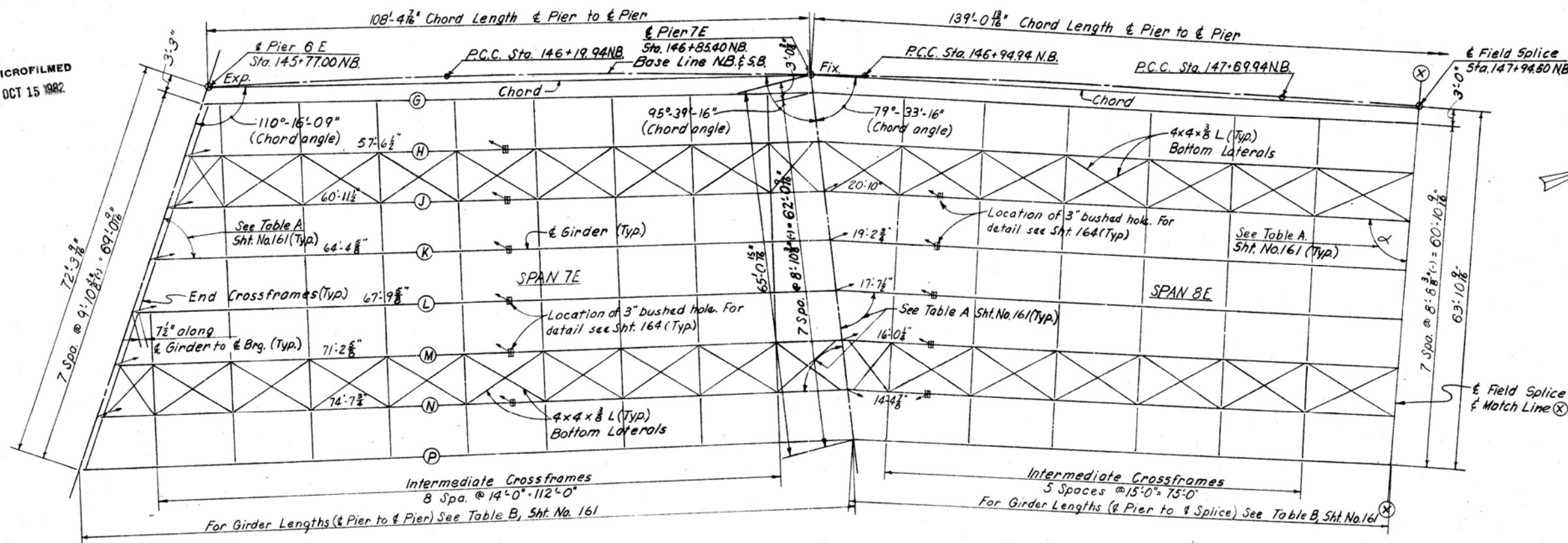
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
MDC	SMH/MAS 12-3-69		CHH 2-1-65	JHO 3/22/65	

MICROFILMED
OCT 15 1982

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

160
210

HAM-71-1.80



- NOTES:** The ϕ 's of Piers 8E and 9E, Brg. N. Abut and Field Splice are Radial.
 For Bearing details see Shts. No. 165 & 166
 For beam splice details see Sht. No. 165
 For inlet framing see Shts. No. 187 & 188
 For typical girder elevations and details see Sht. No. 164
 For detail of end crossframes at N. Abut. see Ohio Standard Drawing No. SD-1-63 Sht. 2
 For detail of end crossframe at Pier 6E see Sht. No. 163
 For details of intermediate crossframes see Sht. No. 164
 For Type A & Type B crossframes see Sht. No. 165
 For Bottom Lateral Bracing see Sht. No. 164
 Web Plate is 68" x 1/2"
 For Flange IR's, Bearing Stiffs, & intermediate Stiffeners see Sht. No. 161
 All Girders in Unit 5 are flared.

FRAMING PLAN UNIT 5
(Spans 7E thru 10E)

HAZELT & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

STRUCTURAL STEEL DETAILS
UNIT 5

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVIEWED
DME	ENH/HAS 12-10-69		CHH 2-1-65	JHO 3/22/65	

DEFLECTION AND CAMBER (Unit 5)

Girder	G				H				J				K				L				M				N				P																																									
	7E	8E	9E	10E	7E	8E	9E	10E	7E	8E	9E	10E	7E	8E	9E	10E	7E	8E	9E	10E	7E	8E	9E	10E	7E	8E	9E	10E	7E	8E	9E	10E																																						
Location	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Deflection due to weight of steel	0																																																																					
Deflection due to remaining dead load	0																																																																					
Convexity (See note below)	0																																																																					
Sum of deflection and convexity (Camber)	0																																																																					

NOTE: Camber required for Span 7E Girder G thru P & Span 8E Girder G thru K.
No Camber required for Spans 9E and 10E.
Convexity includes variations due to superelevation, horizontal and vertical Curvature.

TABLE A (UNIT 5)

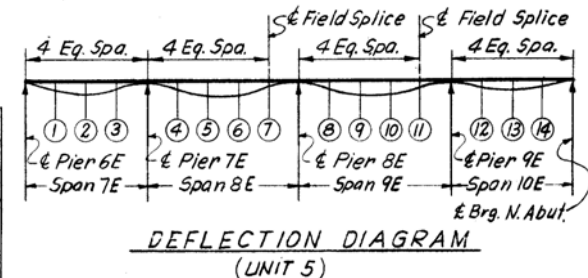
Girder	Pier 6E		Pier 7E		Splice		Pier 8E		Splice		Pier 9E		N. Abut.
	Span 7E	Span 8E	Span 7E	Span 8E	α	β	Span 8E	Span 9E	θ	φ	Span 9E	Span 10E	
G	69°42'49"	84°21'45"	80°01'51"	88°12'39"	88°22'20"	89°22'14"	88°42'13"	89°06'32"	89°29'28"	89°29'28"	89°12'37"	89°12'37"	
H	69°29'51"	84°34'43"	80°03'01"	88°11'28"	88°39'48"	89°33'42"	88°30'45"	89°10'21"	89°33'17"	89°33'17"	89°08'48"	89°08'48"	
J	69°17'44"	84°46'50"	80°04'13"	88°10'16"	88°51'14"	89°45'08"	88°19'19"	89°14'14"	89°37'10"	89°37'10"	89°04'55"	89°04'55"	
K	69°06'32"	84°58'02"	80°05'30"	88°08'59"	89°02'49"	89°56'43"	88°07'44"	89°18'02"	89°40'58"	89°40'58"	89°01'07"	89°01'07"	
L	68°56'07"	85°08'27"	80°06'49"	88°07'40"	89°14'27"	90°08'21"	87°56'06"	89°21'55"	89°44'51"	89°44'51"	88°57'14"	88°57'14"	
M	68°46'20"	85°18'14"	80°08'11"	88°06'19"	89°26'10"	90°20'04"	87°44'23"	89°25'52"	89°48'48"	89°48'48"	88°53'17"	88°53'17"	
N	68°37'11"	85°27'23"	80°09'40"	88°04'50"	89°37'58"	90°31'52"	87°32'35"	89°29'50"	89°52'46"	89°52'46"	88°49'19"	88°49'19"	
P	68°28'39"	85°35'55"	80°11'11"	88°03'19"	89°49'54"	90°43'48"	87°20'39"	89°33'47"	89°56'43"	89°56'43"	88°45'22"	88°45'22"	

Angles from Girders to Piers or Brgs. or Field Splices (See Plan Sht. No. 160)

TABLE B (UNIT 5)

Girder	Span 7E	Span 7E to Splice	Splice to Pier 8E	Pier 8E to Splice	Span 9E	Span 10E
G	109'9 1/2"	108'5 3/8"	29'11 7/16"	74'10 3/8"	19'11 3/4"	74'11"
H	114'1"	106'7 3/16"	29'9 13/16"	74'7 3/16"	19'11 1/16"	74'8 3/4"
J	118'4 9/16"	104'10 5/16"	29'8 3/16"	74'3 3/16"	19'10 7/16"	74'6 1/2"
K	122'8 1/16"	103'0 5/8"	29'6 1/2"	74'0 1/16"	19'9 3/4"	74'4 1/4"
L	126'11 3/8"	101'2 5/16"	29'4 7/8"	73'9 1/16"	19'9 1/16"	74'2"
M	131'3 3/16"	99'5 1/4"	29'3 1/4"	73'5 3/4"	19'8 3/8"	73'11 3/4"
N	135'6 3/4"	97'7 9/16"	29'1 5/8"	73'2 3/8"	19'7 3/4"	73'9 1/2"
P	139'10 5/16"	95'9 5/16"	29'0"	72'11 1/16"	19'7 1/16"	73'7 3/16"

Girder Lengths (See Plan Sht. No. 160)



DEFLECTION OF FLOOR BEAM 7E

GIRDER	G	H	J	K	L	M	N	P
Steel Weight	0	1/16	1/8	3/16	3/16	3/16	1/8	1/16
Remaining D.L.	0	3/16	3/16	1/16	1/16	1/16	1/16	1/8

NOTE: All Zero's indicate a negligible amount of deflection

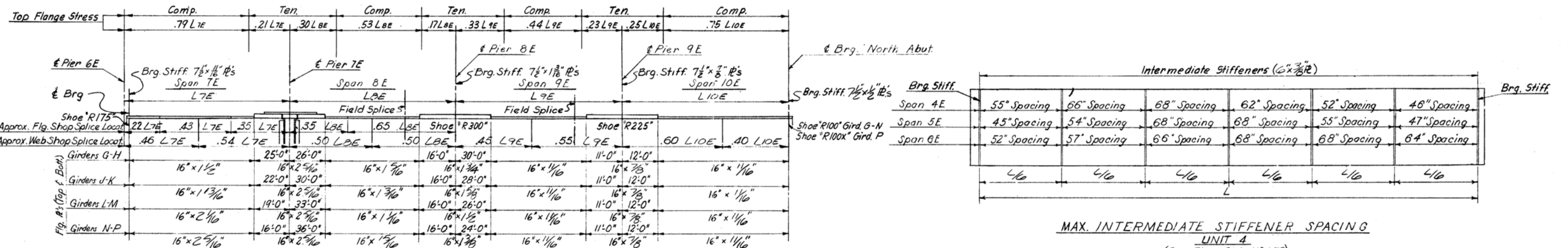
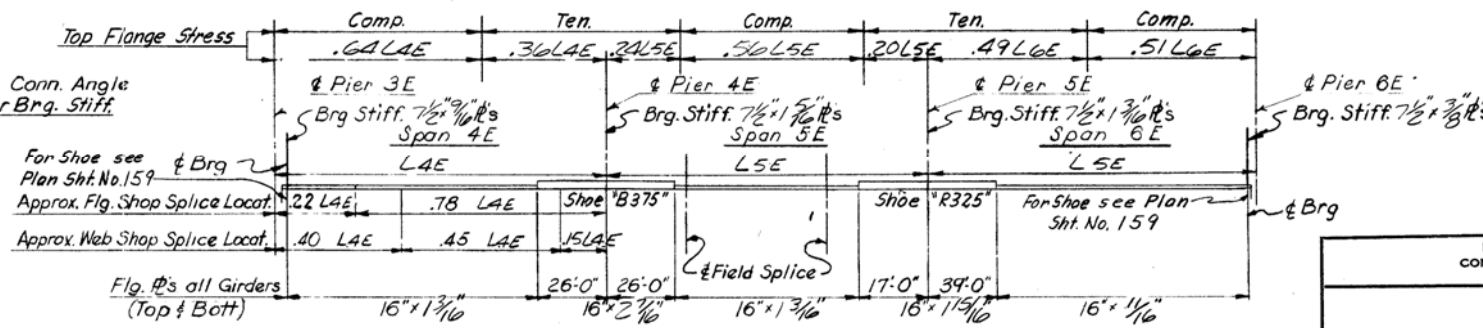


TABLE OF FLANGE PLATES AND SPLICES (UNIT 5)
(See Plan Sht. No. 160)

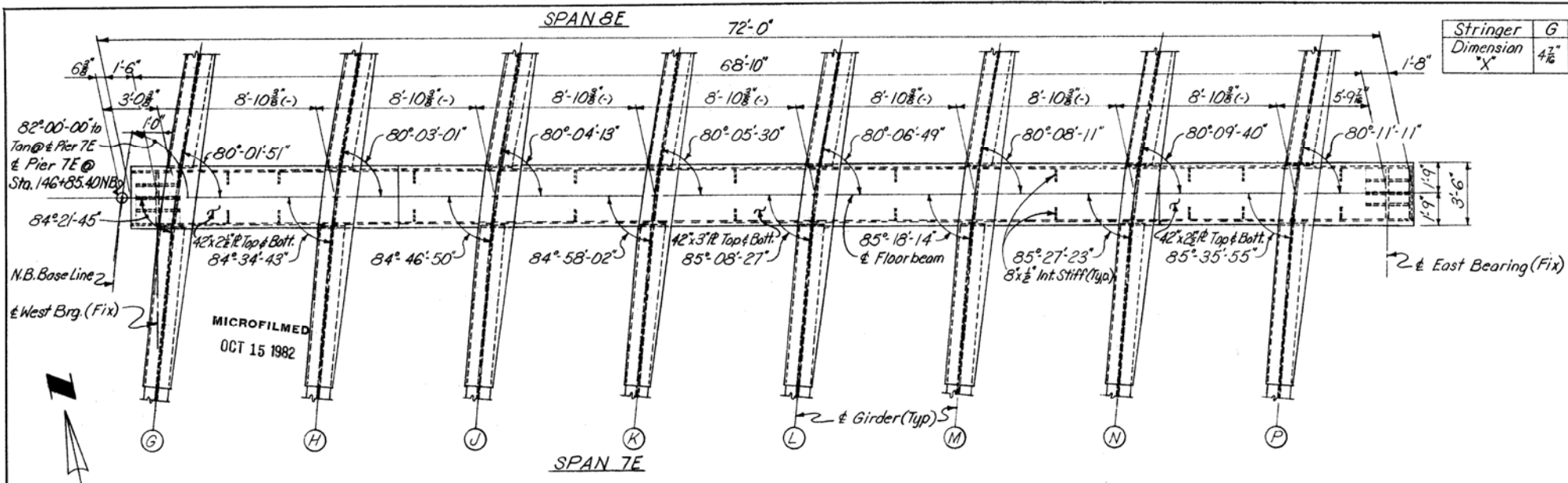
Span	7E	8E	9E	10E
Span 7E	50" Spacing	62" Spacing	68" Spacing	57" Spacing
Span 8E	46" Spacing	54" Spacing	65" Spacing	68" Spacing
Span 9E	51" Spacing	60" Spacing	68" Spacing	65" Spacing
Span 10E	57" Spacing	64" Spacing	68" Spacing	68" Spacing



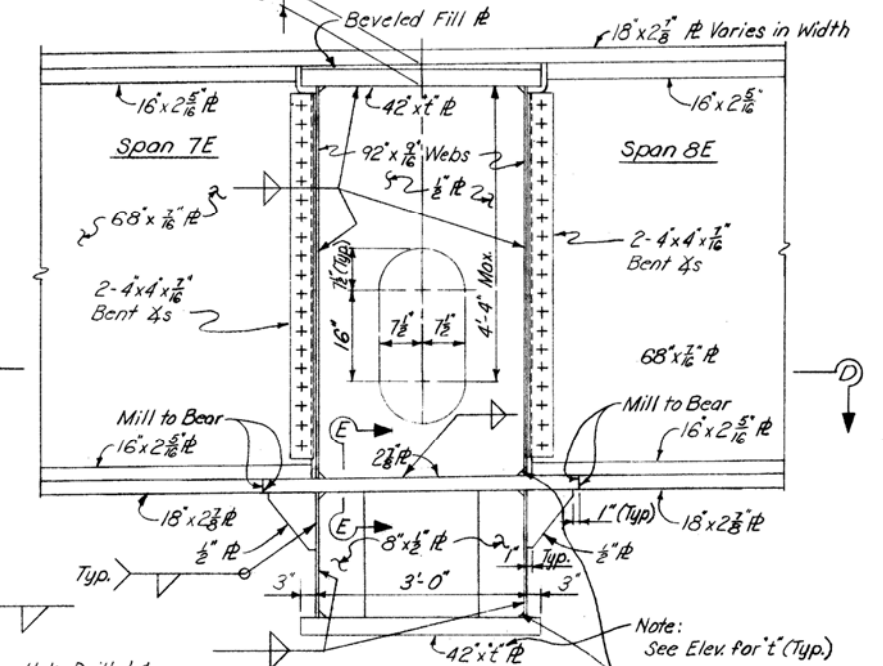
HAZLET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

**STRUCTURAL STEEL DETAILS
UNITS 4 & 5**

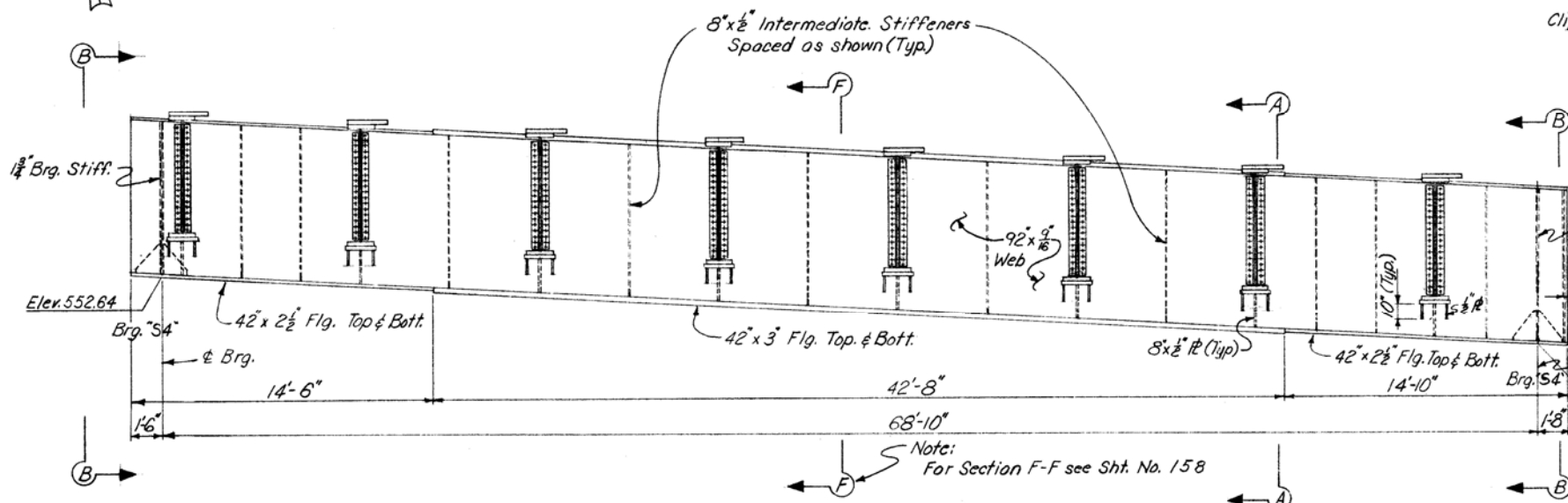
DESIGNED MJC	DRAWN SMH/NAS	TRACED CHH	CHECKED CHH	REVIEWED DATE 3/22/65	REVISED
#PME	12-18-64	2-1-65	JHO		



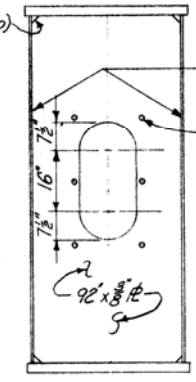
PLAN - FLOORBEAM AT PIER 7E



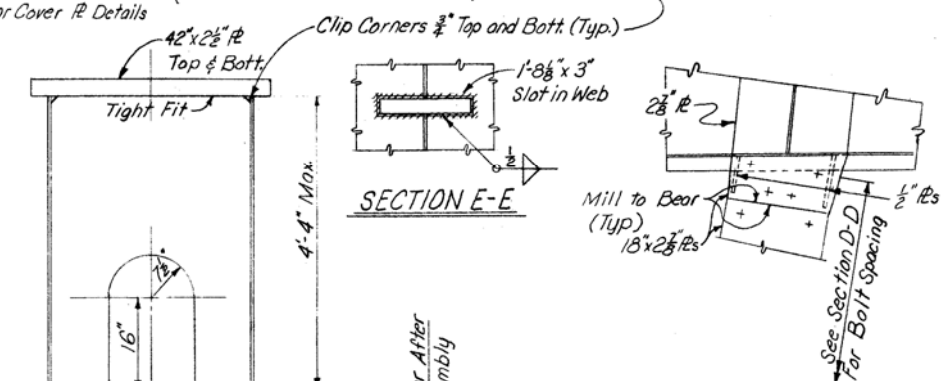
SECTION A-A
(TYPICAL FOR ALL GIRDERS)



ELEVATION



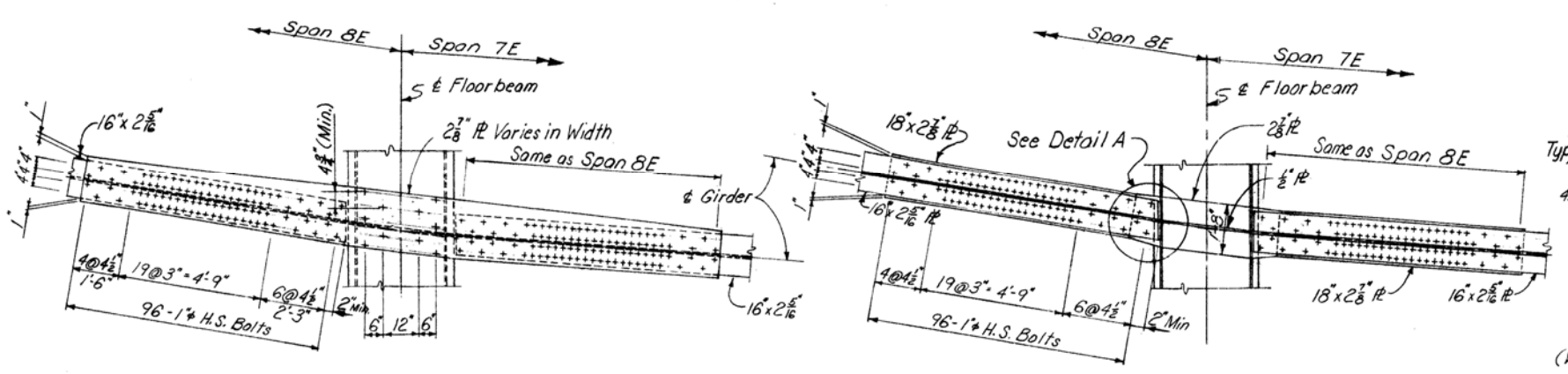
EAST END ELEVATION
Elev. 548.96



SECTION E-E

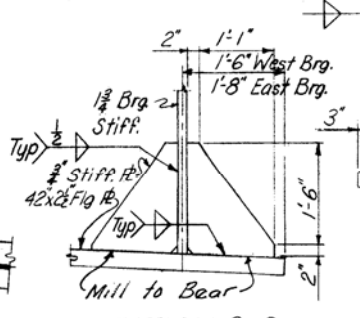
DETAIL A
With Bott. Flg. of Girder Removed

Note: Milled ends of compression splice plates on bottom flanges of girders shall be brought to full bearing against milled ends of pier girder brackets before bolts are tightened.

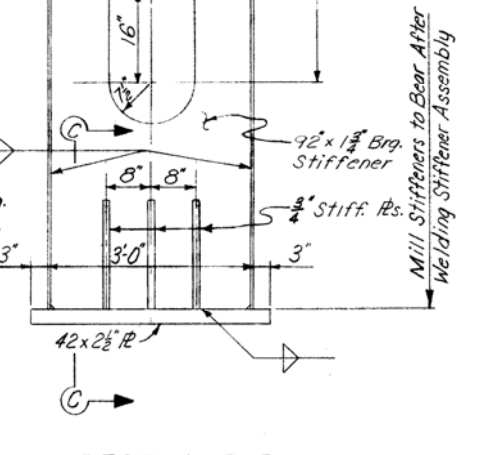


PLAN OF TOP SPLICE PLATE

SECTION D-D



SECTION C-C
East Bearing Shown
(West Bearing Identical Except
42" x 2 1/2" Flange Plate Slope Opposite)



SECTION B-B

Note:
For Cover Plate Details and Section F-F
See Floorbeam 2E, Sht. No. 158
For fillet weld sizes not shown, see TABLE
OF FILLET WELD SIZES, Sht. No. 164
For Bearing Details see Sht. No. 165

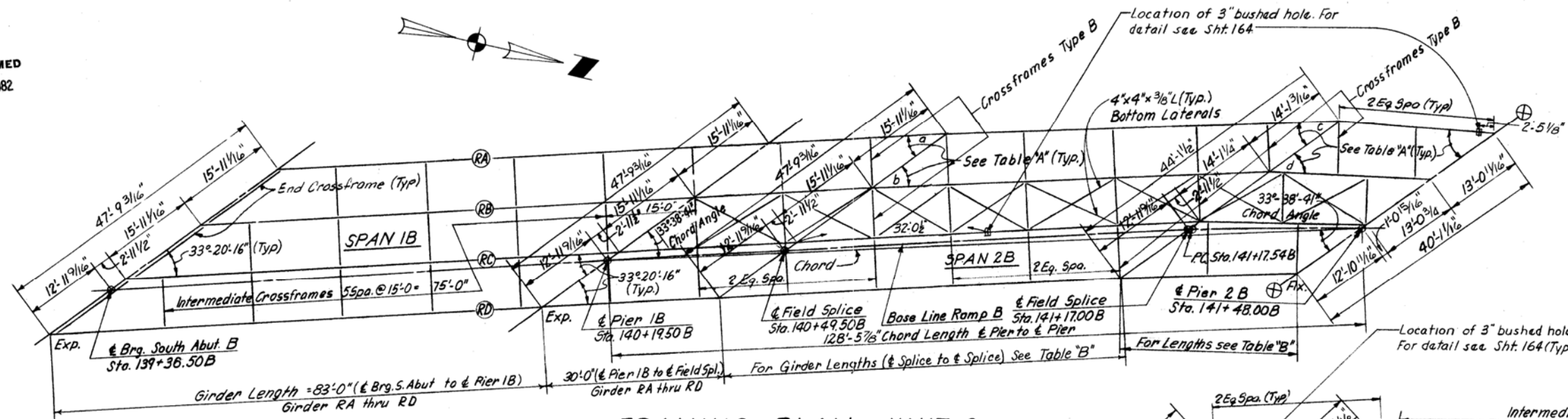
HAZELET & ERDAL CONSULTING ENGINEERS CINCINNATI, OHIO					
STRUCTURAL STEEL DETAILS					
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
TIG	WRT 10-11-65		CHP 2-9-65	JHO 3/22/65	

MICROFILMED
OCT 15 1982

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

163
210

HAM-71-1.80

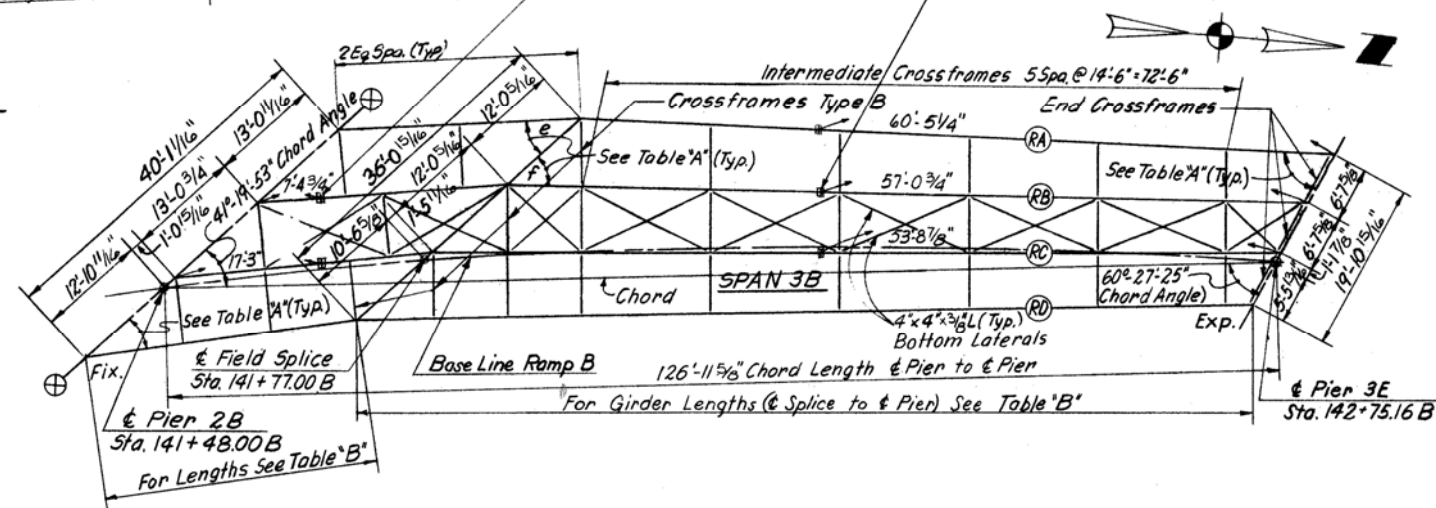
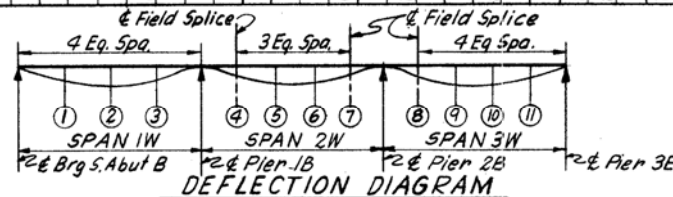


NOTE: All Crossframes are Intermediate Crossframes except those noted otherwise. Maximum Crossframe Spacing = 15'-0"

FRAMING PLAN UNIT 6
(Spans 1B thru 3B)

GIRDER	DEFLECTION AND CAMBER																					
	1B			2B			3B			RD												
LOCATION	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
Deflection due to weight of steel.	1/16	1/16	0	1/16	1/8	1/8	1/16	1/8	1/8	1/16	1/8	1/16	1/16	0	1/16	1/8	1/8	1/16	1/8	1/8	1/16	1/8
Deflection due to remaining dead load	3/16	3/16	3/16	3/16	3/8	3/8	3/16	3/8	3/8	3/16	3/8	3/16	3/16	1/2	3/16	3/8	3/8	3/16	3/8	3/8	3/16	3/8
Convexity (See Note below)	-1/2	-2 1/4	3/2	2 3/4	3 1/2	2 1/2	1/2	3/8	3/8	3/8	3/8	-1 1/2	-1 1/2	-1 1/2	-1 1/2	-1 1/2	-1 1/2	-1 1/2	-1 1/2	-1 1/2	-1 1/2	-1 1/2
Sum of deflection and convexity.	1/4	1 1/4	1 1/2	1 1/2	2 1/2	2 1/2	1/2	1 1/8	1 1/8	1/2	1 1/8	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2

NOTE: No Camber required in Spans 1B, 2B and 3B. Convexity includes variations due to superelevation, horizontal and vertical curvature.



NOTES: Web Plate is 68" x 7/16"
For Details of Bottom Laterals see Sht. No. 164
For Bearing details, see Sht. No. 166
For beam splice details, see Sht. No. 165
For inlet framing, see Sht. No. 187 & 188
For typical girder elevation and details see Sht. No. 164
For detail of end crossframes at S. Abut. B see Sht. No. 167
For detail of intermediate crossframes see Sht. No. 164
For Detail of End Crossframes at Pier 3E see Sht. No. 167 & 168
For Type B Crossframes see Sht. No. 165
South Abutment B, Pier 1B and Pier 2B and all Field Splices are parallel.

Girder	TABLE 'B'			
	Splice to Splice	Splice to Pier 2B	Pier 2B to Splice	Splice to Pier 3B
RA	64'-5 1/8"	27'-9 1/8"	27'-8 3/16"	86'-2 13/16"
RB	65'-11 7/16"	28'-7 1/16"	28'-5 1/8"	91'-10 1/4"
RC	67'-6"	29'-5 5/8"	29'-3 3/4"	97'-6 7/16"
RD	67'-6"	31'-0 1/16"	30'-10 3/4"	103'-3 3/4"

GIRDER LENGTHS

GIRDER	TABLE 'A'							
	FIELD SPLICE		FIELD SPLICE		PIER 2B	FIELD SPLICE		PIER 3E
	a	b	c	d	Span 2B	Span 3B	e	f
RA	33°-20'-16"	35°-06'-57"	35°-06'-57"	39°-14'-59"	39°-14'-59"	39°-14'-59"	39°-14'-59"	45°-35'-50"
RB	33°-20'-16"	34°-12'-19"	34°-12'-19"	37°-56'-04"	37°-56'-04"	37°-56'-04"	37°-56'-04"	43°-58'-50"
RC	33°-20'-16"	33°-20'-16"	33°-20'-16"	36°-41'-21"	36°-41'-21"	36°-41'-21"	36°-41'-21"	42°-33'-04"
RD	33°-20'-16"	33°-20'-16"	33°-20'-16"	34°-32'-10"	34°-32'-10"	34°-32'-10"	34°-32'-10"	41°-16'-58"

Angles from Girders to Piers, Brgs. or Field Splices (See Plan)

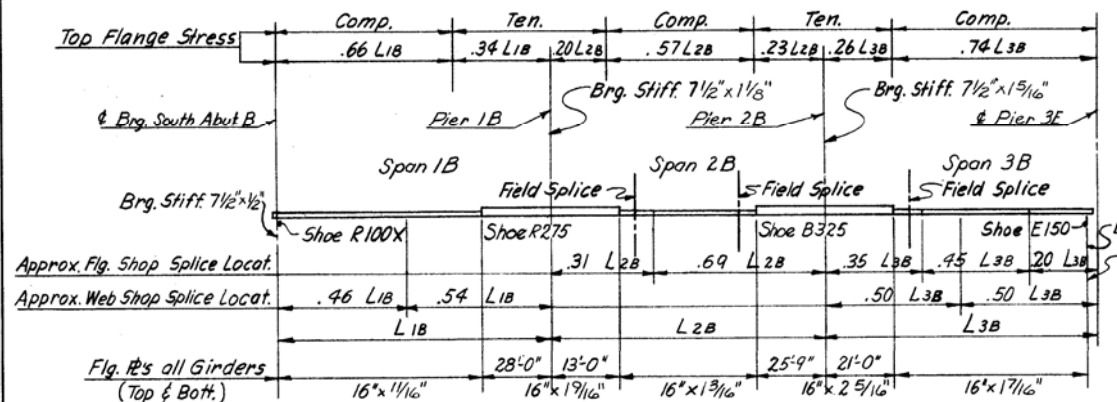
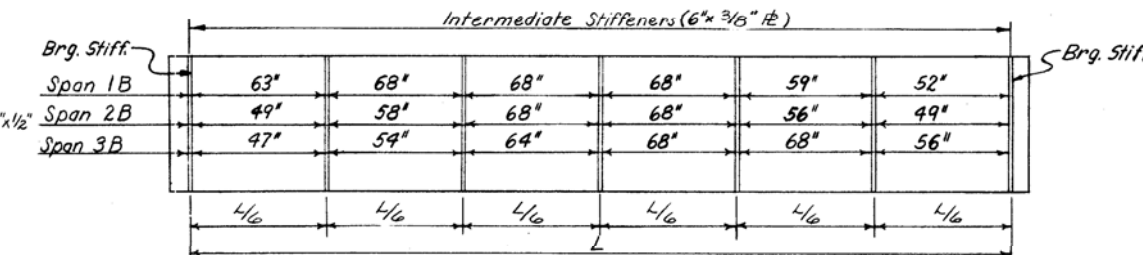


TABLE OF FLANGE PLATES AND SPLICES



MAX. INTERMEDIATE STIFFENER SPACING

NOTE: Adjust intermediate Stiffener spacing to conform to intermediate crossframe spacing.

HAZELT & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

**STRUCTURAL STEEL DETAILS
UNIT 6**

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
P.M.E.	SMH/HAS 10-16-60		Jag 2-2-65	Jito 3/22/65	

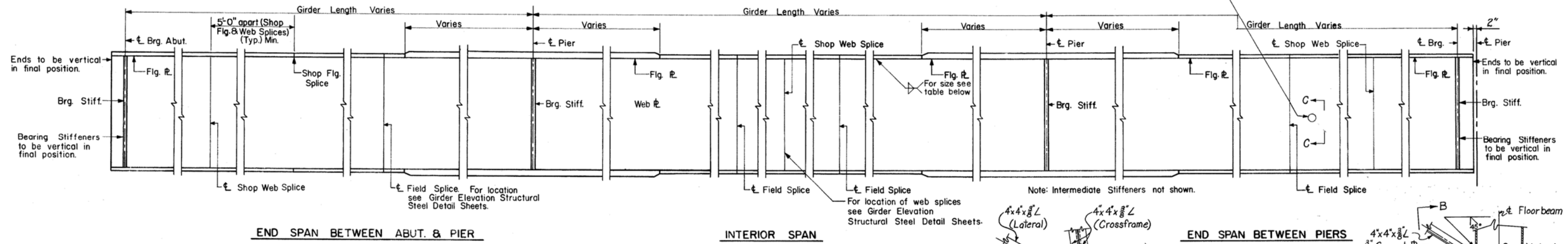
MICROFILMED
OCT 15 1982

Provide bused hole (for electric cables) located at mid-depth of web. Include with Item S-7 for payment.

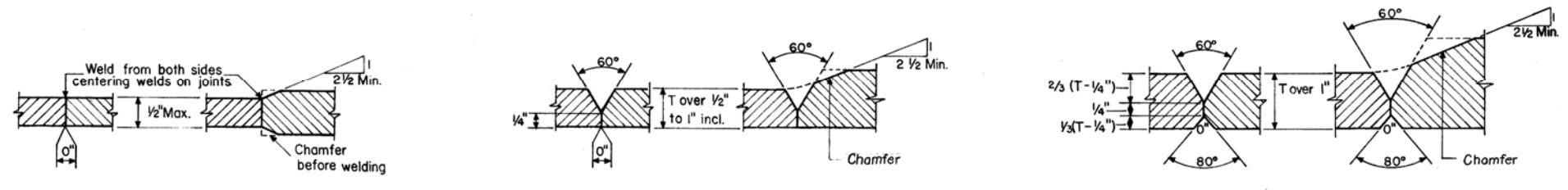
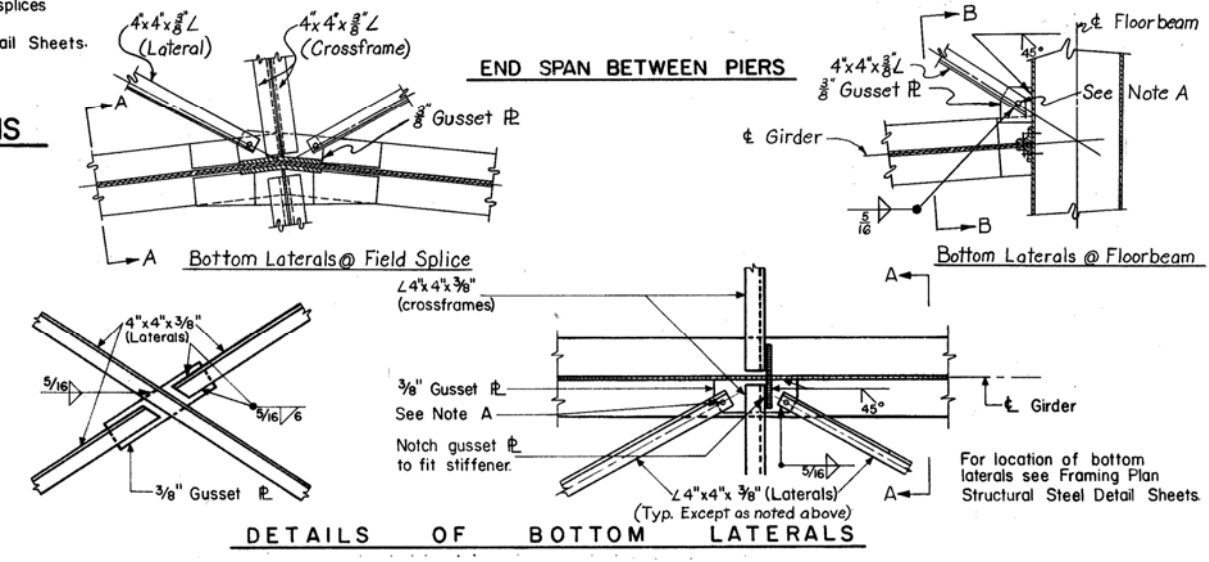
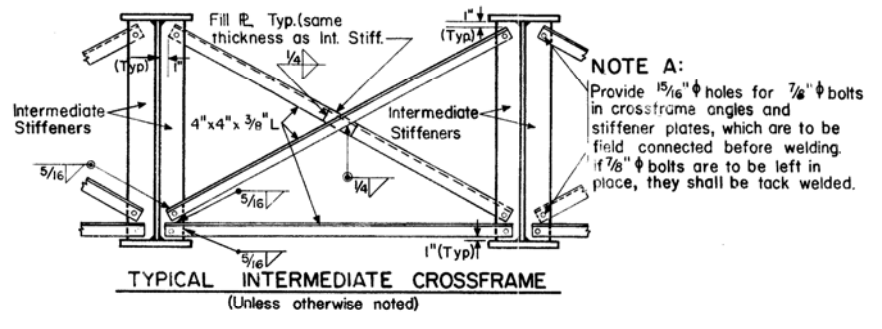
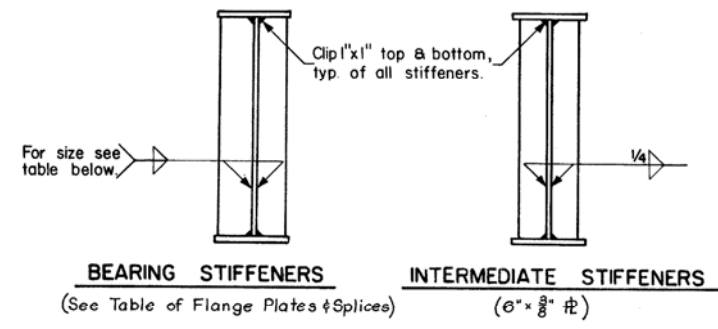
FED. RD. DIV.	STATE	PROJECT	FISCAL YEAR
2	OHIO		

HAM-71-1.80

164
210



TYPICAL PLATE GIRDER ELEVATIONS



All of the above full penetration welds shall be back-gouged and welded after welding far side.

Butt welds on beam and girder flange plates shall be ground flush, the finish grinding being parallel to the direction of stress.

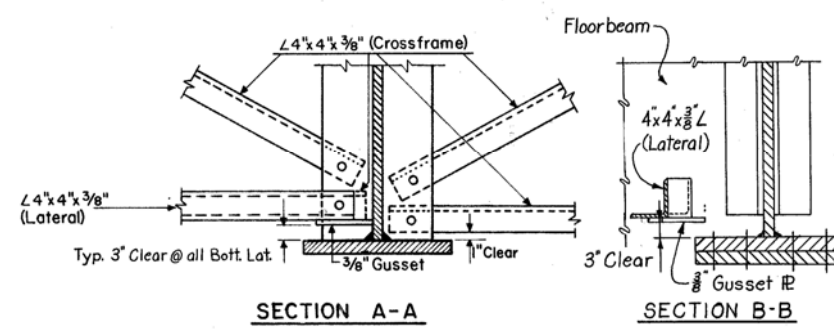


Plate Thickness	Fillet Weld Size
Up to $\frac{3}{4}"$	$\frac{1}{4}"$
Over $\frac{3}{4}"$ to $1\frac{1}{2}"$	$\frac{5}{16}"$
Over $1\frac{1}{2}"$ to $2\frac{1}{4}"$	$\frac{3}{8}"$
Over $2\frac{1}{4}"$ to $6"$	$\frac{1}{2}"$

Plate Thickness refers to the thickness of the thicker part joined.

NOTES:

Bearing Stiffeners over abutments and piers shall be grooved and fully butt-welded to the lower flange and fitted in close contact without welding to the upper flange.

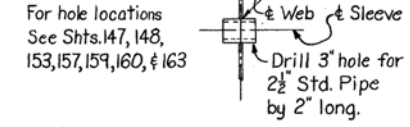
Intermediate Stiffeners shall have contact bearing with the compression flange, but may have a clearance of not more than $\frac{1}{8}"$ from the tension flange. In shop painting care shall be taken to make certain that paint is forced

through from one side to the other of the $\frac{1}{8}"$ opening.

For examination of welds for all plate girder spans see Supplemental Specification No. S-307

The contractor shall submit to the Director, for approval, 3 prints showing erection procedure for the plate girders.

Structural Steel - ASTM A36 - basic unit stress 20,000psi

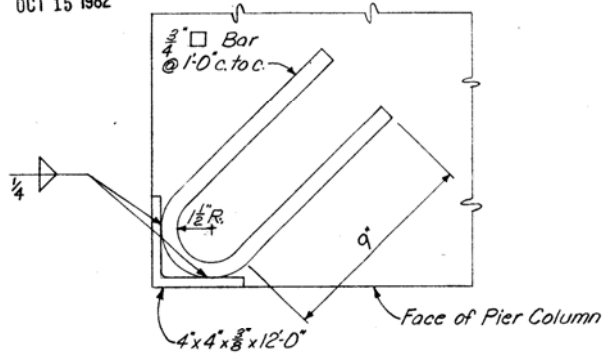


HAZELET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

TYPICAL STRUCTURAL STEEL DETAILS

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVIEWED
M.J.E.	J.H.O.			5/22/65	

MICROFILMED
OCT 15 1982

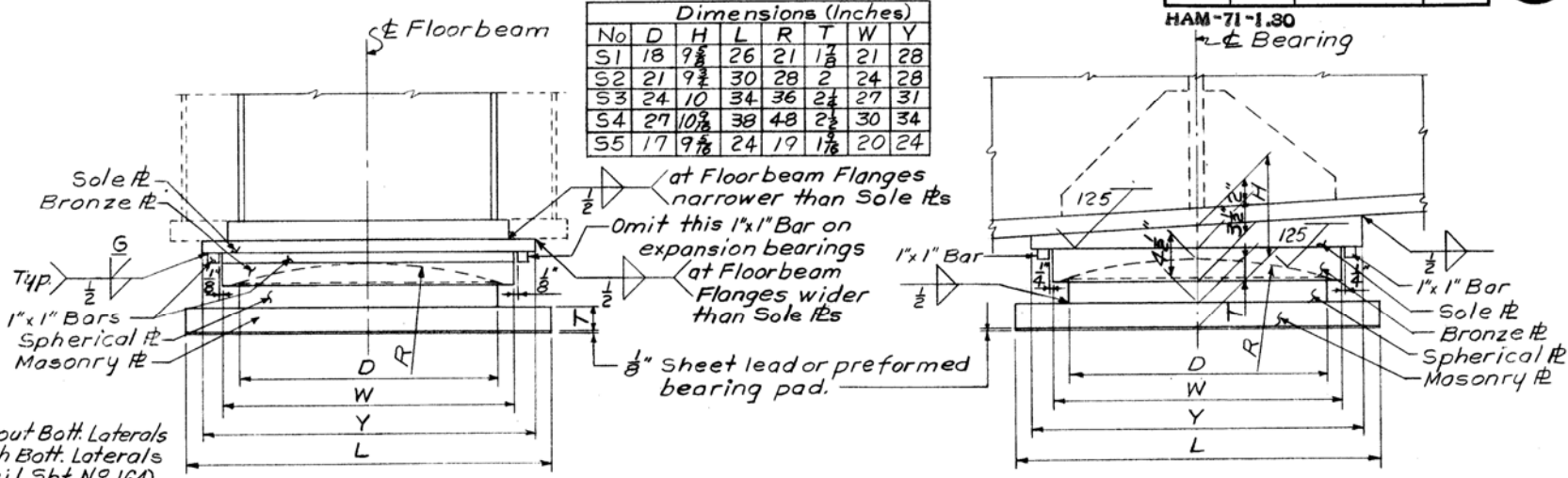


DETAIL OF ARMOR ANGLES FOR PIER COLUMNS
Included with Item S-7 for payment

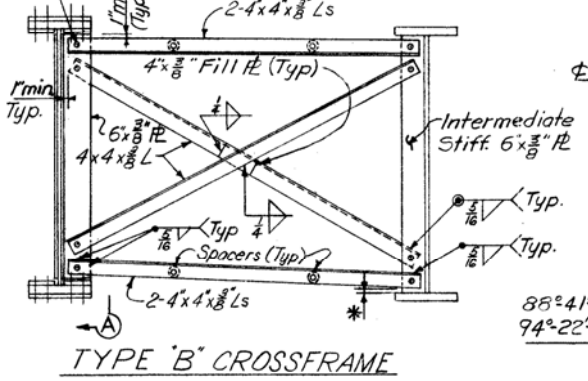
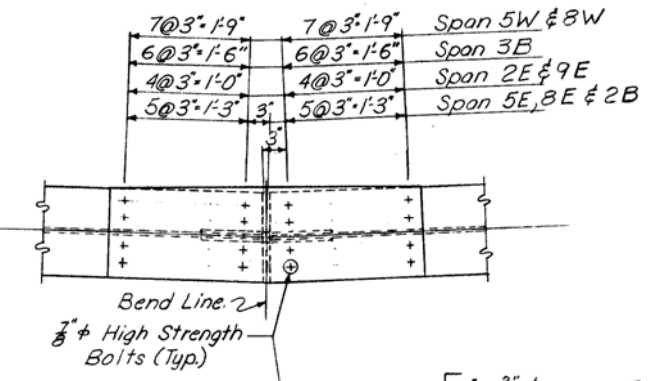
Dimensions (Inches)							
No	D	H	L	R	T	W	Y
S1	18	9 1/2	26	21	1 1/2	21	28
S2	21	9 1/2	30	28	2	24	28
S3	24	10	34	36	2 1/2	27	31
S4	27	10 1/2	38	48	2 1/2	30	34
S5	17	9 1/2	24	19	1 1/2	20	24

Note: Provide 1 1/2" holes for 7/8" bolts in crossframe angles, connector and stiffener plates, which are to be field connected before welding. If bolts are to be left in place, they shall be tack welded. (Typ. all crossframes.)

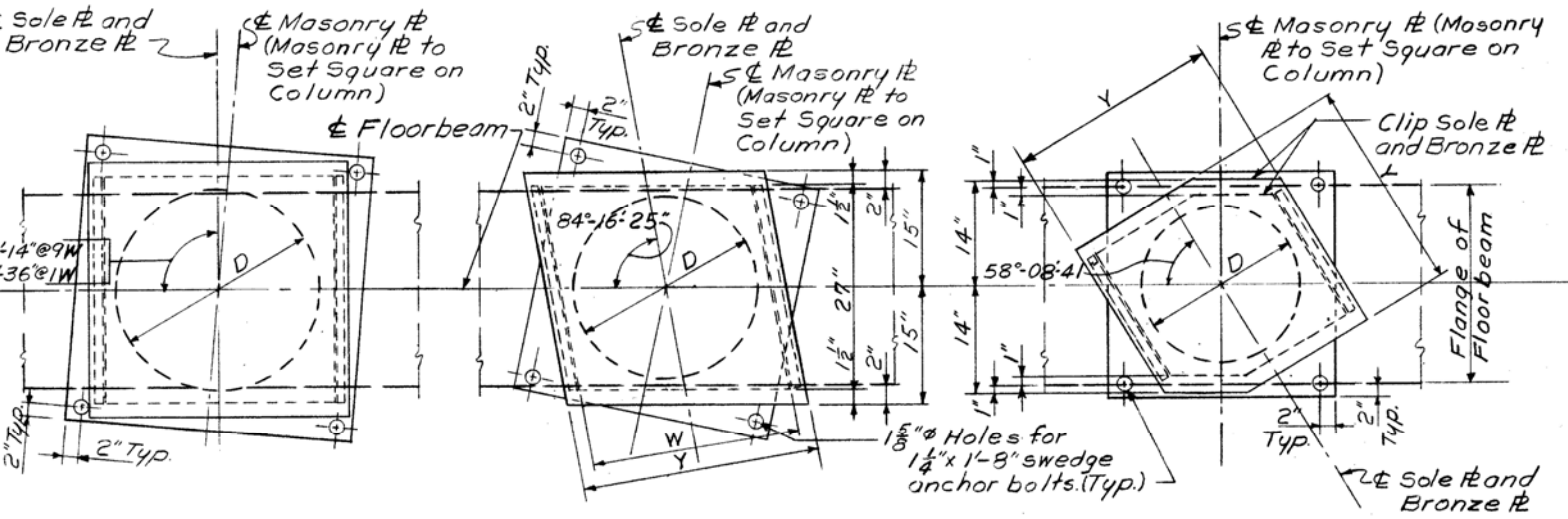
* 1" Clear with out Bott. Laterals
3/8" Clear with Bott. Laterals
(See Detail Sht. No. 164)



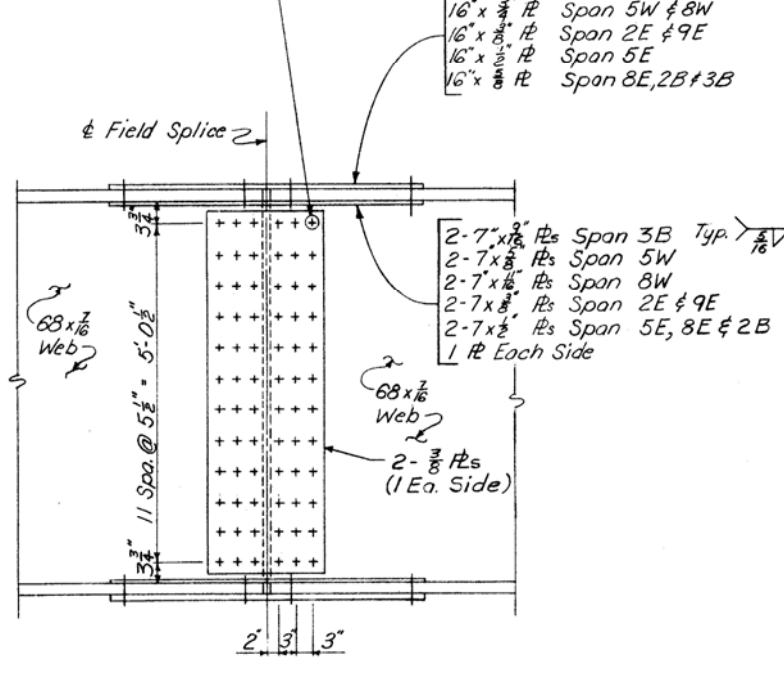
SPHERICAL BEARING DETAILS



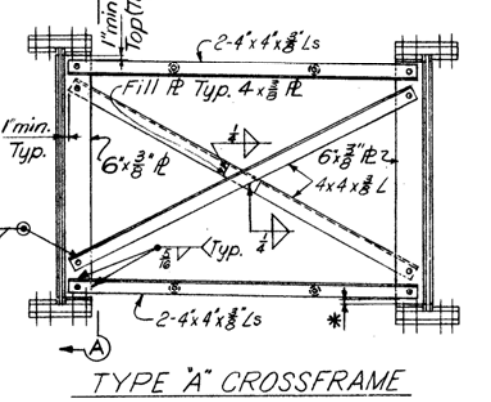
TYPE B CROSSFRAME



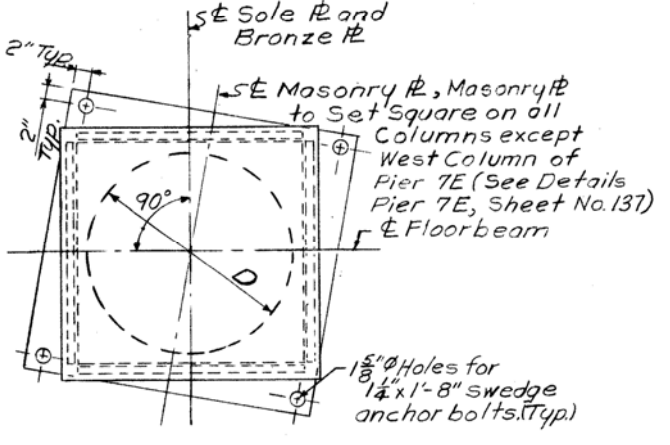
EXPANSION BEARING PLANS



FIELD SPLICE DETAIL



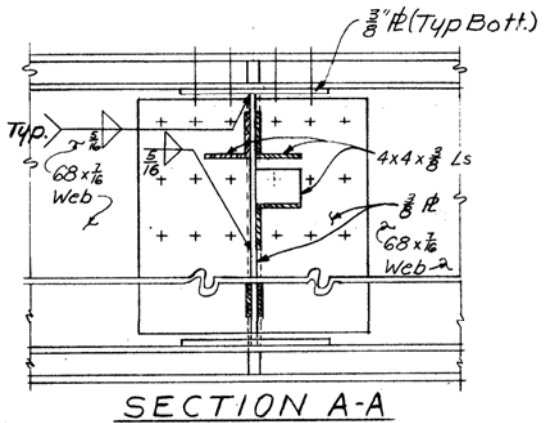
TYPE A CROSSFRAME



FIXED BEARING PLAN

Notes: For Specification for Self-Lubricating Bronze Bearing Plates see Standard Drawing FSB-1-62
For Spherical Bearing No. to be used, See Floorbeam Detail Sheets.

Note: Bottom Flange Splice Material same as Top Flange Splice Material



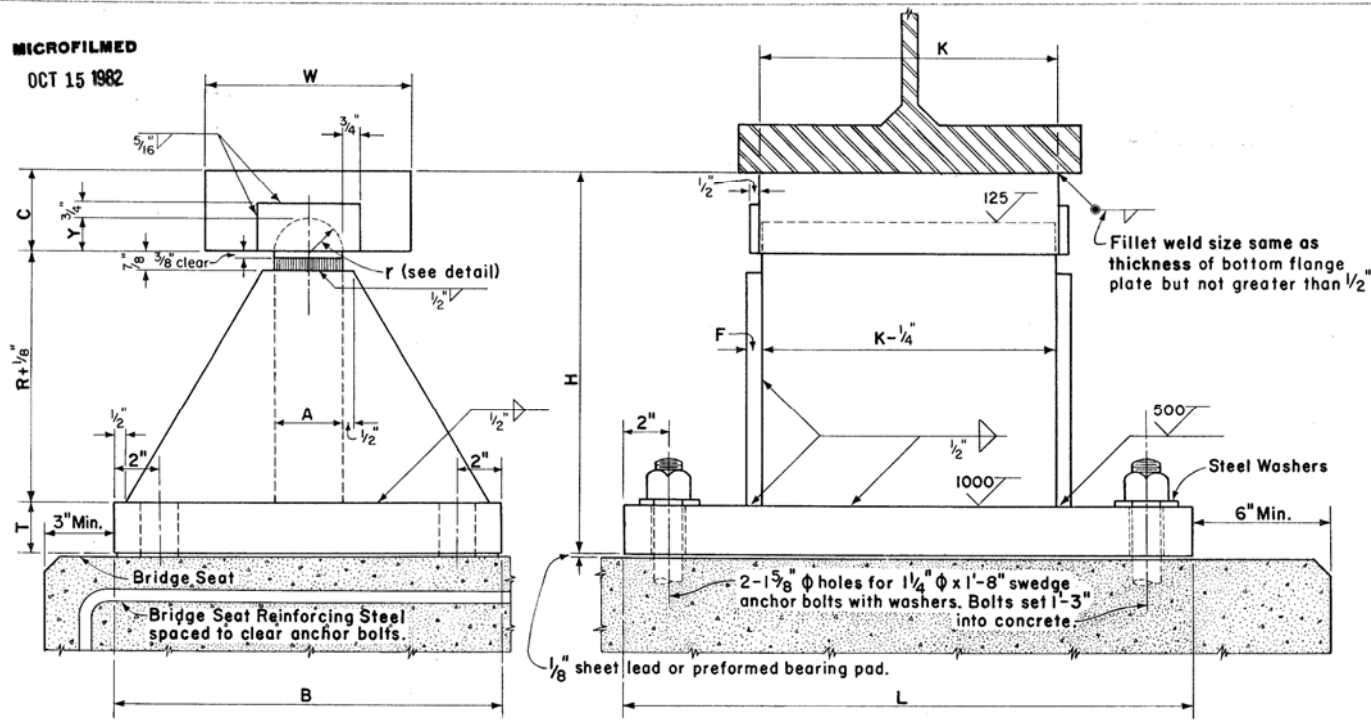
SECTION A-A

HAZLET & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

MISCELLANEOUS STRUCTURAL STEEL DETAILS

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
RBS	W.R.T.		Jaa CHH	JHO 3/22/65	

MICROFILMED
OCT 15 1982



STRUCTURAL STEEL BOLSTER
See Table below for additional dimensions.

BOLSTER NO.	ROCKER NO.	A	B	C	D	F	G	H	K	L	M	R	T	W	Y
	R 75	2 1/2	8	2 1/2	1 3/4	1/2	7	9 3/8	9	24	16	5 1/2	1 1/2	9	1 3/16
	R 100	2 1/2	10	2 1/2	2	1/2	7 1/2	10 3/8	9	25	17	6 1/2	1 1/2	9	1 3/16
	R 100X	2 1/2	15 1/2	2 1/2	2	1/2	7 1/2	10 3/8	9	19	17	6 1/2	1 1/2	9	1 3/16
	R 125	3	11	3	2	1/2	8	12 1/8	10 1/2	26	18	7 1/2	1 1/2	9	1 3/16
	R 150	3	12	3	2 1/4	1/2	8 1/2	13 3/8	11 1/2	27	19	8 1/2	1 3/4	9	1 7/16
	R 150X	3	16 1/2	3	2 1/4	1/2	8 1/2	13 3/8	11 1/2	22	19	8 1/2	1 3/4	9	1 7/16
	R 175	3	14	3 1/2	2 1/2	1/2	9	15 1/8	12	28	20	9 1/2	2	9	1 7/16
	R 225	3	17	3 1/2	2 3/4	3/8	9	16 1/8	13	25	22	11	2 1/4	9	1 7/16
	R 250	3 1/2	18	3 1/2	2 3/4	3/4	10	17 3/8	13	26	23	11 1/2	2 1/2	9	1 11/16
	R 275	3 1/2	20	3 1/2	3 1/4	3/4	12	18 3/8	14	27	24	12	2 3/4	9	1 11/16
	R 300	3 1/2	20	3 1/2	3 1/4	3/4	12	19 1/8	14	28	25	12 1/2	3	9	1 11/16
	R 325	4	21	4	3 1/2	3/4	13	20 3/8	15	29	26	13	3 1/4	9	1 15/16
	R 375	4	23	4 1/2	3 3/4	7/8	14	22 3/8	17	31	28	14	3 3/4	9	2 3/16
	B 325	4	21	4	3/4	3/4	12	20 3/8	15	29	13	3 1/4	9	1 11/16	1 1/8
	B 375	4	23	4 1/2	1/8	3/4	12	20 3/8	17	31	12	3 3/4	9	2 3/16	1 1/8

ROCKER NO.	R	H
R 100 A	7 13/16	11 15/16
R 100 B	7 13/16	11 15/16
R 100 C	7 7/8	12
R 100 D	7 15/16	12 1/16
R 100 E	8	12 1/8
R 100 F	7 15/16	12 1/16

Dimensions not shown above are the same as R 100

ROCKER NO.	R	H
R 75 G	14 1/16	18 3/16
R 75 H	14 1/16	18 3/16
R 75 J	14 3/8	18 1/2
R 75 K	14 3/8	18 1/2
R 75 L	14 5/8	18 3/4
R 75 M	14 3/8	18 3/4
R 75 N	14 3/8	19
R 75 P	14 13/16	18 9/16

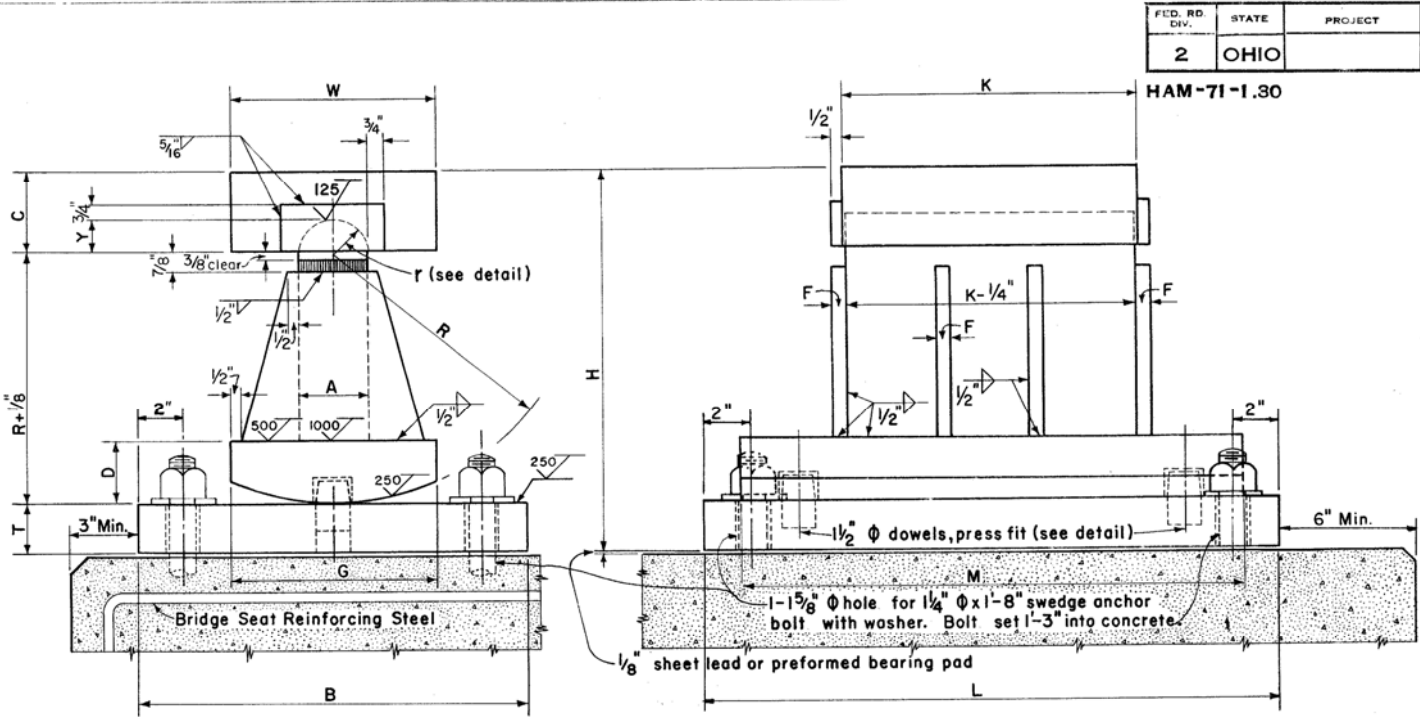
Dimensions not shown above are the same as R 75

BEARING NO.	V	Y
E 150 G	3 1/8	5 1/2
E 150 H	2	4 3/8
E 150 J	2	4 3/8
E 150 K	2	4 3/8
E 150 L	2	4 3/8
E 150 M	6 5/16	8 1/16
E 150 N	2 5/16	5 3/16
E 150 P	6 1/4	8 5/8

Dimensions not shown above are the same as E 150. See standard drawing No. FSB-1-62

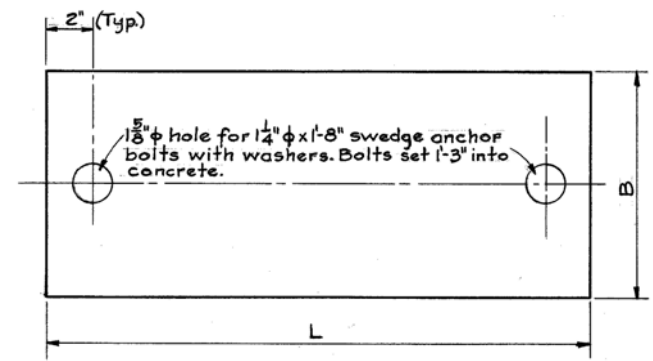
BEARING NO.	V	Y
E 100 G	2	4 3/8
E 100 H	2 5/16	4 11/16
E 100 J	3 3/4	6 1/8
E 100 K	2	4 3/8
E 100 L	2	4 3/8
E 100 M	2	4 3/8
E 100 N	7 15/16	10 3/16

Dimensions not shown above are the same as E 100

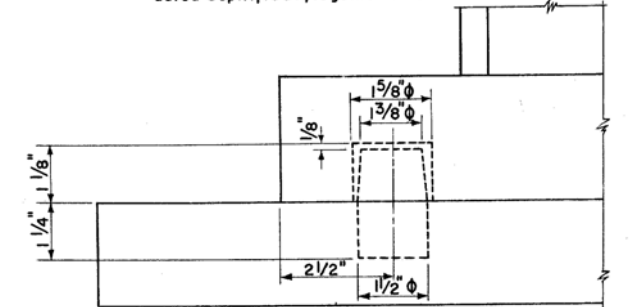


STRUCTURAL STEEL ROCKER
See Table below for additional dimensions.

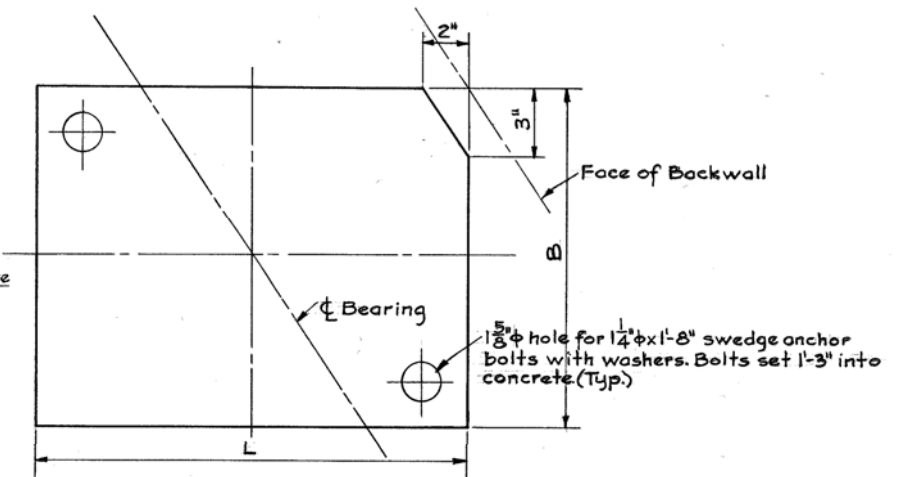
Design Specifications: This drawing conforms to the requirements of "Design Specifications for Highway Structures" of the State of Ohio, Department of Highways, dated Sept. 1, 1957, together with revisions thereof dated Feb. 21, 1958.



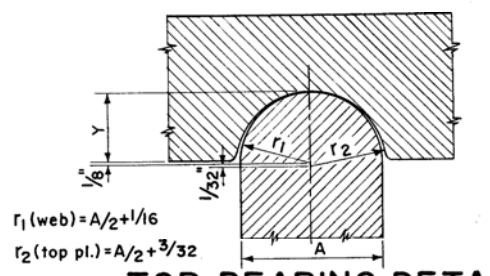
SPECIAL MASONRY PLATE FOR STRUCTURAL STEEL ROCKERS
(Use for Rockers R 75, R 100, R 125, R 150, R 150A thru R 150F and R 175 G thru R 175P)



DOWEL DETAIL



MASONRY PLATE R100X AT SOUTH ABUTMENT B



TOP BEARING DETAIL

HAZELT & ERDAL
CONSULTING ENGINEERS
CINCINNATI, OHIO

ROCKERS AND BOLSTERS

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED DATE	REVISED
	LMH		058 8-10-65	JHO 3/22/65	10-2-65