# Anamosa Dillion Military (Cemetery) Road Bridge

# Anamosa, Iowa


# 2024 Bridge Inspection Report

Bridge Inspection By: Modjeski and Masters, Inc.

Bridge Inspection Report By: Michael S. Januszkiewicz, P.E. and Shane D. Stauffer

June 30, 2024

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Expires 12/31/25

# Bridge Inspection Summary

An inspection of the Anamosa Dillion Military (Cemetery) Road Bridge over the Wapsipinicon River located in Anamosa, IA was performed by Modjeski and Masters, Inc. (MM) under contract with the City of Anamosa as a subconsultant to HR Green, Inc. The inspection field work was performed from May 21 to May 24, 2024 by Messrs. M.S. Januszkiewicz, P.E. and S.D. Stauffer. Mr. D.W. Petermeier, P.E., S.E. was available for consultation during the field work, as well as report preparation. The inspection included a condition inspection of the overall structure to document structural defects, the collection of dimensions and details for the structure sufficient to perform potential subsequent load capacity ratings, and the performance of non-destructive ultrasonic testing (UT) of the truss bridge pins. The inspection was performed utilizing standard walking access, fall arrest access, and technical access climbing.

The bridge consists of a 167.5-foot single span pin connected Pratt truss supported by stone masonry abutments (see Photograph Nos. 1 thru 7 for typical structure photos). The bridge was previously utilized to convey pedestrian/bicycle traffic across the river; however, the bridge is currently closed to all traffic. The principal purpose of this inspection was to evaluate the structure for potential rehabilitation and reopening to pedestrian/bicycle traffic.

Existing plans and/or prior inspection reports for the structure were not available. For the purpose of this report, the bridge is orientated from south to north. The truss panel points / vertical members of the truss and floorbeams are numbered 0 through 10 increasing from south to north. The truss panels are numbered 1 through 10 from south to north (i.e., Panel Points 0 to 1 would equal Panel 1). The upper chord truss joints are designated with a U and the lower chord truss joints are designated with an L; thus, L5E is the lower chord truss joint at Panel Point 5 of the east truss line.

The following report includes a general discussion of the structure and its overall conditions, an itemized log of noted structural deficiencies, and a photograph log of overall conditions and representative deficiencies. Dimensional and detail sketches of the structure are included within Appendix A.

## General Truss Findings:

The top chords, end posts and verticals are built-up steel members, whereas the bottom chords, diagonals and lateral bracing members are pin connected eyebars. The truss members are in overall fair condition; however, the bridge pin connections are in poor condition (see the following section).

The truss metalwork typically exhibits paint failure with surface corrosion throughout. Crevice corrosion was observed throughout several top chord connection plates causing corrosion induced cracks. The bottom chord eyebars exhibit isolated areas of impact damage from apparent flood events. Several of the bridge pins exhibit surface cracks (U1W, L4W, U5W, U6W and L9E).

The upper and lower lateral bracing throughout is typically in satisfactory condition. The lower lateral bracing exhibits isolated areas of impact damage from apparent flood events.

The truss bearings are comprised of two fixed bearings at the North Abutment and two roller-type bearings at the South Abutment. The fixed bearings were not accessible due to dense vegetation.

The east roller retainer bar of the southeast roller bearing is displaced at the inboard and outboard ends allowing one roller to be completely displaced from the assembly and the remaining rollers to be misaligned. At the southwest roller bearing, the north roller is completely exposed and not bearing any load. The South Abutment bearings both have dirt and debris washed into the bearings.

Truss Bridge Pin Findings:

A detailed visual inspection of all 40 bridge pins was performed, as well as the UT inspection of 22 bridge pins. The UT inspection was conducted by Mr. M.S. Januszkiewicz, UT Level II. The UT inspection was conducted in accordance with the FHWA Guidelines for Ultrasonic Inspection of Bridge Pins and Modjeski and Masters' Ultrasonic Testing Procedure for the Inspection of Bridge Pins using the ultrasonic pulse-echo technique.

The UT inspection of the bridge pins was performed with the use of a GE/Krautkramer USM-Go portable ultrasonic flaw detector. The primary transducer used was a 0-degree 2.25 MHz, 0.50" diameter longitudinal wave transducer. Additional available transducers included a 2.25 MHz 0.50" diameter QC transducer and a 5.0 MHz, 0.50" diameter QC transducer with 45-degree, 12-degree, 5-degree and 20"-radius rocker wedges; and a 0-degree Krautkramer 5.0 MHz, 0.50" diameter longitudinal wave transducer.

The truss bridge pins are shouldered pins of various lengths (10" to 17" depending on location within the truss). Each pin face was cleaned with 60 and 80-grit sanding disks on a 4-1/2" angle grinder prior to UT inspection.

The bridge pin assemblies were initially visually inspected revealing the following:

- The bridge pins appear to be in good to satisfactory condition.
- Surface defects are apparent on the exposed end faces of all bridge pins (likely due to porosity and/or inclusions from the original fabrication of the bridge pins). Some of these surface defects are over 1/8" deep.
- Hammer marks and gouges exist in numerous pin faces but are difficult to distinguish from the porosity defects that are typical throughout.
- Fretting corrosion was not noted at any of the truss joints.
- All bridge pins appeared to be tight in their respective joints with no apparent movement or shifting of the pins within the joints.
- Once the paint was removed from the pin faces, visual cracks were revealed in five pins (U1W, L4W, U5W, U6W and L9E). These cracks are extremely tight with no fretting corrosion and they were not evident prior to removal of the paint. It seems likely that these cracks have existed for quite some time. Due to the fact that the paint was not cracked and that there isn't any fretting corrosion at the crack surfaces, these cracks appear to be inactive.

The UT inspection of the bridge pins revealed the following:

- There is an extreme amount of attenuation (dampening and scattering of sound due to a coarse grain microstructure and/or improper heat treatment processes employed during the formation of the bridge pins). The extreme amount of attenuation and the likely existence of numerous internal defects makes it impossible to ultrasonically "view" the entire volume of the various pins.
- Backwall measurements (pin lengths) could be identified for 21 of the 22 bridge pins examined with UT. Typically, backwall measurements could not be made throughout the

full circumference of each pin, but could be found from isolated locations on the various pin faces.

- Of the five bridge pins noted with visual cracks, a backwall signal could be found for each pin; thus, it appears that the visual cracks are likely isolated within a portion of the volume of each of the five pins.
- A-scans (UT machine screen shots) of a typical shouldered bridge pin versus the bridge pins of this structure with the extreme attenuation are included within Appendix B.

Although the bridge pins and their respective truss joints appear stable and tight with minimal wear or corrosion, there are five pins noted with visual cracks (U1W, U5W, U6W, L4W & L9E). Due to the nature of the extreme ultrasonic attenuation and the finding of five pins with visual cracks, the bridge pins are in poor condition. It is recommended that the bridge remain closed to any public traffic (pedestrian or otherwise).

General Floorsystem Findings:

The floorsystem consists of 13 timber stringers supported by timber end floorbeams at each abutment and steel built-up interior floorbeams throughout the span. The floorsystem is generally in satisfactory condition.

The timber stringers and end floorbeams typically exhibit minor checks and algae build-up. The timber floorbeams at each end are partially buried and can only be viewed from the face of the respective abutments. The exposed portions of each timber floorbeam appear to be intact with minor decay.

The steel built-up interior floorbeams connect to the truss vertical members via a square-stock U-bolt at each end of the floorbeam that is suspended from the lower chord bridge pin. The floorbeams exhibit paint failure with surface corrosion throughout with minimal section loss. There are isolated areas of crevice corrosion between the built-up plates/angles. The west end of several floorbeams exhibit impact damage from apparent flood events. The floorbeam-to-truss connections are in good condition; however, several of the spacer plates at the bottom of the floorbeam connections are cracked with portions missing.

General Deck Findings:

The deck consists of timber planking that is generally in fair condition with isolated areas in poor condition. Planks exhibit areas of checking, decay and advanced section loss throughout.

The bridge railing consists of steel chainlink fencing attached to the truss and floorsystem with welds and to the deck with U-shaped fasteners. The welds are located along the top rail and at the base of some railing posts. There are a total of 19 truss verticals, 1 truss diagonal eyebar, and 3 floorbeams with welded connections. Several of these welds are cracked, but none of the cracks appear to propagate into the base metal of the truss member or floorbeam.

General Substructure Findings:

The north and south abutments are constructed with stone masonry and are in overall poor condition. At the North Abutment, there is excessive vegetation and trees that prevented complete access. The North Abutment is missing mortar between all the masonry stones and there is one small 3” diameter tree growing from the mortar joint below the east truss line. The

South Abutment is also missing mortar between all of the masonry stones. At the interface between the west end of the South Abutment and the South Abutment's west wingwall, most of the masonry stones are partially displaced and a few large stones are missing. The South Abutment also exhibits minor vegetation growth, as well as evidence of previous plant debris and root systems throughout the abutment. Finally, the South Abutment may be susceptible to scour due to the flow of water and angle of attack being focused in this area; the presence of scour conditions could not be assessed during the inspection due to high flow of the river.

Conclusions and Recommendations:

A summary of the structure's overall conditions are as follows:

- Truss members – Fair
- Truss pins – Poor
- Truss expansion bearings – Poor
- Floorsystem – Satisfactory
- Deck – Fair (isolated Poor)
- Rail / Fence – Poor
- Substructure – Poor

The truss members, floorsystem and deck are in reasonable condition and could be rehabilitated for the continued use of the structure. However, the poor conditions of the truss pins and expansion bearings would require their replacement for continued use. The poor condition of the substructure would require extensive rehabilitation of the abutments (likely encasement) to extend their expected life. If the bridge were to be reopened for pedestrian access, the timber deck would likely require rehabilitation, if not replacement, and the existing rail / fence should be replaced with an appropriate pedestrian / bicycle railing system.

Due to the uncertainty of the internal conditions of the truss pins, the bridge should remain closed to public access.

Rehabilitation and/or replacement of the above noted components would be cost prohibitive and structure replacement is recommended.

| TABLE OF DEFICIENCIES<br>Anamosa Dillion Military (Cemetery) Road Bridge<br>May 24, 2024 | | | |
|---|---|---|---|
| **Location(s)** | **Member(s)** | **Photo(s)** | **Deficiency(ies)** |
| U1W | Truss, Upper Pin | 8 | Crack in pin face |
| L4W | Truss, Lower Pin | 9 | Crack in pin face |
| U5W | Truss, Upper Pin | 10 | 2 Cracks in pin face and surface pitting |
| U6W | Truss, Upper Pin | 11 | Crack in pin face |
| L9E | Truss, Lower Pin | 12 | Crack in pin face |
| L9W | Truss, Lower Pin | 13 | Typical pin face; surface deterioration |
| U4W | Truss, Top Chord Connection Plate | | 3/4" Crevice corrosion; one 2 1/4" corrosion induced crack |
| U6W | Truss, Top Chord Connection Plate | | 3/4" Crevice corrosion; 2 corrosion induced cracks on south side of plate, one 2" long and one 1 1/2" long |
| U7W | Truss, Top Chord Connection Plate | | 1 1/4" Crevice corrosion |
| U8W | Truss, Top Chord Connection Plate | | 1 1/4" Crevice corrosion |
| U4E | Truss, Top Chord Connection Plate | 14 | 3/4" Crevice corrosion;<br>4 corrosion induced cracks - one 5 1/2" long crack and one 1" long crack on the north, and one 2 1/4" long crack and one 1" long crack on south side of plate |
| U6E | Truss, Top Chord Connection Plate | | 3/4" Crevice corrosion; 2 corrosion induced cracks on south side of plate; one crack 2 3/8" long and one crack 1 13/16" long |
| U8E | Truss, Top Chord Connection Plate | | 3/4" Crevice corrosion; 1 corrosion induced crack on south side of plate 1" long |
| U4E-U5E,<br>Panel 5 | Truss, Top Chord | 15 | 3 1/4" long x 1/4” wide area of section loss |
| U1W-L1W | Truss, Vertical Eyebar | 16 | Northward deformation of vertical member by 2" |
| Panel 1 to Panel 5 | Truss, West Bottom Chord Eyebars | 17, 18 | Downward and eastward deformation exhibited from impact damage |
| Panel 3 | Truss, Lower Lateral Bracing | 19 | Impact damage; approximately 6" upward |
| Panel 4 | Truss, Lower Lateral Bracing | | Impact damage (deformation) |
| Panel 5 | Truss, Lower Lateral Bracing | 20 | Impact damage; approximately 3" downward |
| L3W | Truss, Vertical Built-Up C-Channel | 21 | Flange angle sheared and bent for 4” from impact damage |
| L4W | Truss, Eyebar / Pin Assembly | 22 | 1/4" Crevice corrosion typical of western lower pin assemblies |

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| **Location(s)** | **Member(s)** | **Photo(s)** | **Deficiency(ies)** |
| L4E, Panel 4 | Truss, Bottom Chord | 23 | Log lodged between easternmost stringer and bottom chord at 4E Floorbeam |
| 10E and 10W, Panel 10 | Truss End Posts | 1 | Vegetation growth through Truss End Posts on both the east and west members |
| L2W | Floorbeam | 24 | Downward and northward deformation from impact damage |
| L2W | Floorbeam, Southwest Side - Top Flange | 25 | Impact damage (deformation) |
| L3W | Floorbeam, Southwest Flange | 26 | Sheared rivet from impact damage |
| L4W | Floorbeam, Southwest Side Flange | 27 | Eastward deformation from impact damage |
| L5W | Floorbeam, Southwest Side Flange | 28 | Sheared flange from impact damage |
| 4W, Panel 5 | Floorbeam, Web Connection Plate | 29 | 3/4" Crevice corrosion; typical throughout |
| L4E | Floorbeam, East U-Bolt to Floorbeam Connection | 30 | Spacer plate cracked on south side of Floorbeam |
| L8W | Floorbeam, West U-Bolt to Floorbeam Connection | 31 | Spacer plate deterioration greater than 75% |
| 1E, 9E, 9W | Fence Rail Post / Floorbeam | 32 | Fence rail post welded to floorbeam; cracked weld at 1E |
| 0W-8W, 10W, 0E, 2E-8E, 10E | Top Fence Rail / Vertical Members | 33, 34, 35 | Top fence rail welded to vertical members |
| Panel 2 | Deck | 36 | 100% Section loss 1 1/2" long x 2" wide |
| South Abutment | East Roller Bearing | 37 | Roller retaining bar and roller displaced |
| South Abutment | West Roller Bearing | 38 | Roller exposed; not bearing load |
| South Abutment | West Wingwall | 39 | Missing stones from West Wingwall and South Abutment interface |
| South Abutment | North Face | 40 | Vegetation growth |
| North Abutment | West Wingwall | 41 | Vegetation growth |
| North Abutment | South Face | 42 | Vegetation growth |

PHOTO 01 WEST ELEVATION

PHOTO 02 EAST ELEVATION

PHOTO 03 TYPICAL SECTION, LOOKING NORTH


PHOTO 04 UPPER TRUSS (PANELS 5-10), LOOKING NORTH

PHOTO 05 TYPICAL UPPER TRUSS JOINT (U7W)

PHOTO 06 TYPICAL LOWER TRUSS JOINT (L4W)

PHOTO 07 TYPICAL FLOORSYSTEM (PANELS 9-10), LOOKING SOUTHEAST


PHOTO 08 U1W – TRUSS, UPPER PIN

| | |
|---|---|
| PHOTO 09 | L4W – TRUSS, LOWER PIN |

| | |
|---|---|
| PHOTO 10 | U5W – TRUSS, UPPER PIN |


PHOTO 11 U6W – TRUSS, UPPER PIN

PHOTO 12 L9E – TRUSS, LOWER PIN

PHOTO 13 L9W – TRUSS, LOWER PIN

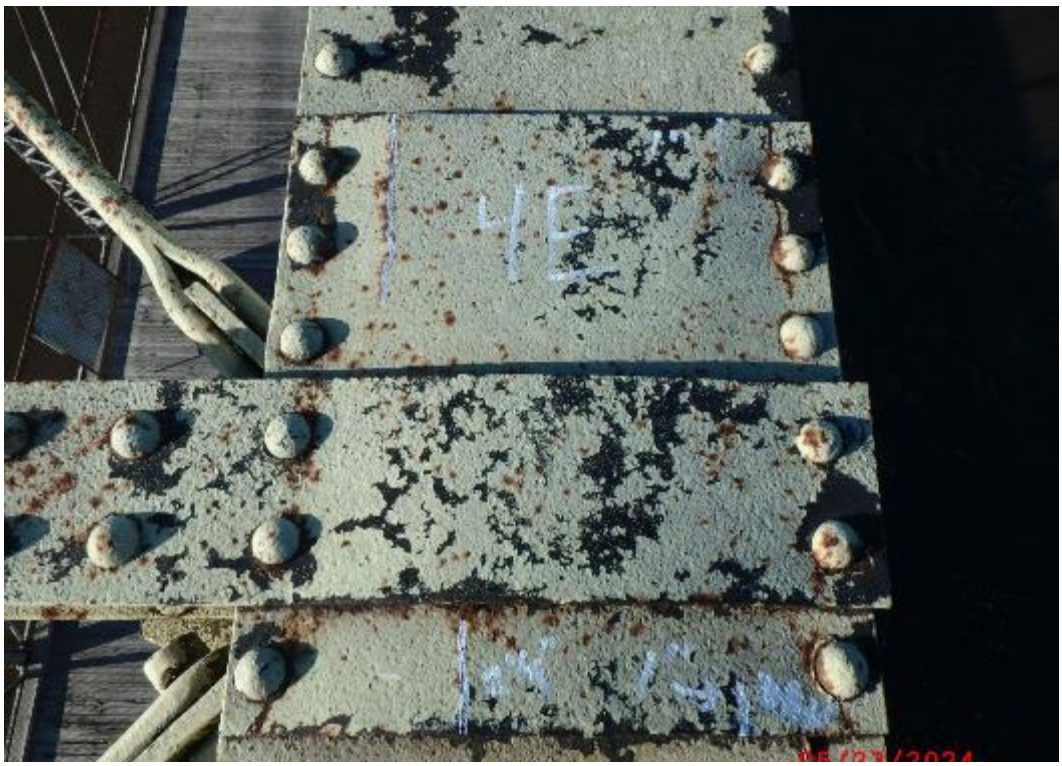



PHOTO 14 U4E – TRUSS, TOP CHORD CONNECTION PLATE

PHOTO 15 U4E-U5E, PANEL 5 – TRUSS TOP CHORD

PHOTO 16 U1W-L1W – TRUSS, VERTICAL EYEBAR

PHOTO 17 PANEL 1 – TRUSS, WEST BOTTOM CHORD EYEBARS

PHOTO 18 PANELS 1-5 – TRUSS, WEST BOTTOM CHORD EYEBARS


PHOTO 19 PANEL 3 – TRUSS, LOWER LATERAL BRACING


PHOTO 20 PANEL 5 – TRUSS, LOWER LATERAL BRACING

PHOTO 21 L3W – TRUSS, VERTICAL BUILT-UP C-CHANNEL

PHOTO 22 L4W – TRUSS, EYEBAR / PIN ASSEMBLY

PHOTO 23 L4E, PANEL 4 – TRUSS, BOTTOM CHORD

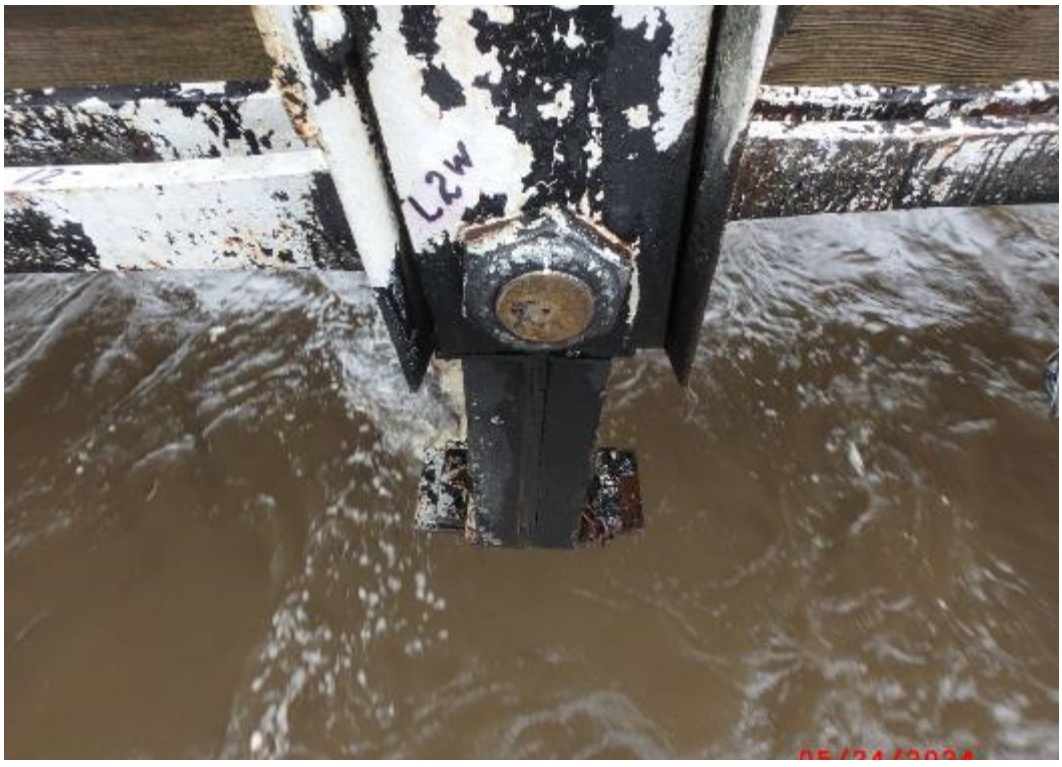



PHOTO 24 L2W – FLOORBEAM


PHOTO 25 L2W – FLOORBEAM SOUTHWEST, TOP FLANGE

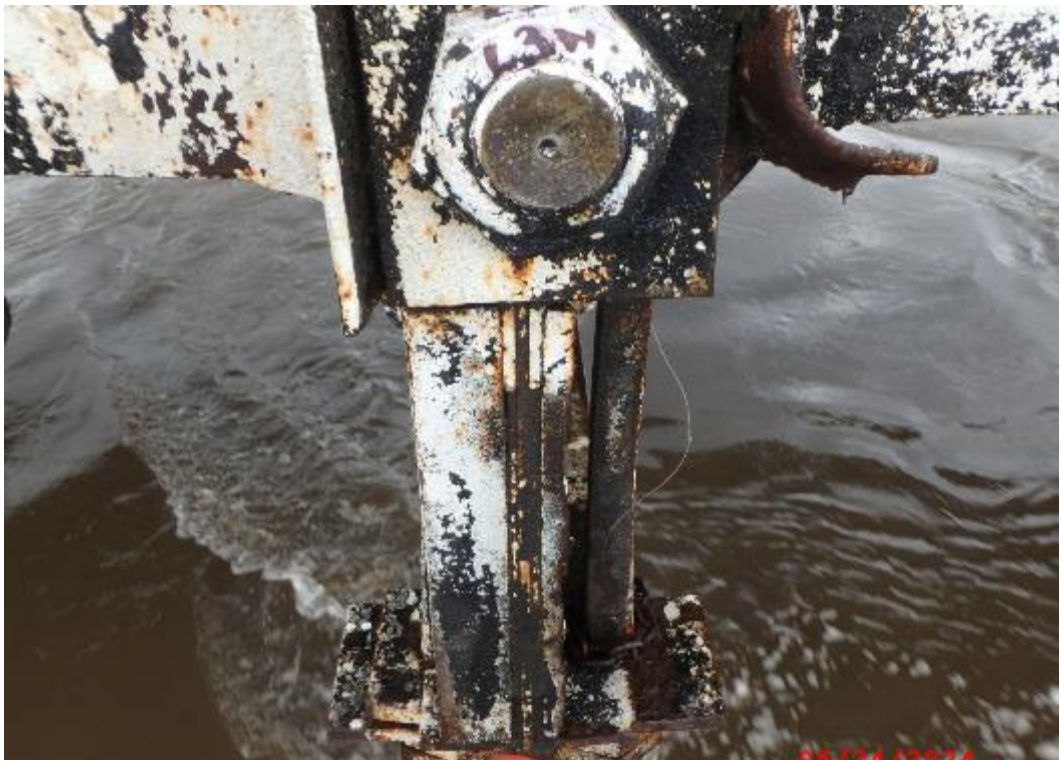



PHOTO 26 L3W – FLOORBEAM, SOUTHWEST FLANGE


PHOTO 27 L4W – FLOORBEAM, SOUTHWEST FLANGE

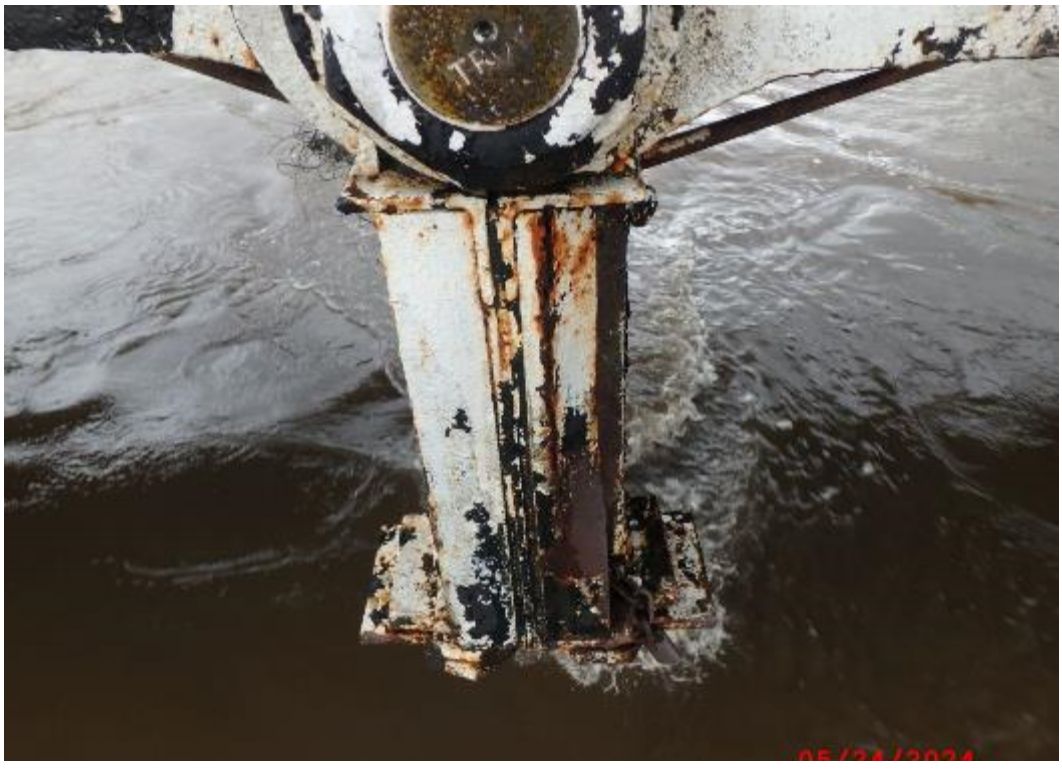


PHOTO 28 L5W – FLOORBEAM, SOUTHWEST FLANGE


PHOTO 29 4W, PANEL 5 – FLOORBEAM, WEB CONNECTION PLATE

PHOTO 30 L4E – FLOORBEAM, EAST U-BOLT SPACER PLATE

PHOTO 31 L8W – FLOORBEAM, WEST U-BOLT SPACER PLATE

PHOTO 32 1E – FLOORBEAM, RAILING POST


PHOTO 33 1W – FENCE RAILING

PHOTO 34 3E – FENCE RAILING

| | |
|---|---|
| PHOTO 35 | OW – FENCE RAILING |

| | |
|---|---|
| PHOTO 36 | PANEL 2 - DECK |

PHOTO 37 SOUTH ABUTMENT – EAST ROLLER BEARING

PHOTO 38 SOUTH ABUTMENT – WEST ROLLER BEARING

PHOTO 39 SOUTH ABUTMENT – WEST WINGWALL

PHOTO 40 SOUTH ABUTMENT

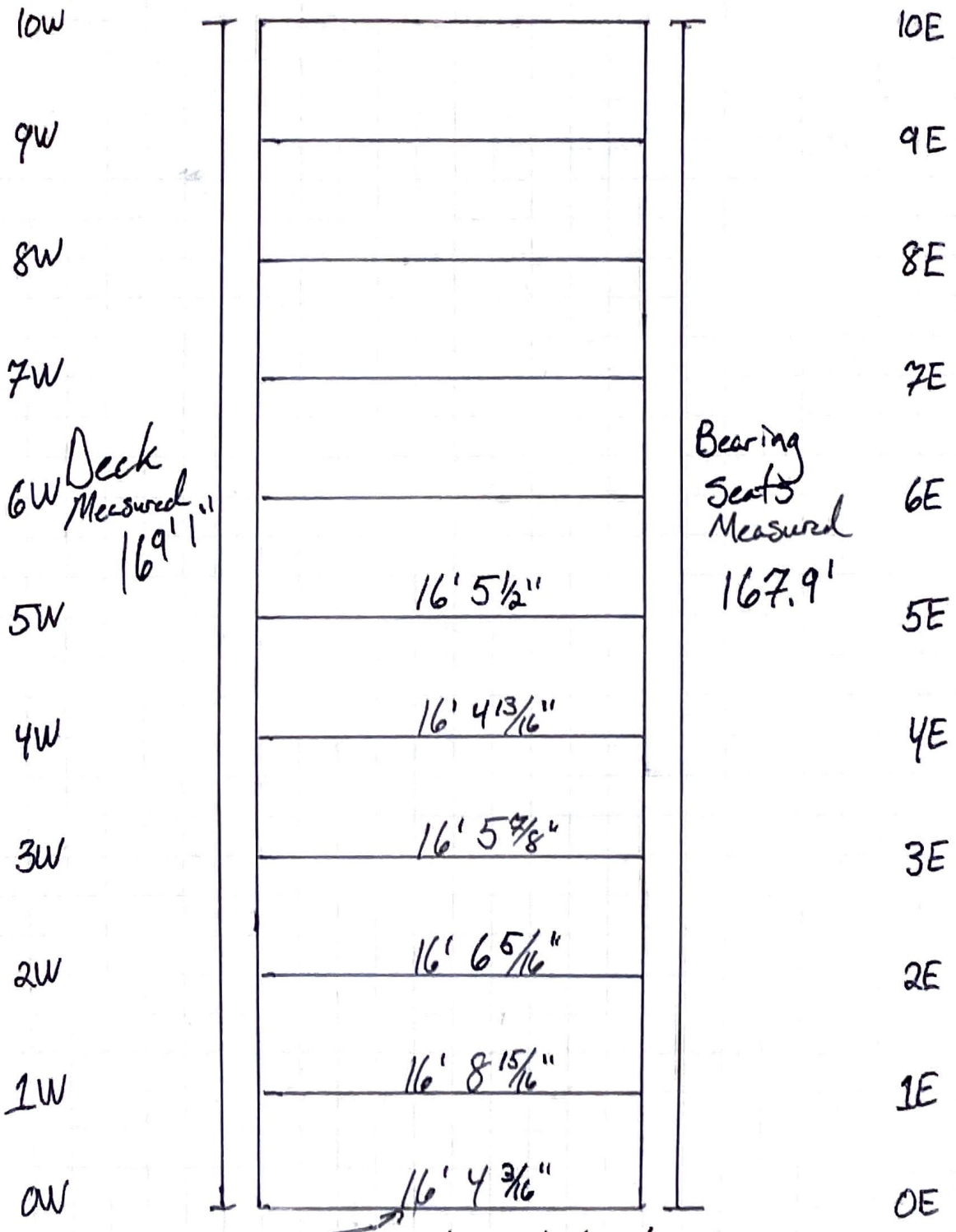
PHOTO 41 NORTH ABUTMENT – WEST WINGWALL

PHOTO 42 NORTH ABUTMENT

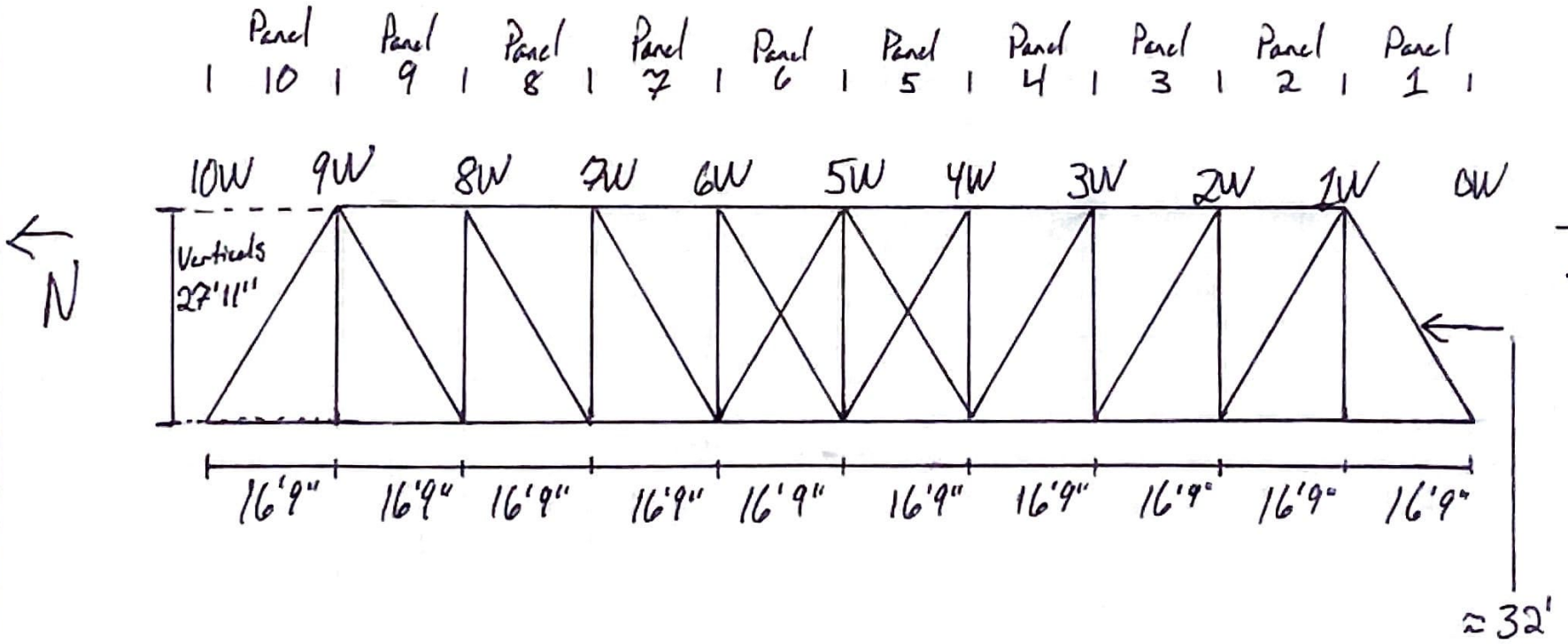
# Appendix A

# Structure Sketches

# North Abutment



# West Elevation

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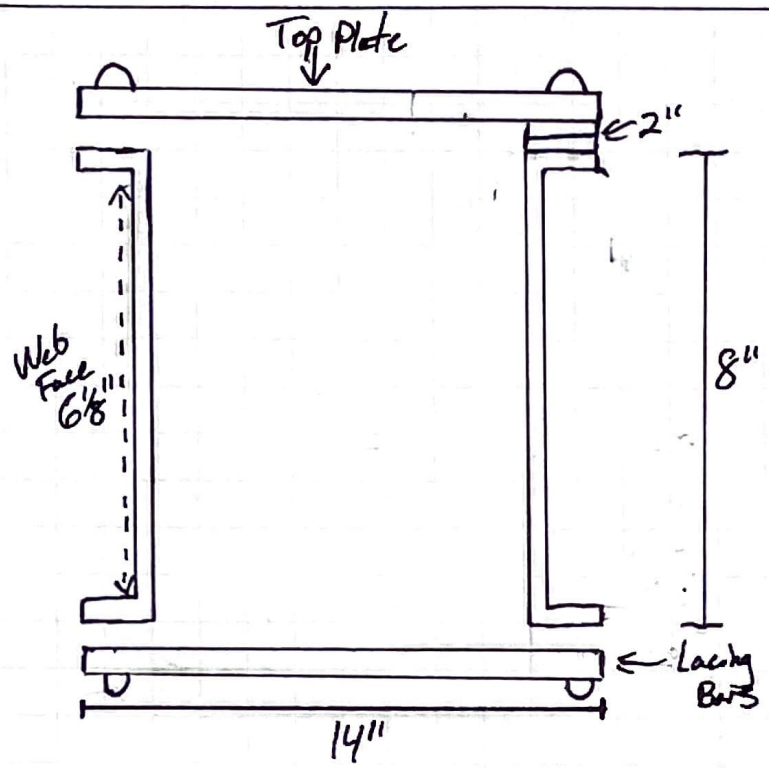
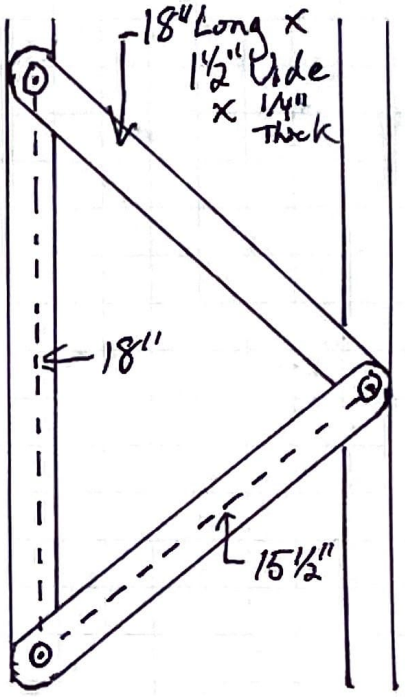
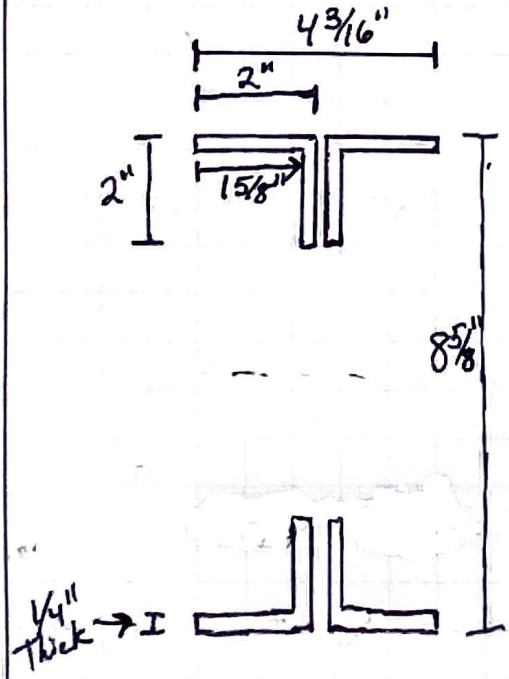
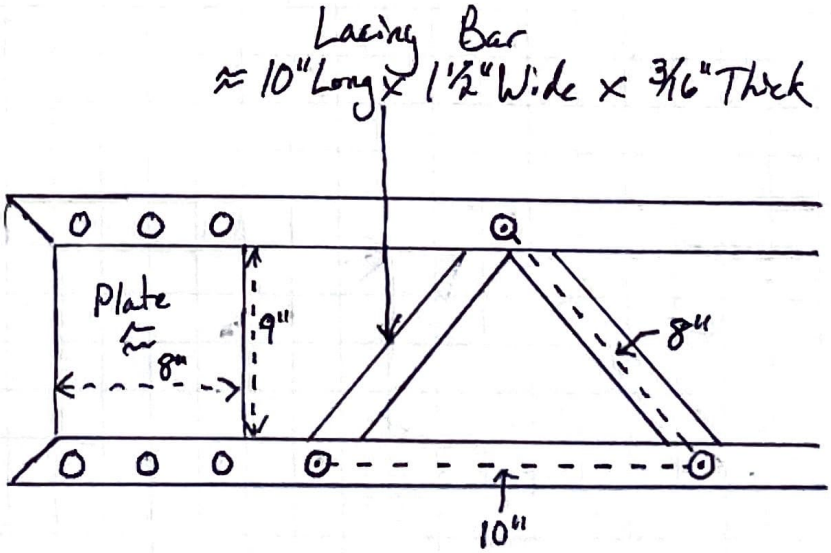
# Photo 3W to 4W - Panel 4 Top Chord




# Photo 3W Strut




1 BLOCK = ¼ Inch

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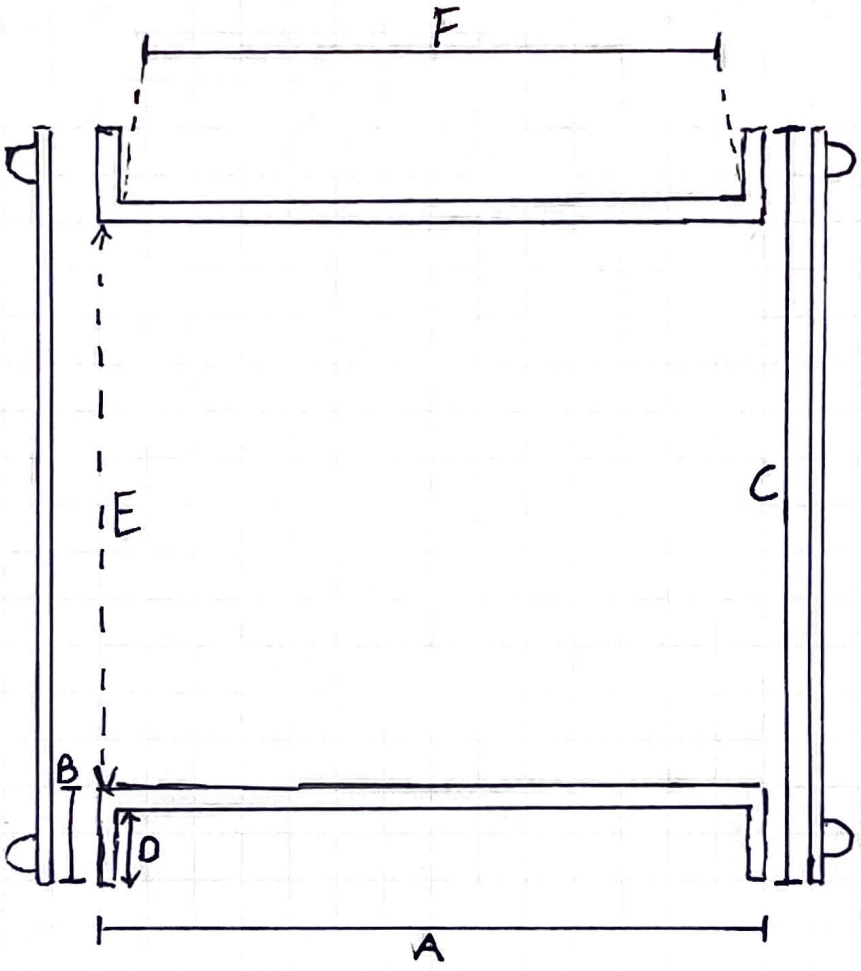
# Vertical Members




| | 2W | 3W | 4W | 5W |
|---|---|---|---|---|
| A. | 8" | 7 1/8" | 6" | 5" |
| B. | 2" | 2" | 1 3/4" | 1 9/16" |
| C. | 12 5/16" | 12 3/8" | 11 3/4" | 11 3/8" |
| D. | 1 7/8" | 1 7/8" | 1 9/16" | 1 3/8" |
| E | 8 5/16" | 8 1/4" | 8 3/16" | 8 1/8" |
| F | 6 3/4" | 6" | 5" | 4" |
| tw | .266 | .206 | .253 | .187 |
| CF | 1/4" | 1/4" | 1/4" | 1/4" |

tw = ULT Web Face For Web Thickness

CF = C-Channel Flange Thickness

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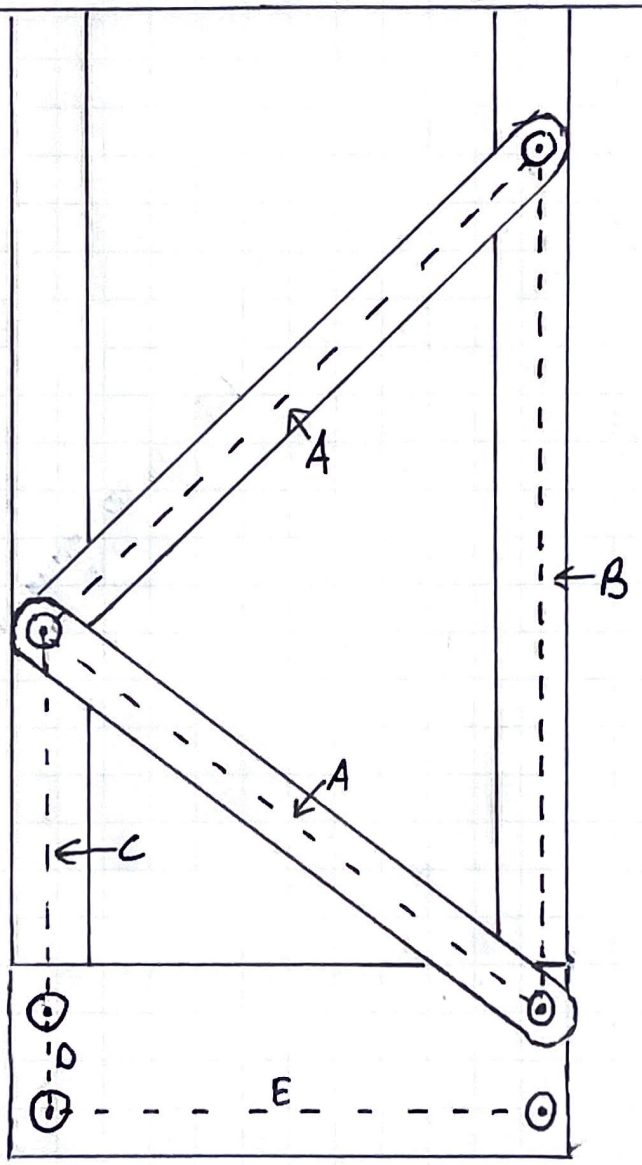
# Vertical Lacing Bars & Rivet Detail W/ Spacing




| | | |
|---|---|---|
| A | ≈13"+/- | All Verticals - Diagonal Lacing Bars |
| B | ≈15"+/- | All Verticals - Vertical Lacing Bars |
| C | 7" | Photo 2W 3 - Measurements Very and Bottom Plate Placement Varies Based Off Vertical |
| D | 3⅛" | |
| E | 10½" | |
| Lacing Bars | 3,4,5,6,7 | Verticals 3-7 Lacing Bars 15" Long x 1½" Wide x ¼" Thick |
| | 2, 8 | Verticals 2 & 8 Lacing Bars 15" Long x 1¾" Wide x ¼" Thick |

1 BLOCK = ¼ Inch

# Pin/Vertical Connection Plate

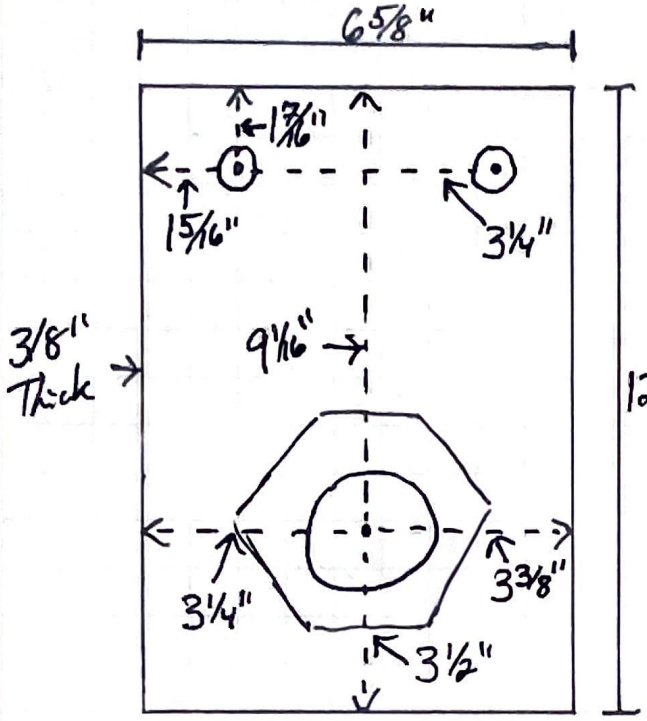



Photo 2W 4

# 10E to 9E Vertical/Top Chord Connection

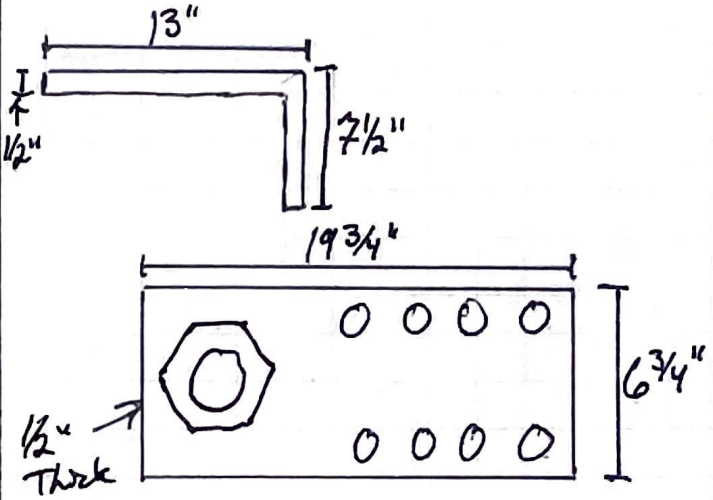



Photo 9E Top Connection

# Photo 3W - Top Chord Connection

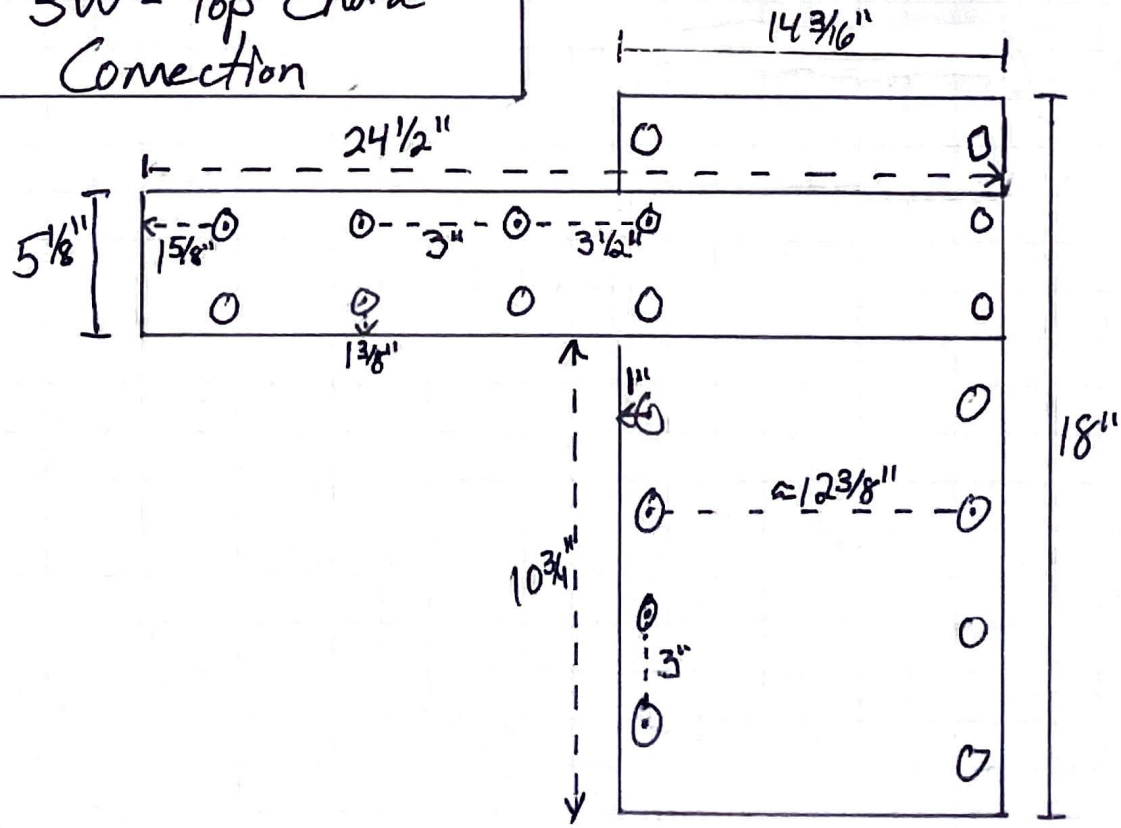


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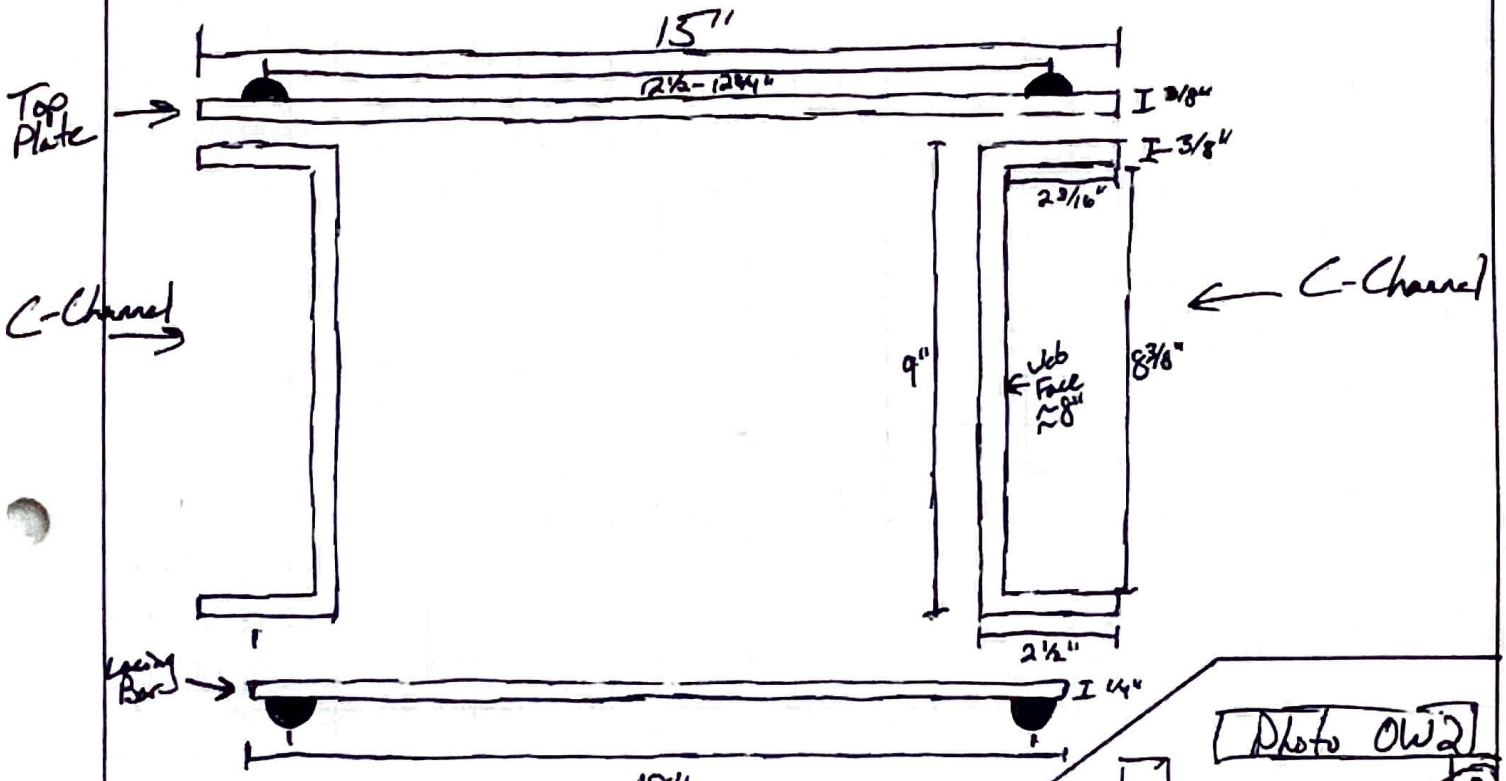
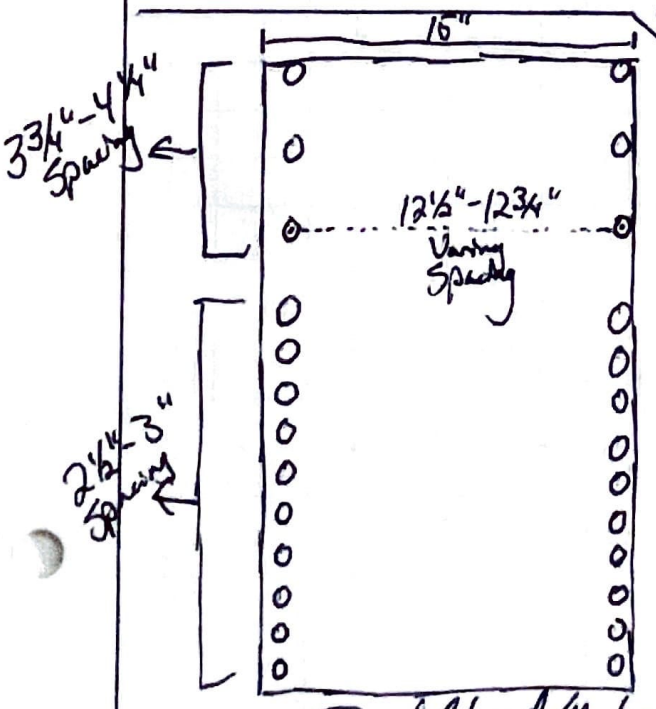
Photo OW1

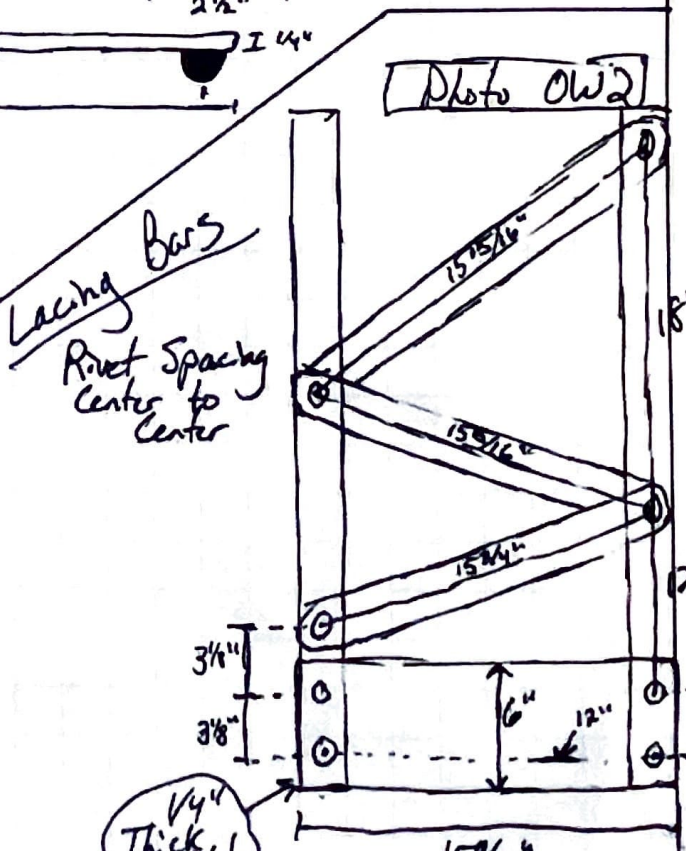
# OW Diagonal Truss Member




Top of Chord Member (Top Plate)
OW3 Photo

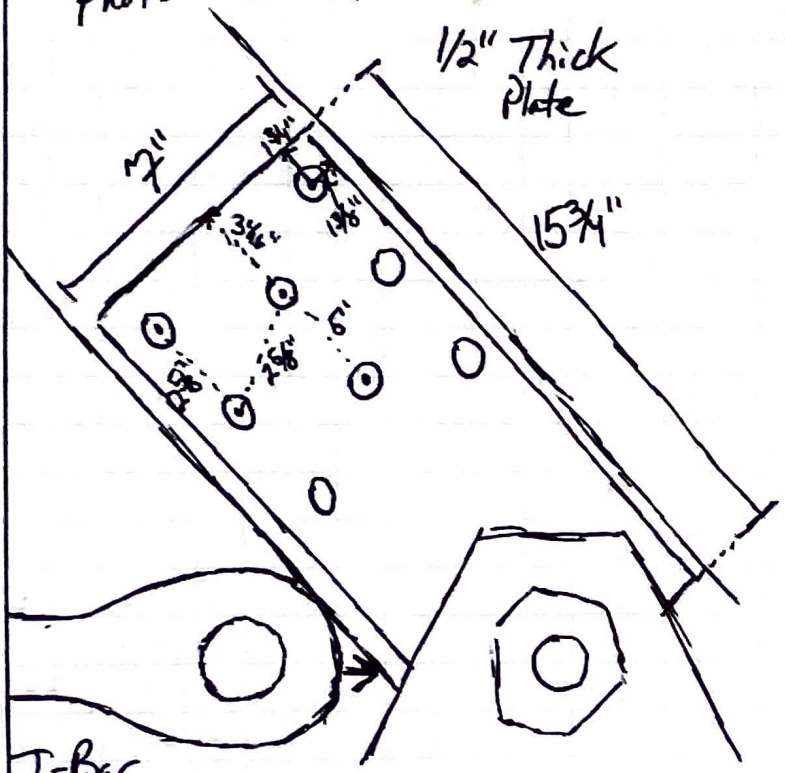
Photo OW2



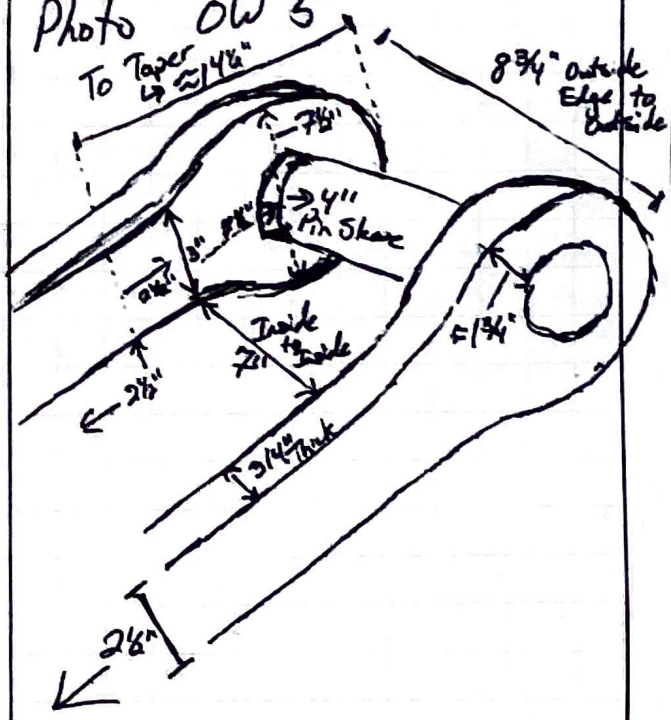

1 BLOCK = ¼ Inch

# OW Diagonal Truss Member

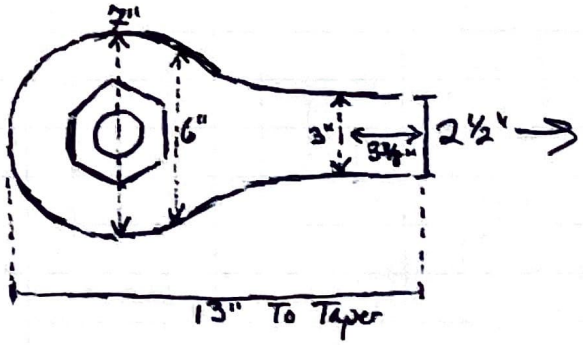
## Connection Plate Photo OW 4

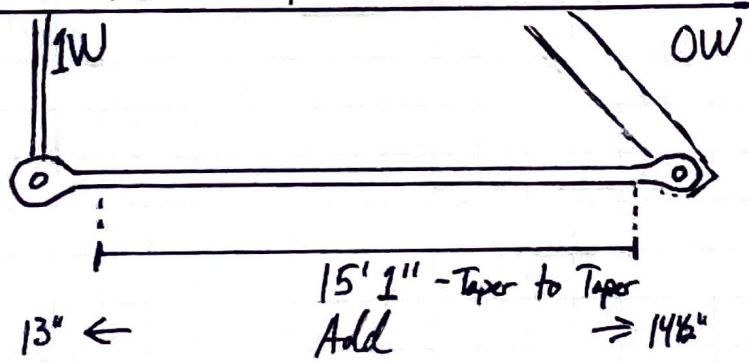



## Photo OW 5

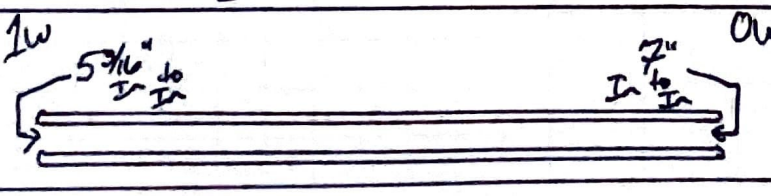



## Photo OW 6 - Actual Location 1W/Panel 1 I-Bar Lower Horizontal




## Panel 1 Lower Horizontal I-Bar ≈ 17' 4 1/2"




## 1W to OW Panel 1

Pin to Pin Measurement 16' 9"

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# 1W I-Bar Pin Assembly - Vertical and Lower Horizontal

Photos 1W 1 & 1W 3

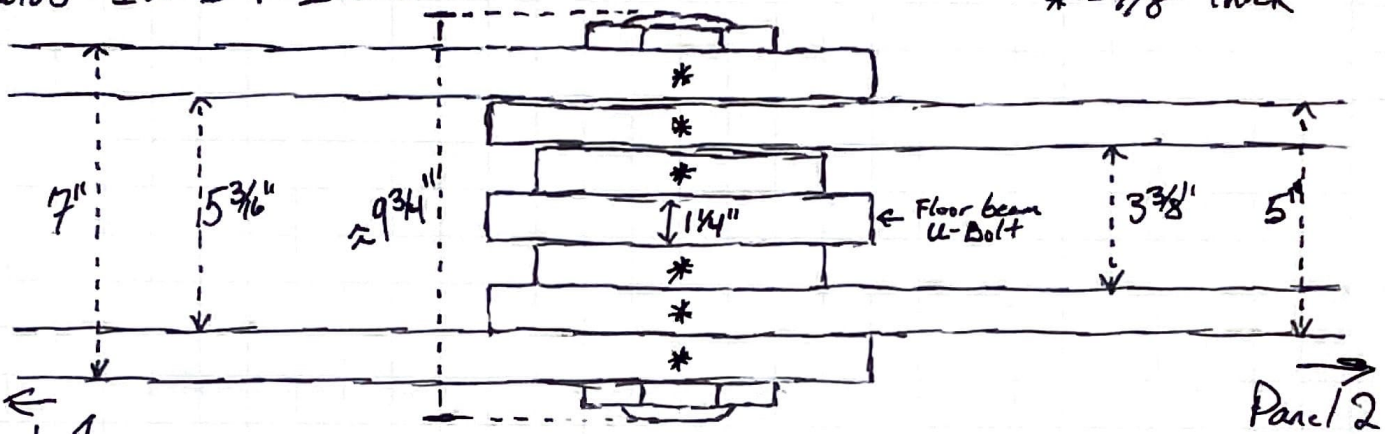
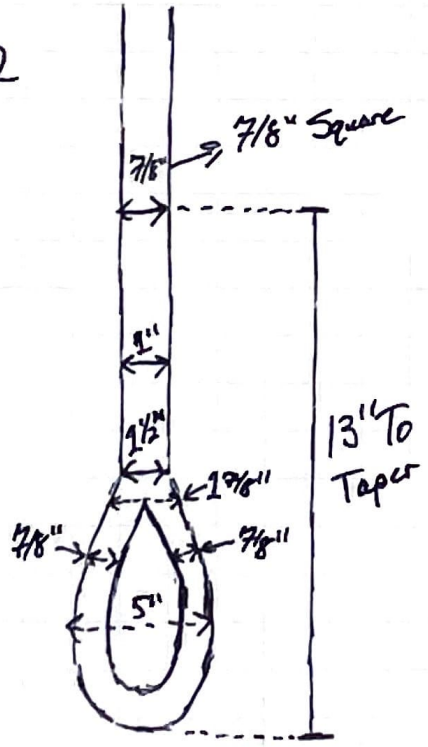
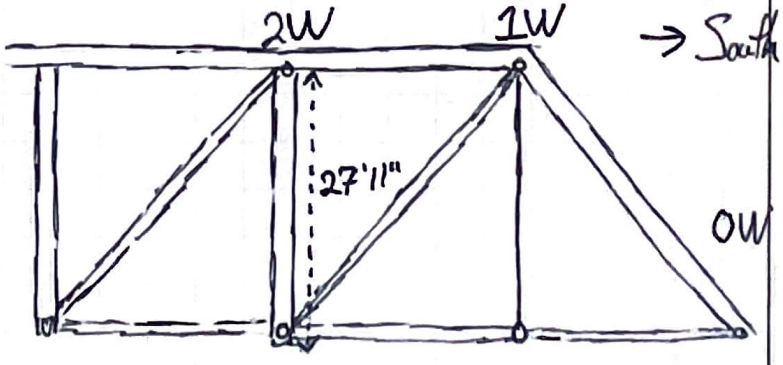



Photo 1W 2




No Vertical Measurement Taken at 1W - Suspended I-Bar

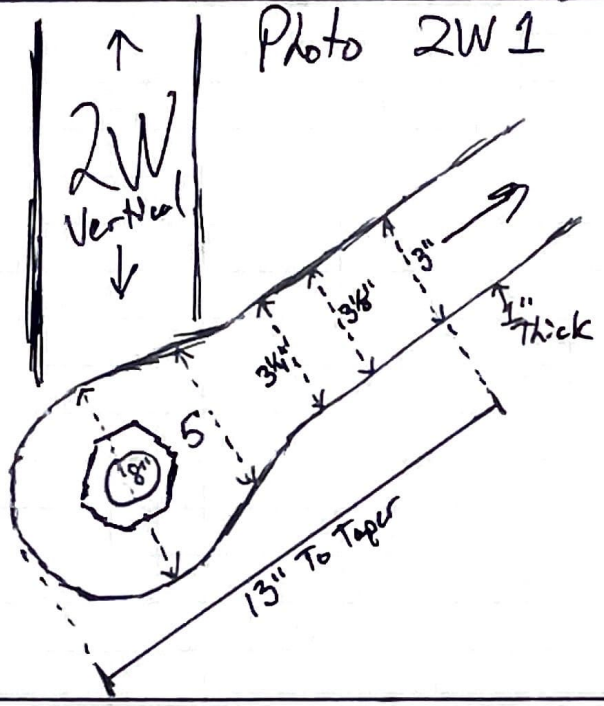
Vertical Measurements Taken at 2W & 4W From Bottom Edge of Vertical to Bottom of Top Chord



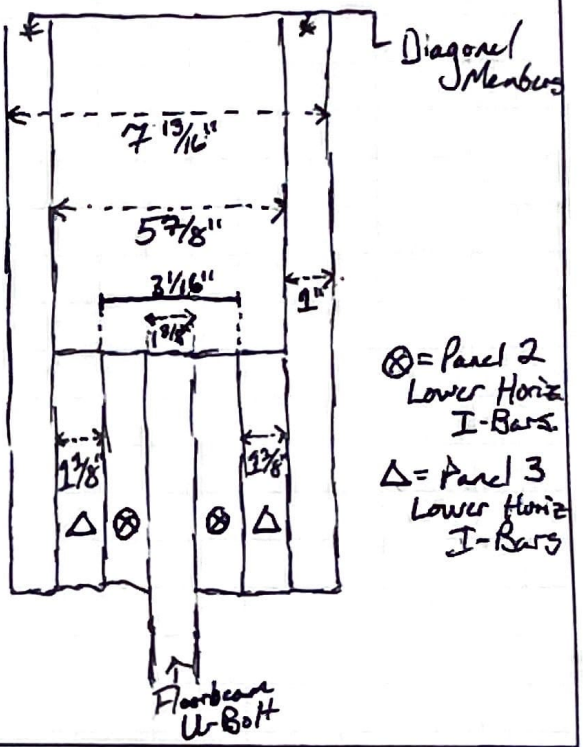

1 BLOCK = ¼ Inch

# Panel 2 - 2W Diagonal I-Bar

## Photo 2W 1

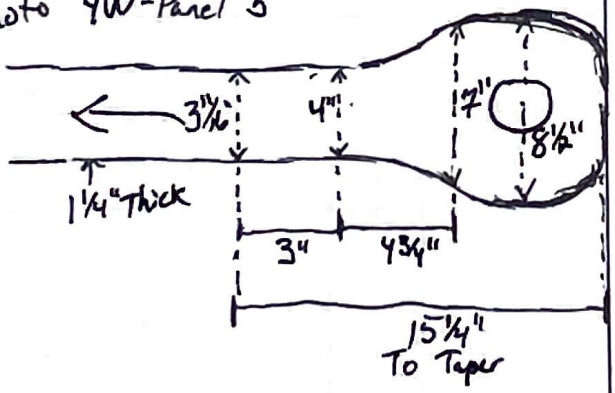



## Photo 2W 2

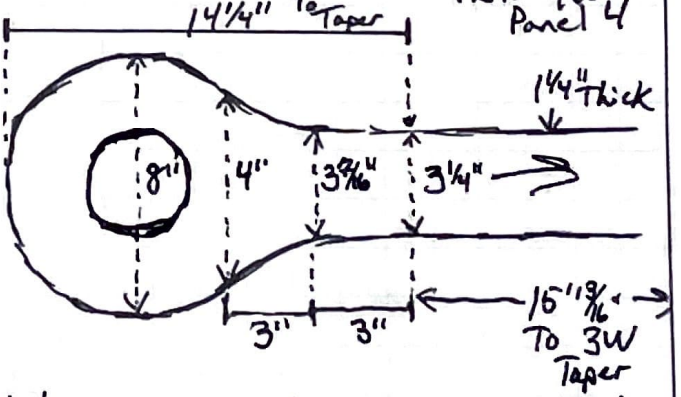



## 4W - Lower Horizontal I-Bars

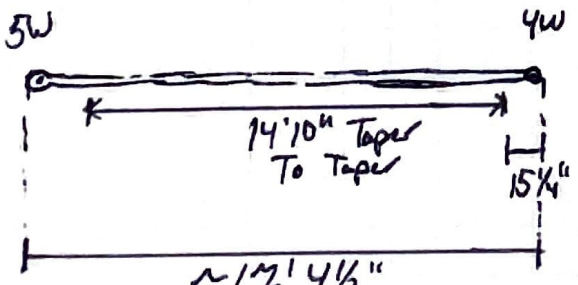
## Photo 4W-Panel 5




## Photo 4W Panel 4

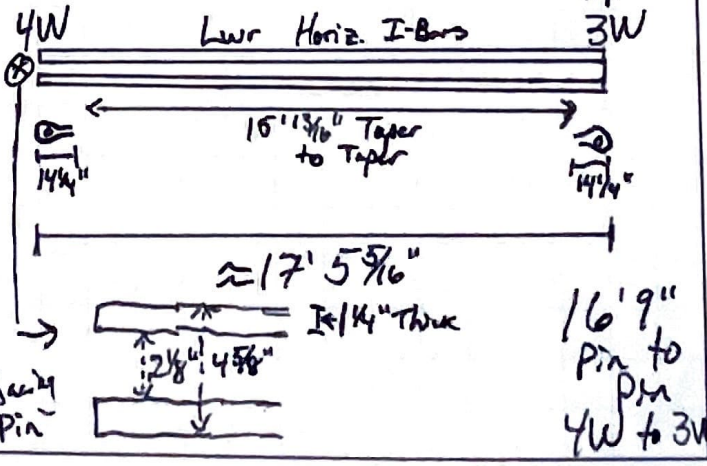



Lwr Horiz. I-Bars

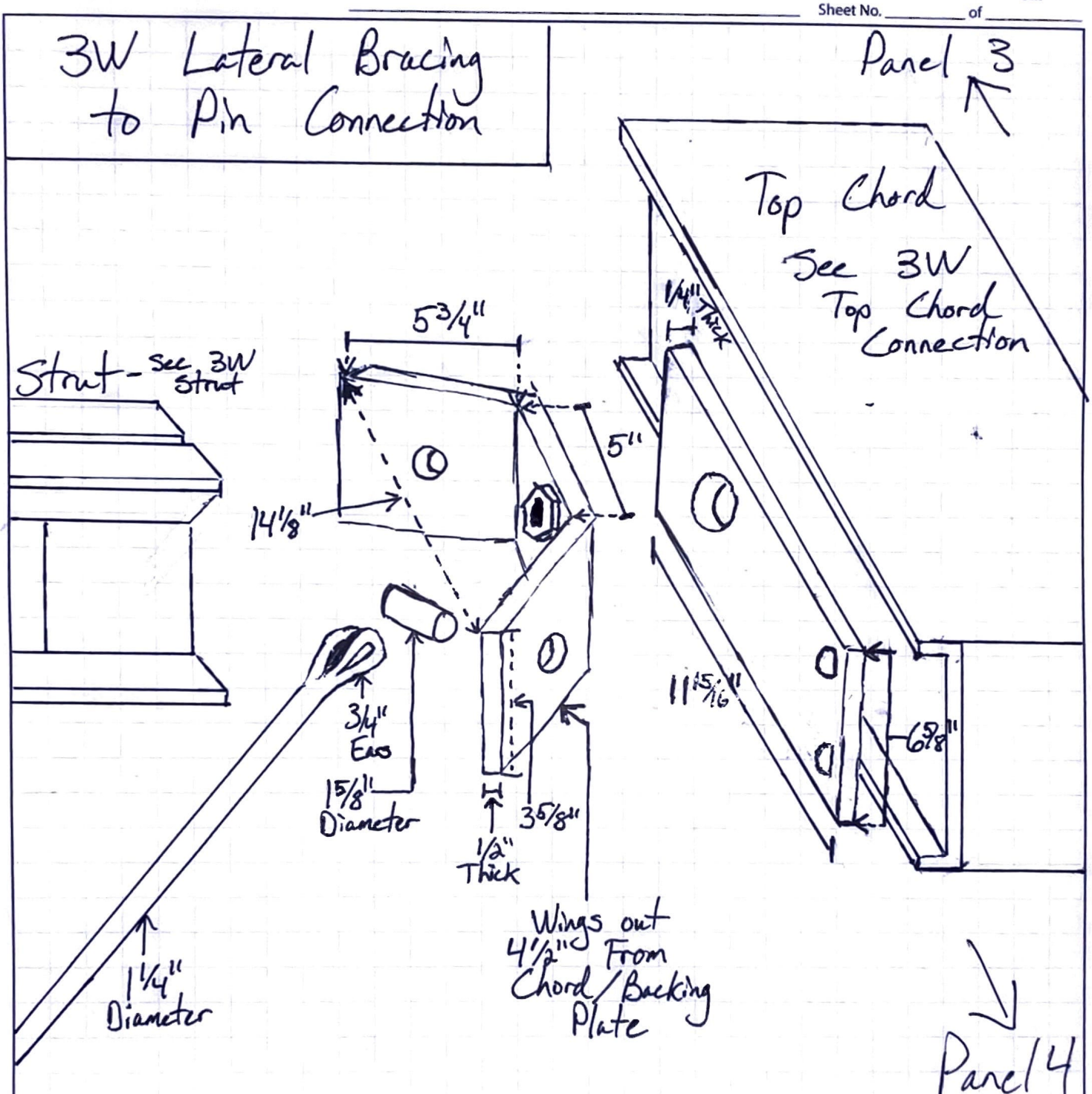



≈17' 4½"

16'9" Pin to Pin



# 3W Lateral Bracing to Pin Connection



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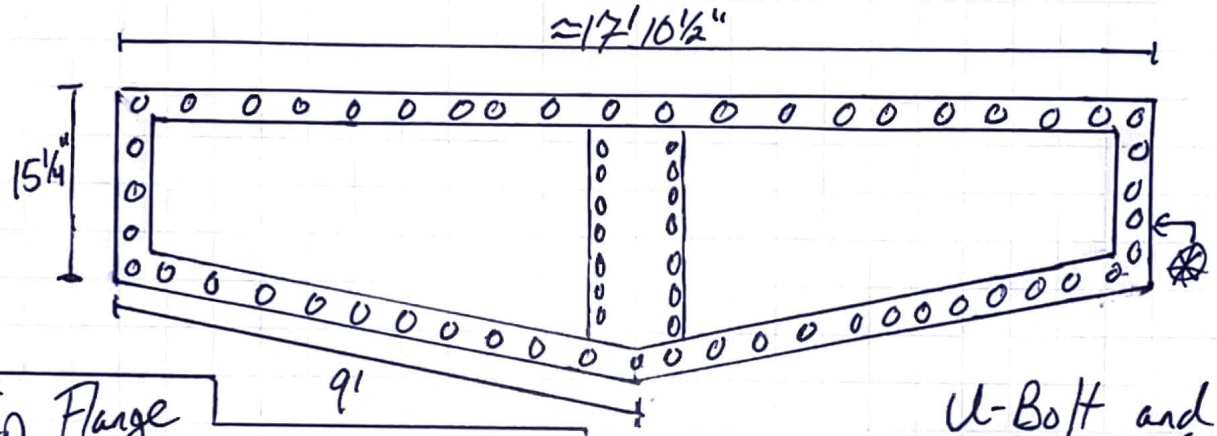
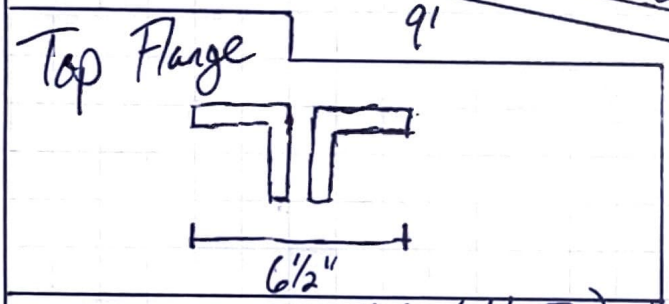
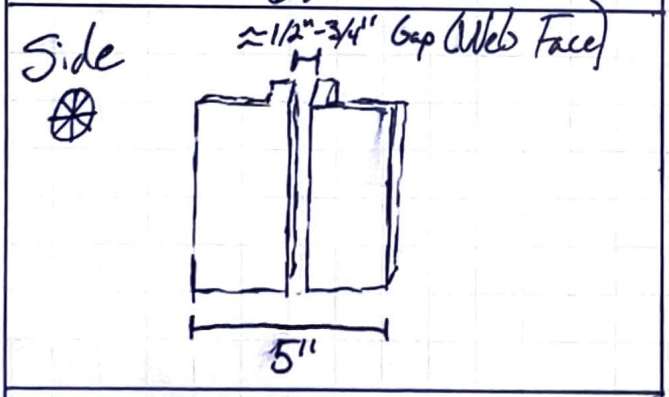
# Photo 8E Floorbeam

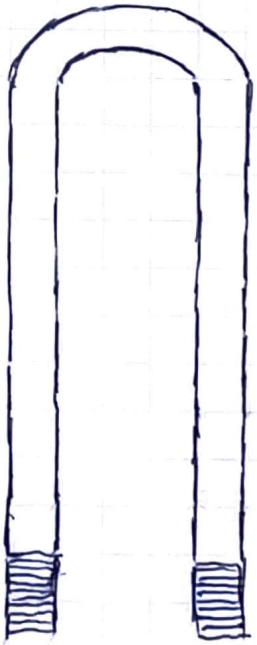
## Floorbeam Suspended From Vertical Lower Pin/I-Bar Assembly With U-Bolts

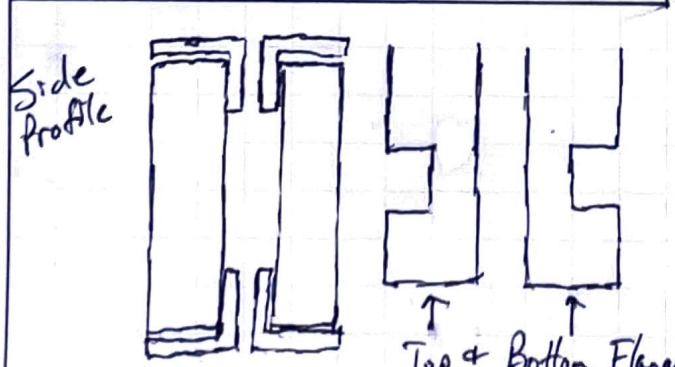



U-Bolt and Center Connection Plate Details Not Obtained






1 BLOCK = ¼ Inch

# Appendix B

# UT A-Scans

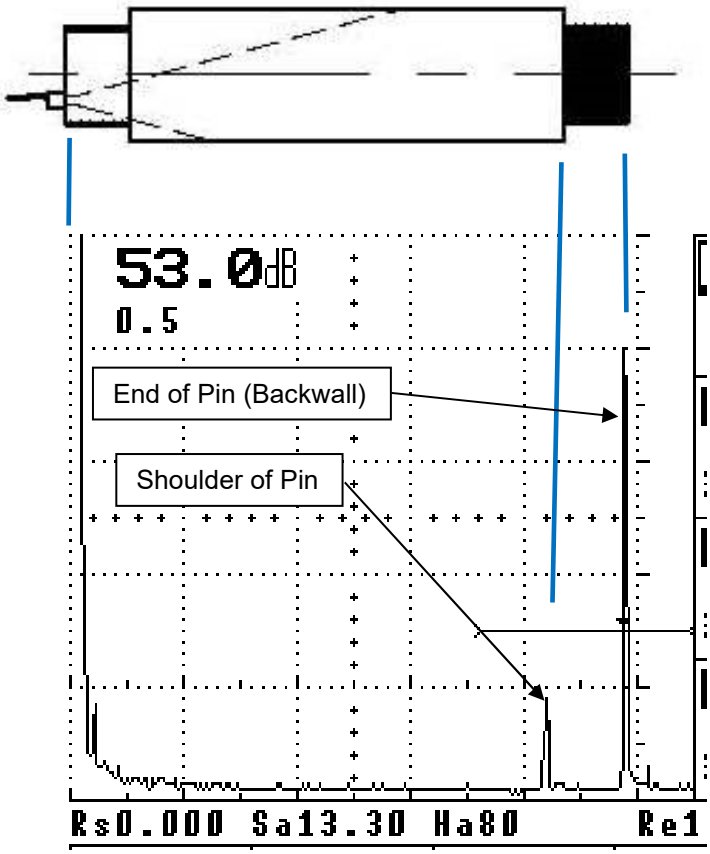



**Figure B1**: Typical A-Scan (UT machine screen capture) of Shouldered Bridge Pin

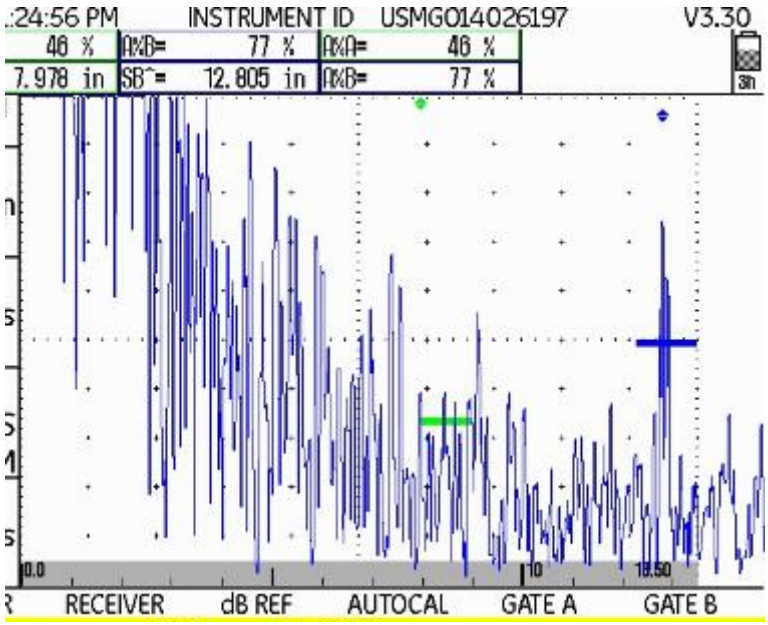



**Figure B2**: Typical A-scan of Cemetery Road Bridge Pins (excessive attenuation blocking a thorough UT investigation of the volume of the pin).

Note: the pins shown in Figures B1 and B2 are of similar length and geometry.