Revised: 5/12/2021
310 Form 270 and Instructions may be downloaded from: http://dnrc.mt.gov/licenses-and-permits/stream-permitting

CD/AGENCY USE ONLY Application # Li-09-03-24, Clif + Sinclair Date Rece...

Date Accepted 9-18-24 Initials RR Date FW: to FW...

This space is for all Department of Transportation and SPA 124 permits (government projects).

Project Name ____________________

Control Number ____________________ Contract Letting Date ____________________

MEPA/NEPA Compliance ☐Yes ☐No If yes, #C5 of this application does not apply.

JOINT APPLICATION FOR PROPOSED WORK IN MONTANA'S STREAMS, WETLANDS, FLOODPLAINS & OTHER WATER BODIES

This is a standardized application to apply for one or all local, state, or federal permits listed below.

- Refer to instructions to determine which permits apply and submit a signed application to each applicable agency.
- Incomplete applications will result in the delay of the application process.
- The applicant is responsible for obtaining all necessary permits and landowner permission before beginning work.
- **Other laws may apply.**

	PERMIT	AGENCY	FILL OUT SECTIONS	FEE
	310 Permit	Local Conservation District	A - E and G	Inquire locally
	SPA 124 Permit	Department of Fish, Wildlife and Parks	A - E and G	No fee
	318 Authorization 401 Certification	Department of Environmental Quality	A - E and G	$250 (318); $400 - $20,000 (401)
	Navigable Rivers Land Use License, Lease, or Easement	Department of Natural Resources and Conservation, Trust Lands Management Division	A - E and G	$50, plus additional fee
	Section 404 Permit, Section 10 Permit	U. S. Army Corps of Engineers (USACE)	A - G F1-8	Varies ($0 - $100)
	Floodplain Permit	Local Floodplain Administrator	A - G	Varies by city/county ($25 - $500+)

A. APPLICANT INFORMATION

APPLICANT NAME (person responsible for project): Roger Clift

Has the landowner consented to this project? ☐ Yes ☐ No

Mailing Address: 117 Glen Way, Eureka, MT 59917

Physical Address: Same

Cellphone: 806-736-9531 Home Phone: ____________ E-Mail: ____________

LANDOWNER NAME (if different from applicant): Same

Mailing Address: ____________

Physical Address: ____________

Cellphone: ____________ Home Phone: ____________ E-Mail: ____________

CONTRACTOR/COMPANY NAME (if applicable): ____________

PRIMARY CONTACT NAME: Jeff Evjene

Mailing Address: 300 Tobacco Siding Rd, Eureka, MT 59917

Physical Address: ____________

Cellphone: 406-250-9695 Home Phone: ____________ E-Mail: ____________

B. PROJECT SITE INFORMATION

1. NAME OF **STREAM** or **WATER BODY** at project location Sinclair Creek
Project Address/Location: Sinclair Creek Rd Nearest Town: Eureka
County: Lincoln Geocode: 56-4824-19-1-01-04-0000
______1/4 of the NW 1/4 of, Section 19 Township 36N Range 26W
Latitude________ Longitude ________ Refer to section B1 in the instructions.

2. Is the proposed activity within **SAGE GROUSE** areas designated as general, connected, or core habitat?
Yes ☐ No ☑ Attach consultation letter if required. Refer to section B2 in the instructions.

3. Is this a **STATE NAVIGABLE WATERWAY**? The state owns beds of certain navigable waterways.
Yes ☐ No☑ If yes, send a copy of this application to the appropriate DNRC land office. Refer to section B3 in the instructions.

4. **WHAT IS THE CURRENT CONDITION** of the proposed project site? Describe the existing bank condition, bank slope, height, nearby structures, and wetlands. What vegetation is present? Refer to section B4 in the instructions.

Please see attached drawing. The proposed project is near the Glen Lake Irrigation District Siphon. This site was mitigated following a siphon failure across Sinclair Creek Road.

C. PROPOSED PROJECT OR ACTIVITY INFORMATION

1. **TYPE OF PROJECT** (check all that apply) Refer to section C1 in the instructions.
☐ **Agricultural and Irrigation Projects:** Diversions, Headgates, Flumes, Riparian fencing, Ditches, etc.
☐ **Buildings/Structures:** Accessory Structures, Manufactured Homes, Residential or Commercial Buildings, etc.
☐ **Channel/Bank Projects:** Stabilization, Restoration, Alteration, Dredging, Fish Habitat, Vegetation or Tree Removal, or any other work that modifies existing channels or banks.
☑ **Crossings/Roads:** Bridge, Culvert, Fords, Road Work, Temporary Access, or any project that crosses over or under a stream or channel.
☐ **Mining Projects:** All mining related activity, including; Placer Mining, Aggregate Mining, etc.
☐ **Recreation related Projects:** Boat Ramps, Docks, Marinas, etc.
☐ **Other Projects:** Cistern, Debris Removal, Excavation/Pit/Pond, Placement of Fill, drilling or directional boring, Utilities, Wetland Alteration. Other project type not listed here ____________________

2. **IS THIS APPLICATION FOR** an annual maintenance permit? ☐ Yes ☑ No
(If yes attach annual plan of operation to this application) – Refer to section C2 in the instructions.

3. **WHY IS THIS PROJECT NECESSARY? STATE THE PURPOSE OR GOAL** of the proposed project. Refer to section C3 in the instructions.

A crossing is necessary to access the other side of the property for repairs and maintenance.

4. **PROVIDE A BRIEF DESCRIPTION** of the proposed project plan and how it will be accomplished. Refer to section C4 in the instructions.

The proposed project includes the placement of a 40' engineered bridge across Sinclair Creek. The first step of the project will be to prepare the road approach to the bridge. Concrete will also be poured prior to a change in weather. The existing GLID structure was measured to determine measurements for the bridge placement. In high flow events, debris is able to easily pass under the GLID pipe. The distance from the bottom of the bridge to the surface of the water will be a minmum of 72". All construction work will occur 14 ft away from the stream. A rock guard barrier will be set to grade and bolted to the edge of the bridge to prevent any material from entering the stream. Any disturbed areas will be revegetated to prevent weed establishment and erosion. An excavator will be used to set the bridge so no machinery will enter the stream. Please see attachements for engineering and project design.

5. **WHAT OTHER ALTERNATIVES were considered to accomplish the stated purpose of the project?** Why was the proposed alternative selected? Refer to section C5 in the instructions.

Alternative 1 would be to place a culvert in the stream for a crossing. This option is not ideal as heavy equipment may cross the stream and culverts are not an option for longevity. Alternative 2 would be to ford the stream. This is not ideal as it could cause turbidiy and impact water quality. Alternative 3 would be to access the property using an existing bridge downstream. This option is not ideal as the bridge is not built for heavy equipment. The proposed option is an engineered bridge that is designed for equipment crossing. This option is safer, reduces negative impacts to the stream, and provides a permanent crossing solution.

6. **NATURAL RESOURCE BENEFITS OR POTENTIAL IMPACTS. Please complete the information below to the best of your ability.**

* Explain any temporary or permanent changes in erosion, sedimentation, turbidity, or increases of potential contaminants. What will be done to minimize those impacts?

This project is designed to keep construction activity away from the stream. A barrier is included to prevent sedimention. Having a bridge crossing will minimize any potential impacts to the stream if crossings are necessary for infrasturcture or property maintenance.

- Will the project cause temporary or permanent impacts to fish and/or aquatic habitat? What will be done to protect the fisheries?

  Since construction activities are set back from the bank and no equipment will be entering the stream, it is unlikely that there will be any impact to fish or aquatic habitat.

- What will be done to minimize temporary or permanent impacts to the floodplain, wetlands, or riparian habitat?

  The project site already includes an approach to the stream. The road will be prepped to ensure a proper grade to the bridge.

- What efforts will be made to decrease flooding potential upstream and downstream of project?

  The bridge will be set at a distance at least equal to that of the existing GLID pipe which is upstream of the project. In high water events, debris has easily passed under that structure to decrease the likelihood of any flooding potential.

- Explain potential temporary or permanent changes to the water flow or to the bed and banks of the waterbody. What will be done to minimize those changes?

  There are no anticpated changes to the water flow or the streambed. All construction activities will be set back at least 14' from the bank. An excavator will be used to span the bridge across the stream. No equipment will enter the stream.

- How will existing vegetation be protected and its removal minimized? Explain how the site will be revegetated. Include weed control plans.

  Any disturbed areas will be revegetated with a native forest mix. The area was recently disturbed due to a blowout at the GLID siphon so it is unlikely that there is any existing vegetation that has been established.

D. CONSTRUCTION DETAILS

1. **PROPOSED CONSTRUCTION DATES**. Include a project timeline. Start date September 20, 2024
Finish date September 20, 2025 How long will it take to complete the project? Most will be complete this fall.
Is any portion of the work already completed? ☐ Yes ☑ No (If yes, describe previously completed work.)
Refer to section D1 in the instructions.

2. **PROJECT DIMENSIONS.** Describe length and width of the project. Refer to section D2 in the instructions.
Please refer to attachments.

3. **EQUIPMENT**. List all equipment that will be used for this project. How will the equipment be used on the bank and/or in the water? Note: All equipment used in the water must be clean, drained and dry. Refer to section D3 in the instructions.
Komatsu 238 excavator, Cat 308 excavator, John Deere 700 dozer, and a bomag roller compactor. Most of the equipment will be used to build and compact the road approach.

Will equipment from out of state be used? YES ☐ NO ☑ UNKNOWN ☐
Will the equipment cross west over the continental divide to the project site? YES ☐ NO ☑ UNKNOWN ☐
Will equipment enter the Flathead Basin? YES ☐ NO ☑ UNKNOWN ☐

4. **MATERIALS**. Provide the total quantity and source of materials proposed to be used or removed. Note: This may be modified during the permitting process therefore it is **recommended you do not purchase materials until all permits are issued.** List soil/fill type, cubic yards and source, culvert size, rip-rap size, any other materials to be used or removed on the project. Refer to section D4 in the instructions.

Cubic yards/Linear feet	Size and Type	Source

E. REQUIRED ATTACHMENTS

1. **PLANS AND/OR DRAWINGS** of the proposed project. **Include**:
   - Plan/Aerial view
   - an elevation or cross section view
   - dimensions of the project (height, width, depth in feet)
   - location of storage or stockpile materials dimensions and location of fill or excavation sites
   - drainage facilities
   - location of existing/proposed structures, such as buildings, utilities, roads, or bridges
   - an arrow indicating north
   - Site photos

2. **ATTACH A VICINITY MAP OR A SKETCH** which includes: The water body where the project is located, roads, tributaries, other landmarks. Place an "X" on the project location. Provide written directions to the site. This is a plan view (looking at the project from above).

3. **ATTACH ANNUAL PLAN OF OPERATION if requesting a Maintenance 310 Permit.**

4. **ATTACH AQUATIC RESOURCE MAP.** Document the location and boundary of all waters of the U.S. in the project vicinity, including wetlands and other special aquatic sites. Show the location of the ordinary high-water mark of streams or waterbodies. **if requesting a Section 404 or Section 10 Permit.** Ordinary high-water mark delineation included on plan or drawings and/or a separate wetland delineation.

F. ADDITIONAL INFORMATION FOR U.S. ARMY CORPS OF ENGINEERS (USACE) SECTION 404, SECTION 10 AND FLOODPLAIN PERMITS.

Section F should only be filled out by those needing Section 404, Section 10, and/or Floodplain permits. Applicants applying for Section 404 and/or Section 10 permits complete F 1- 8. Applicants applying for Floodplain permits, complete all of Section F. Refer to section F in the instructions.

FOR QUESTIONS RELATING TO SECTION F, QUESTIONS 1-8 PLEASE CONTACT THE USACE BY TELEPHONE AT 406-441-1375 OR BY E-MAIL MONTANA.REG@USACE.ARMY.MIL.

1. Identify the specific **Nationwide Permit(s)** that you want to use to authorize the proposed activity. Refer to section F1 in the instructions.

2. Provide the **quantity of materials** proposed to be used in waters of the United States. What is the length and width (or square footage or acreage) of impacts that are occurring within waters of the United States? How many cubic yards of fill material will be placed below the ordinary high-water mark, in a wetland, stream, or other waters of the United States? Note: Delineations are required of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Refer to section F2 in the instructions.

3. How will the proposed project avoid or minimize **impacts to waters of the United States?** Attach additional sheets if necessary. Refer to section F3 in the instructions.

4. Will the project impact greater than 0.10-acre of wetland and/or more than 300 linear feet of stream or other waters? If yes, describe how the applicant is going to **compensate (mitigation bank, in-lieu fee program, or permittee responsible)** for these unavoidable impacts to waters of the United States. Refer to section F4 in the instructions.

5. Is the activity proposed within any component of the **National Wild and Scenic River System**, or a river that has been officially designated by Congress as a **"study river"**? Refer to section F5 in the instructions.

   ☐ Yes ☐ No

6. Does this activity require permission from the USACE because it will alter or temporarily or permanently occupy or use a **USACE authorized civil works project? (Examples include USACE owned levees, Fort Peck Dam, and others)**? Refer to section F6 in the instructions.

   ☐ Yes ☐ No

7. List the **ENDANGERED AND THREATENED SPECIES** and **CRITICAL HABITAT(s)** that might be present in the project location. Refer to section F7 in the instructions.

8. List any **HISTORIC PROPERTY(S)** that are listed, determined to be eligible or are potentially eligible (over 50 years old) for listing on the National Register of Historic Places." Refer to section F8 in the instructions.

9. List **all applicable local, state, and federal** permits and indicate whether they were issued, waived, denied, or pending. Note: All required local, state, and federal permits, or proof of waiver must be issued prior to the issuance of a floodplain permit. Refer to section F9 in the instructions.

10. List the **NAMES AND ADDRESSES OF LANDOWNERS** adjacent to the project site. This includes properties adjacent to and across from the project site. (Some floodplain communities require certified adjoining landowner lists).
NAME/ADDRESS OF **Adjacent Landowner:** Troy and Sarita Welch PO Box 2401, Eureka, MT 59917
NAME/ADDRESS OF **Adjacent Landowner:** Mike Marvel 577 Sinclair Cr Rd Eureka, MT 59917
NAME/ADDRESS OF **Adjacent Landowner:** ______
NAME/ADDRESS OF **Adjacent Landowner:** ______

11. **Floodplain Map Number** 3001570235B Refer to section F11 in the instructions.

12. Does this project comply with **local planning or zoning regulations**? Refer to section F12 in the instructions.
☑ Yes ☐ No

G. SIGNATURES/AUTHORIZATIONS

Some agencies require original signatures. **After completing the form**, make the required number of copies and **then sign each copy.** Send the copies with original signatures and additional information required directly to each applicable agency.

The statements contained in this application are true and correct. The applicant possess' the authority to undertake the work described herein or is acting as the duly authorized agent of the landowner. The applicant understands that the granting of a permit does not include landowner permission to access land or construct a project. Inspections of the project site after notice by inspection authorities are hereby authorized. Refer to section G in the instructions.

APPLICANT (Person responsible for project):
Print Name: Roger Clift

Roger Clift 9/10/24
Signature of Applicant Date

LANDOWNER:
Print Name: ______________________

____
Signature of Landowner Date

*CONTRACTOR'S PRIMARY CONTACT (if applicable):
Print Name: Jeff Evjene

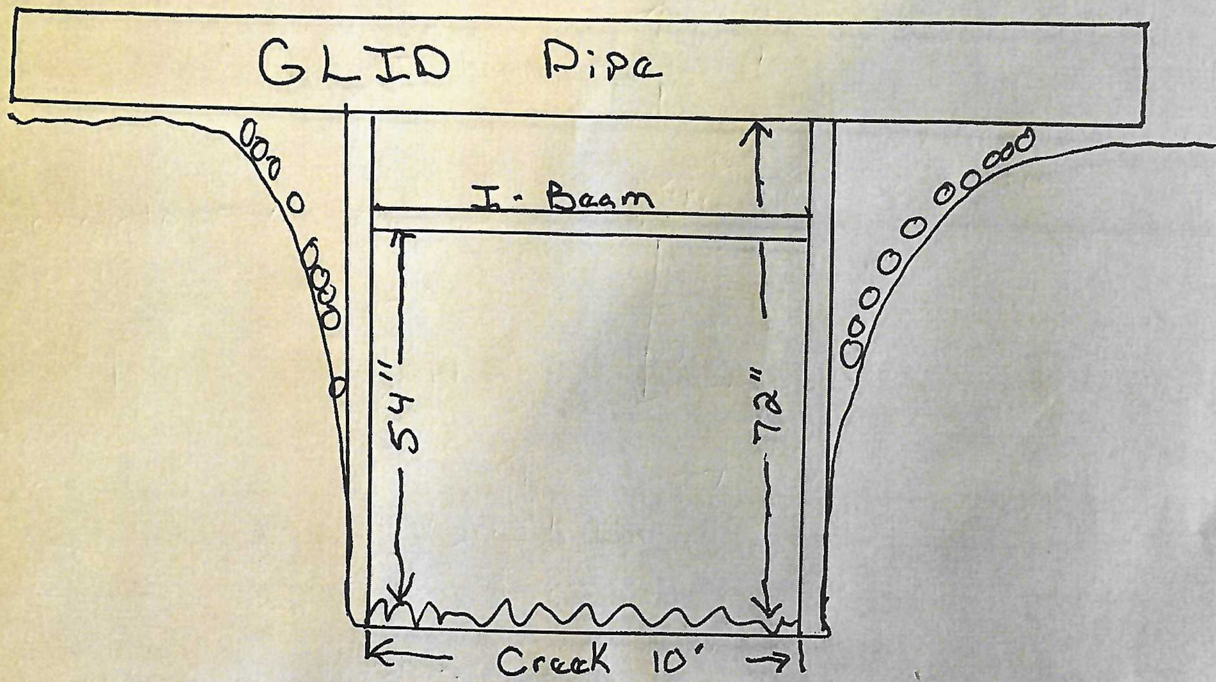
Jeff Evjene 9/10/24
Signature of Contractor/Agent Date
*Contact agency to determine if contractor signature is required.

Jeff Evjene

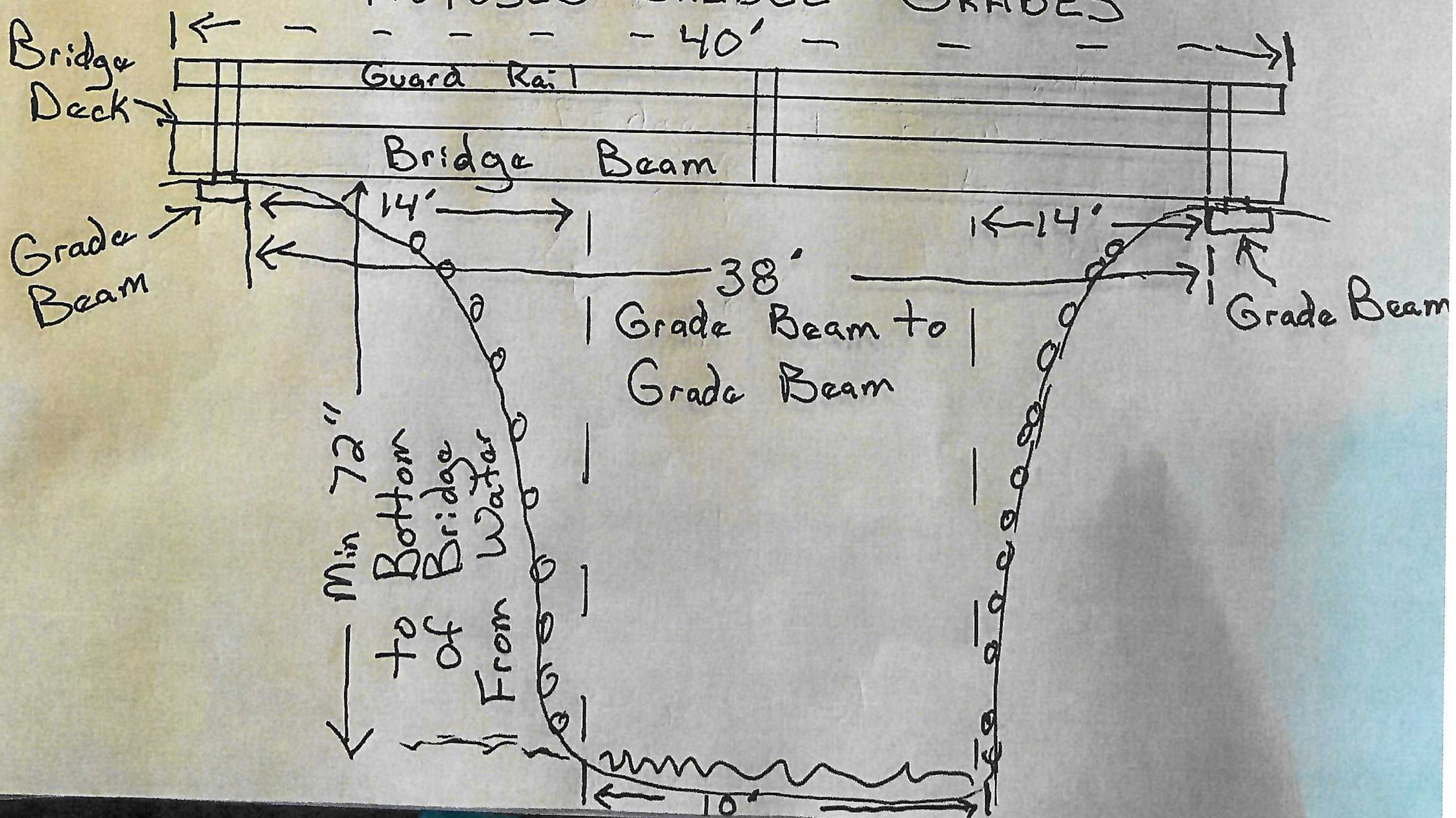
Signature: [signature]
Roger Clift (Sep 11, 2024 02:25 MDT)
Email: roger_clift@yahoo.com

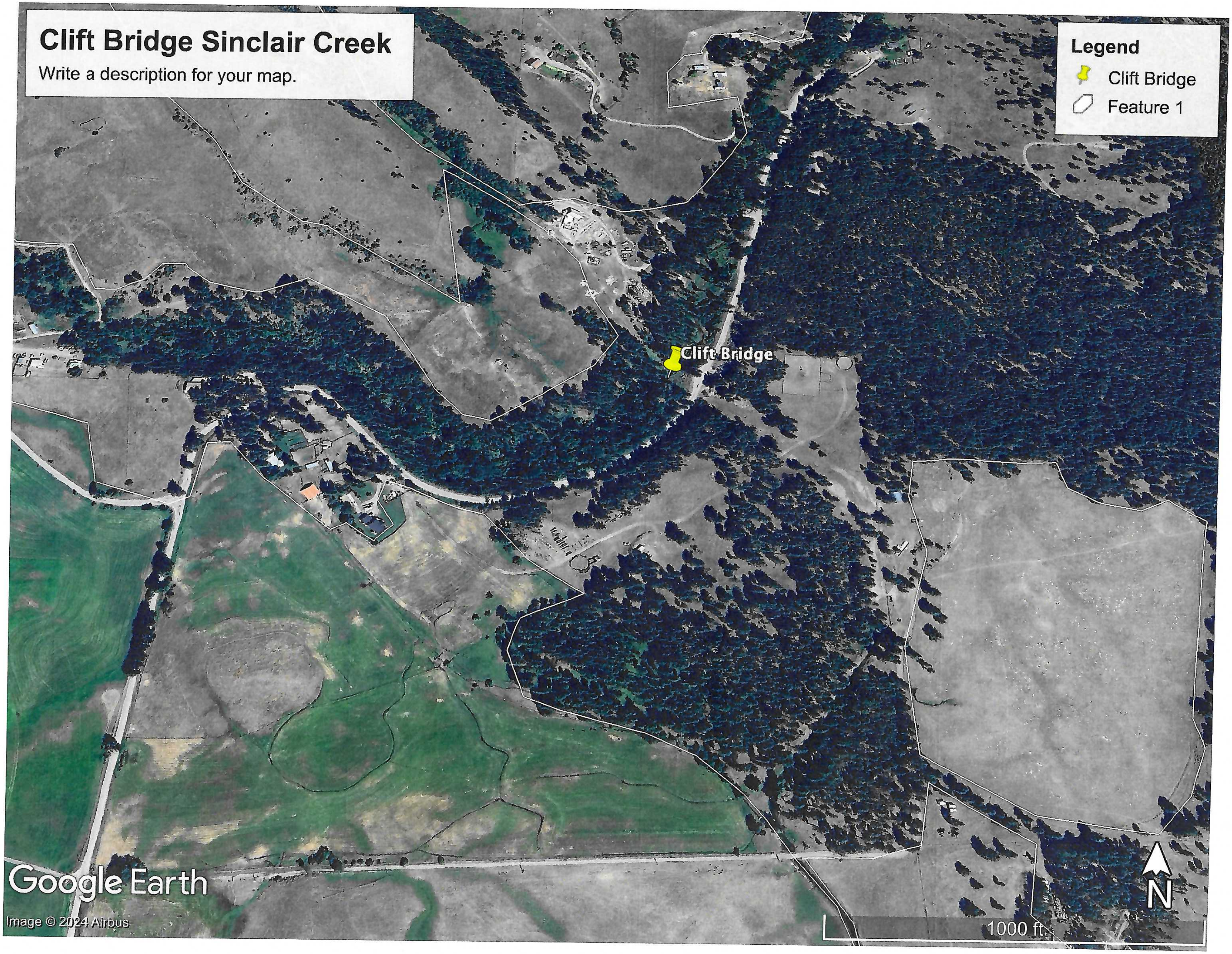
Signature: [signature]
Jeff Evjene (Sep 10, 2024 13:34 MDT)
Email: jeffevjene@hotmail.com

Existing Glid Pipe And Structure



Proposed Bridge Grades




Clift Bridge Sinclair Creek
Write a description for your map.
Legend
Clift Bridge
Feature 1
Clift Bridge
N
1000 ft.
Google Earth
Image © 2024 Airbus

Roger Cliff
Lincoln County, MT
Twin Creek Ranch Bridge
P/N 24-M-605
S/N 40-16-HL93-10-3384

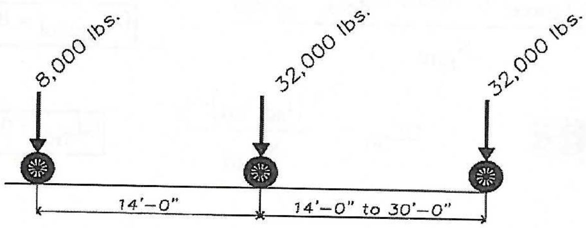
Index 1
Checked Frm.
6/20/2024
AJB

Design is based on AASHTO Standard Specifications for Highway Bridges ~ Seventeenth Edition (2002) & all Interim Revisions

MONTANA FRANKLIN R. MUTH 4469E 6/21/24 REGISTERED PROFESSIONAL ENGINEER

1.) Design Criteria

A.) Design Loading (HL93)



+64psf Lane Load

HS20-44 (36 Tons)

B.) General Bridge Geometry

Deck Width :	$W_{deck} := 16.625ft$	Girder Spacing:	$Sp := 4.5ft$
Roadway Width :	$W_{roadway} := 16ft$	Number of Girders:	$N_{gird} := 4$
Bridge Length :	$L_{total} := 40ft$	Deck Overhang:	$OH := 1.5625ft$
Span Length :	$L_{span} := 39ft$	Surfacing Thickness:	$t_{gravel} := 3in$
Skew Angle :	$Skew := 0deg$	Number of Lanes:	$N_{lane} := 1$

C.) Material Properties

Steel Density :	$\gamma_s := 0.490kcf$		Gravel Density :	$\gamma_{gravel} := 0.12kcf$
Structural Steel Yield Strength :	$F_y := 50ksi$	M270 Gr. 50W (ASTM A588)	Steel Modulus of Elasticity :	$E_s := 29000ksi$
Structural Steel Tensile Strength :	$F_u := 70ksi$		Steel Deck Weight :	$Wt_{deck} := 0.0126ksf$

D.) Impact Fraction (Eq. 3-1)

$$I_M := \min\left(0.30, \frac{50ft}{L_{span} + 125ft}\right) \qquad \boxed{I_M = 0.3}$$

E.) Girder Properties (W24x76)

Girder Weight:	$DL_{gird} := 0.076klf$ ✓	Depth:	$d := 23.9in$ ✓
Section Modulus:	$S_{xx} := 176in^3$ ✓	Web Thickness:	$t_w := 0.440in$ ✓
Moment of Inertia:	$I_{xx} := 2100in^4$ ✓	Flange Width:	$b_f := 8.99in$ ✓

$t_f = 0.68in$

2.) Applied Loading

A.) Dead Load *(ASSUME LOADS DISTRUBUTED EQUALLY OVER 4 GIRDERS)*

Corrugated Deck : $DL_{Deck} := \frac{Wt_{deck} \cdot W_{deck}}{N_{gird}}$ $\boxed{DL_{Deck} = 0.052 \cdot klf}$ ✓

Gravel Surface : $DL_{gravel} := \frac{(W_{deck} \cdot t_{gravel} + .1685ft \cdot W_{deck}) \cdot \gamma_{gravel}}{N_{gird}}$ $\boxed{DL_{gravel} = 0.209 \cdot klf}$

Side Dam : $t_{sd} := .3750in$ $h_{sd} := 9in$ $DL_{Sd} := \frac{2 \cdot (t_{sd} \cdot h_{sd}) \cdot \gamma_s}{N_{gird}}$ $\boxed{DL_{Sd} = 0.006 \cdot klf}$

Girder : $\boxed{DL_{gird} = 0.076 \cdot klf}$

Guardrail (12ga. W-Beam) : $DL_{wbeam} := 6.76 \frac{lb}{ft}$ $DL_{Rail} := \frac{2DL_{wbeam}}{N_{gird}}$ $\boxed{DL_{Rail} = 0.003 \cdot klf}$

Guardrail Post (W6x20) : $DL_{6x20} := 0.02klf$ $L_{post} := 3.9479ft$ $Sp_{post} := 6.25ft$ $N_{post} := 14$

$DL_{Post} := \frac{N_{post} \cdot DL_{6x20} \cdot L_{post}}{L_{total} \cdot N_{gird}}$ $\boxed{DL_{Post} = 0.007\,ft \cdot ksf}$

Guardrail Strut (W6x20) : $L_{strut} := 0ft$

$DL_{Strut} := \frac{N_{post} \cdot DL_{6x20} \cdot L_{strut}}{L_{total} \cdot N_{gird}}$ $\boxed{DL_{Strut} = 0.003 \cdot klf}$

Int.-Diaphragm (Bent PL) : $DL_{I\_Dia} := 0.027klf$

$DL_{Dia} := \frac{(N_{gird} - 1) \cdot Sp \cdot DL_{I\_Dia}}{N_{gird}}$ $\boxed{DL_{Dia} = 0.091 \cdot K}$

End-Diaphragm (Bent PL) : $DL_{E\_Dia} := 0.027klf$

$DL_{EDia} := \frac{(N_{gird} - 1) \cdot Sp \cdot DL_{E\_Dia}}{N_{gird}}$ $\boxed{DL_{EDia} = 0.091 \cdot K}$

Point Dead Load : $P_{DL1} := DL_{Dia}$ $\boxed{P_{DL1} = 0.091 \cdot K}$ $P_{DL2} := DL_{EDia}$ $\boxed{P_{DL2} = 0.091 \cdot K}$

Uniform Dead Load:

$$W_{DL} := DL_{Deck} + DL_{gravel} + DL_{gird} + DL_{Rail} + DL_{Post} + DL_{Strut} + DL_{Sd}$$

$W_{DL} = 0.356 \cdot klf$ Girder Uniform Dead Load

B.) Dead Load Moment / Shear

Dead Load Moment: $M_{DL} := \frac{W_{DL} \cdot L_{span}^2}{8} + P_{DL1} \cdot \left(\frac{L_{span}}{4}\right)$ $M_{DL} = 68.547 \cdot K \cdot ft$

Dead Load Shear: $V_{DL} := \frac{W_{DL} \cdot L_{total}}{2} + 0.5P_{DL1} + P_{DL2}$ $V_{DL} = 7.254 \cdot K$

C.) Truck Moment / Shear (RISA 3D)

$M_{Truck} := 429.333K \cdot ft$ = 432.1 $V_{Truck} := 52.923K$ = 54.8

D.) Lane Load $Lane := 0.064ksf$

Interior Girder Lane Load :

$Lane_{int} := Lane \cdot Sp$ $Lane_{int} = 0.288 \cdot klf$ ✓

Exterior Girder Lane Load :

$Lane_{ext} := Lane \cdot \left(OH + \frac{Sp}{2}\right)$ $Lane_{ext} = 0.244 \cdot klf$

E.) Lane Load Moment / Shear

Interior Girder Bending Moment :

$M_{Lane\_int} := \frac{Lane_{int} \cdot L_{span}^2}{8}$ $M_{Lane\_int} = 54.756 \cdot K \cdot ft$ ✓

Interior Girder Shear :

$V_{Lane\_int} := \frac{Lane_{int} \cdot L_{total}}{2}$ $V_{Lane\_int} = 5.76 \cdot K$ ✓

Exterior Girder Bending Moment :

$M_{Lane\_ext} := \frac{Lane_{ext} \cdot L_{span}^2}{8}$ $M_{Lane\_ext} = 46.39 \cdot K \cdot ft$

Exterior Girder Shear :

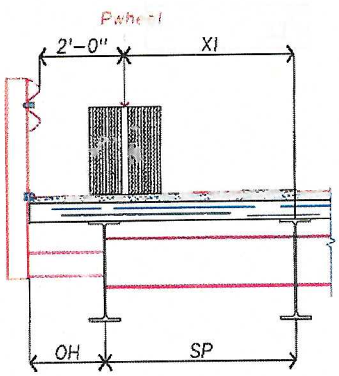
$$V_{Lane\_ext} := \frac{Lane_{ext} \cdot L_{total}}{2}$$ $\boxed{V_{Lane\_ext} = 4.88 \cdot K}$

3.) Live Load Distribution Factor (One Traffic Lane)

A.) Interior Girder (Table 3.23.1)

$$DF_I := \frac{Sp}{5.5}$$ $\boxed{DF_I = 0.818}$ ✓

B.) Exterior Girder (Lever Rule)



$$X_1 := Sp + OH - 2.25ft = 3.813\,ft$$ ✓

$$DF_E := \frac{X_1}{Sp}$$

$\boxed{DF_E = 0.847}$ ✓

4.) Girder Bending Stress

Girder Section Modulus : $\boxed{S_{xx} = 176 \cdot in^3}$ Girder Moment of Inertia : $\boxed{I_{xx} = 2100 \cdot in^4}$

A.) Allowable Bending Stress (Table 10.32.1A)

$$Fb_{all} := 0.55 \cdot F_y$$ $\boxed{Fb_{all} = 27.5 \cdot ksi}$

B.) Girder Bending Stress

Applied Moment :

$$M_{INT} := M_{DL} + M_{Lane\_int} + \frac{M_{Truck}}{2} \cdot (1 + I_M) \cdot DF_I$$ $\boxed{M_{INT} = 351.63 \cdot K \cdot ft}$

$$M_{EXT} := M_{DL} + M_{Lane\_ext} + \frac{M_{Truck}}{2} \cdot (1 + I_M) \cdot DF_E$$ $\boxed{M_{EXT} = 351.368 \cdot K \cdot ft}$

Bending Stress :

$$f_b := \frac{\max(M_{INT}, M_{EXT})}{S_{xx}}$$ $\boxed{f_b = 23.975 \cdot ksi}$ ✓

$\boxed{f_b \le Fb_{all} = 1}$ *~ Therefore Bending Stress O.K. ~*

5.) Girder Shear Stress

Girder depth : $d = 23.9 \cdot in$ Web Thickness : $t_w = 0.44 \cdot in$

A.) Allowable Shear Stress (Table 10.32.1A)

$Fv_{all} := 0.33 \cdot F_y$ $Fv_{all} = 16.5 \cdot ksi$

B.) Interior Girder Shear Stress

Applied Shear :

$$V_{INT} := V_{DL} + V_{Lane\_int} + \frac{V_{Truck}}{2} \cdot (1 + I_M) \cdot DF_I \qquad V_{INT} = 41.159 \cdot K$$

$$V_{EXT} := V_{DL} + V_{Lane\_ext} + \frac{V_{Truck}}{2} \cdot (1 + I_M) \cdot DF_E \qquad V_{EXT} = 41.278 \cdot K$$

Shear Stress :

$$f_v := \frac{\max(V_{INT}, V_{EXT})}{d \cdot t_w} \qquad f_v = 3.925 \cdot ksi$$ ✓

$f_v \le Fv_{all} = 1$ *~ Therefore Shear Stress O.K. ~*

6.) Service Load Deformations

Found In RISA 3D

Permanent Load Deflection :

$$\Delta_{DL} := \frac{5 \cdot W_{DL} \cdot L_{span}^4}{384 \cdot E_s \cdot I_{xx}} + \frac{P_{DL1} \cdot L_{span}^3}{48 \cdot E_s \cdot I_{xx}} \qquad \Delta_{DL} = 0.307 \cdot in$$

~ Provide 1.0" Camber ~ ✓

Lane Load Deflection :

$$\Delta_{Lane} := \frac{5 \cdot \max(Lane_{int}, Lane_{ext}) \cdot L_{span}^4}{384 \cdot E_s \cdot I_{xx}} \qquad \Delta_{Lane} = 0.246 \cdot in$$

Design Truck Deflection (HS20) :

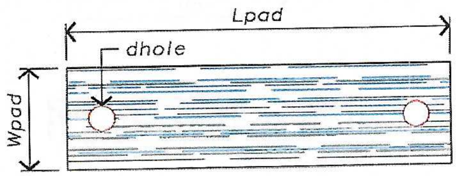
773

$$\Delta_{Truck} := \frac{1.861 in \cdot (1 + I_M) \cdot N_{lane}}{N_{gird}} \qquad \Delta_{Truck} = 0.605 \cdot in \qquad \frac{L_{span}}{\Delta_{Truck}} \ge 500 = 1$$

~ Therefore Live Load Deflection O.K. ~

7.) Bearing Design

A.) Bearing Pad Geometry



$L_{pad} := 17in$ $d_{hole} := 1.375in$

$W_{pad} := 6in$ $N_{hole} := 2$

$h_{rt} := 0.75in$ Total Thickness of Pad

$h_{ri} := 0.75in$ Thickness of thickest layer

$N_{ri} := 1$ Number of Internal layers

Hole Area : $A_{hole} := \frac{\pi}{4} \cdot d_{hole}^2$ $A_{hole} = 1.485 \cdot in^2$

Hole Perimeter : $P_{hole} := \pi \cdot d_{hole}$ $P_{hole} = 4.32 \cdot in$

Shape Factor : $S_{pad} := \frac{(L_{pad} \cdot W_{pad}) - (N_{hole} \cdot A_{hole})}{h_{ri} \cdot 2(L_{pad} + W_{pad} + P_{hole})}$ $S_{pad} = 2.417$

B.) Bearing Reactions

Dead Load Reaction : $R_{DL} := V_{DL}$ $R_{DL} = 7.254 \cdot K$

$$\theta_{DL} := \frac{W_{DL} \cdot L_{span}^3}{24 \cdot E_s \cdot I_{xx}} + \frac{P_{DL1} \cdot L_{span}^2}{16 \cdot E_s \cdot I_{xx}} \qquad \theta_{DL} = 0.12 \cdot deg$$

Live Load Reaction : $R_{Truck} := \frac{V_{Truck}}{2} \cdot \max(DF_I, DF_E) + \max(V_{Lane\_int}, V_{Lane\_ext})$ $R_{Truck} = 28.179 \cdot K$

$\theta_{LL} := 0.73510deg$ ***(No Impact per 14.4)*** $\theta_{Truck} := \frac{\theta_{LL}}{N_{gird}}$ $\theta_{Truck} = 0.184 \cdot deg$

C.) Thermal Expansion (3.16)

Design Temperatures : $t_{max\_design} := 120$ $t_{min\_design} := -30$ ***(Assume Severe Climate)***

$$\Delta_t := t_{max\_design} - t_{min\_design}$$

Coefficient Thermal Expansion : $\alpha := 0.0000065$

Bridge Expansion : $\Delta_L := \alpha \cdot \Delta_t \cdot L_{span}$ $\Delta_L = 0.456 \cdot in$ ✓

D.) Shear Deformation (14.6.6.3.4)

Maximum Horizontal Displacement : $\Delta_s := 0.65 \cdot \Delta_L$ $\quad \Delta_s = 0.297 \cdot in$

$h_{rt} \geq 2 \cdot \Delta_s = 1$ ~ *Therefore Shear Deformation O.K.* ~

E.) Compressive Stress (14.6.6.3.2)

Pad Area : $A_{pad} := (L_{pad} \cdot W_{pad}) - (N_{hole} \cdot A_{hole})$ $\quad A_{pad} = 99.03 \cdot in^2$

Pad Shear Modulus : $G_{pad} := 0.180ksi$ $\quad G_{max} := G_{pad} \cdot 1.15$ $\quad G_{max} = 0.207 \cdot ksi$

(60 Duro Bearing Pad)

$G_{min} := G_{pad} \cdot 0.85$ $\quad G_{min} = 0.153 \cdot ksi$

Applied Compressive Stress : $\sigma TL := \dfrac{R_{DL} + R_{Truck}}{A_{pad}}$ $\quad \sigma TL = 0.358 \cdot ksi$

Allowable Compressive Stress: $\sigma TL_{all\_1} := 0.80ksi$

$\sigma TL_{all\_2} := 1 \cdot G_{min} \cdot S_{pad}$ $\quad \sigma TL_{all\_2} = 0.37 \cdot ksi$

$\sigma TL \leq \min(\sigma TL_{all\_1}, \sigma TL_{all\_2}) = 1$ ~ *Therefore Compressive Stress O.K.* ~

F.) Compressive Deflection (14.6.5.3.3)

Compressive Stress:

Instantaneous : $\sigma LL := \dfrac{R_{Truck}}{A_{pad}}$ $\quad \sigma LL = 0.285 \cdot ksi$ $\quad$ Dead Load : $\sigma DL := \dfrac{R_{DL}}{A_{pad}}$ $\quad \sigma DL = 0.073 \cdot ksi$

Compressive Strain:

Instantaneous : $\varepsilon_{Li} := \dfrac{\sigma LL}{6 \cdot G_{min} \cdot S_{pad}^2}$ $\quad$ Dead Load : $\varepsilon_{di} := \dfrac{\sigma DL}{6 \cdot G_{min} \cdot S_{pad}^2}$

$\varepsilon_{Li} = 0.053$ $\quad \varepsilon_{di} = 0.014$

Compressive Deflection:

Instantaneous: $\delta_L := \varepsilon_{Li} \cdot h_{ri}$ $\quad$ Dead Load: $\delta_d := \varepsilon_{di} \cdot h_{ri}$ $\quad$ Creep: $a_{cr} := 0.35$

$\delta_L = 0.04 \cdot in$ $\quad \delta_d = 0.01 \cdot in$

Long Term Compressive Deflection: $\delta_{lt} := \delta_d + \delta_d \cdot (1 + a_{cr})$ $\quad \delta_{lt} = 0.024 \cdot in$

Limiting Compressive Deflection: $\delta_{max} := 0.125in$ $\quad \delta_{lt} \leq \delta_{max} = 1$ $\quad \delta_L \leq \delta_{max} = 1$

~ *Therefore Compressive Deflection O.K.* ~

G.) Bearing Pad Rotation (14.6.6.3.5a)

Additional Rotation for Uncertainties: $\theta_{add} := 0.005rad$

Design Rotation : $\theta_{design} := \theta_{DL} + \theta_{Truck} + \theta_{add}$ $\quad \theta_{design} = 0.01 \cdot rad$

$$\sigma_{rot} := 0.5 \cdot G_{max} \cdot S_{pad} \cdot \left(\frac{W_{pad}}{h_{ri}}\right)^2 \cdot \frac{\theta_{design}}{N_{ri}} \quad \sigma_{rot} = 0.165 \cdot ksi$$

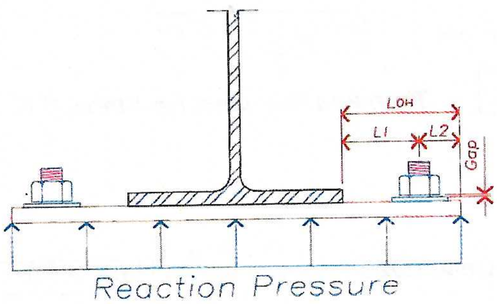
$\sigma TL \geq \sigma_{rot} = 1$ ~ *Therefore Rotation O.K.* ~

H.) Stability:

$h_{rt} \leq \frac{L_{pad}}{3} = 1$ $\quad h_{rt} \leq \frac{W_{pad}}{3} = 1$ ~ *Therefore Stability O.K.* ~

I.) Sole Plate Design:

Sole Plate Geometry :



$L_1 := 2in$

$L_2 := 2in$

$L_{OH} := L_1 + L_2$ $\quad L_{OH} = 4 \cdot in$

$t_{sp} := 1.0in$

$W_{strip} := 1.0in$ ***(Unit Strip)***

$Gap := 0.125in$

Moment of Inertia Provided : $Ix_{sp} := \frac{1}{12} \cdot W_{strip} \cdot t_{sp}^3$ $\quad Ix_{sp} = 0.083 \cdot in^4$

Deflection at Free End : $\Delta_y := \frac{(\sigma TL \cdot W_{strip}) \cdot (L_{OH})^4}{8 \cdot E_s \cdot Ix_{sp}}$ $\quad \Delta_y = 0.005 \cdot in$

$\Delta_y \leq Gap = 1$ ***(Design as Cantilever)***

Applied Moment : $M_{sp} := \frac{(\sigma TL \cdot W_{strip}) \cdot L_{OH}^2}{2}$ $\quad M_{sp} = 2.862 \cdot K \cdot in$

Required Section Modulus : $Sx_{req} := \frac{M_{sp}}{Fb_{all}}$ $\quad Sx_{req} = 0.104 \cdot in^3$

Required Plate Thickness : $t_{req} := \sqrt{\frac{6 \cdot Sx_{req}}{W_{strip}}}$ $\quad t_{req} = 0.79 \cdot in$ $\quad t_{sp} \geq t_{req} = 1$ ~ *O.K.* ~

8.) Guardrail Post Design

A.) Post Loading

Transverse Post Loading (Figure 2.7.4B) : $F_T := 10K$ ✓

Longitudinal Post Loading (2.7.1.3.3) : $F_L := \dfrac{\frac{1}{2}F_T}{4}$ $F_L = 1.25 \cdot K$ ***(Over <= 4 posts)***

Inward Post Loading (2.7.1.3.3) : $F_{IN} := \dfrac{1}{4} \cdot F_T$ $F_{IN} = 2.5 \cdot K$

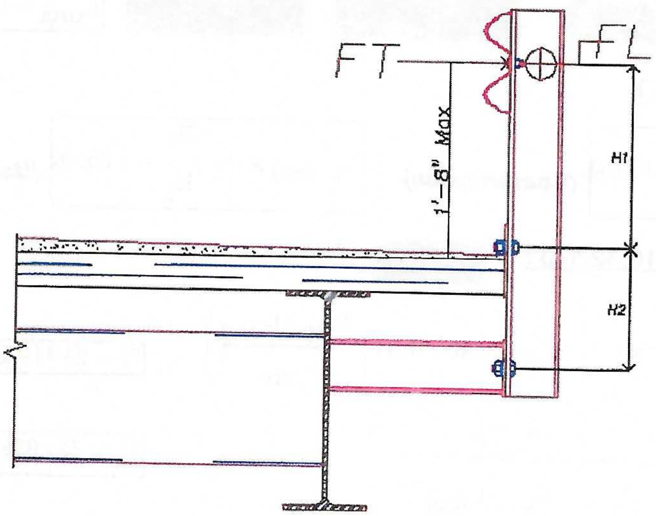
Vertical Attachment Loading (2.7.1.3.4) : $F_V := \dfrac{1}{4} \cdot F_T$ $F_V = 2.5 \cdot K$

B.) Post Properties (W6x20)

$bf_{post} := 6.02in$ $d_{post} := 6.20in$ $A_{post} := 5.87in^2$ $Sx_{post} := 13.4in^3$ $Ix_{post} := 41.4in^4$

$tf_{post} := 0.365in$ $tw_{post} := 0.26in$ $ry_{post} := 1.5in$ $Sy_{post} := 4.41in^3$ $Iy_{post} := 13.3in^4$ $L_{post} = 3.948\,ft$

C.) Loading Combination 1 (FT+FL)



$H_1 := 22.375in$ $H_2 := 15in$

Transverse Moment :

$M_T := F_T \cdot H_1$

$M_T = 18.646 \cdot K \cdot ft$

Longitudinal Moment :

$M_L := F_L \cdot H_1$

$M_L = 2.331 \cdot K \cdot ft$

Section Classification (2.7.4.3) :

Flange : $\dfrac{bf_{post}}{2 \cdot tf_{post}} \le \dfrac{1600}{\sqrt{F_y}} = 0$

(NonCompact Flange)

Web : $\dfrac{d_{post} - (2 \cdot tf_{post})}{tw_{post}} \le \dfrac{13000}{\sqrt{F_y}} = 1$

(Compact Web)

(Allowable Stress = 0.55xFy)

Applied Stress : $fb_{T\_post} := \frac{M_T}{Sx_{post}}$ $fb_{T\_post} = 16.698 \cdot ksi$ $fb_{L\_post} := \frac{M_L}{Sy_{post}}$ $fb_{L\_post} = 6.342 \cdot ksi$

$$\frac{fb_{T\_post} + fb_{L\_post}}{Fb_{all}} \le 1 = 1$$

~ Combined Bending O.K. ~

D.) Loading Combination 2 (FIN)

Transverse Moment : $M_{IN} := F_{IN} \cdot H_1$ $M_{IN} = 4.661 \cdot K \cdot ft$

Applied Stress : $fb_{IN\_post} := \frac{M_{IN}}{Sx_{post}}$ $fb_{IN\_post} = 4.174 \cdot ksi$

$fb_{IN\_post} \le Fb_{all} = 1$ *~ Bending O.K. ~*

9.) Guardrail Strut Design

A.) Strut Properties (W6x20)

$bf_{strut} := 6.02in$ $d_{strut} := 6.20in$ $A_{strut} := 5.87in^2$ $Sx_{strut} := 13.4in^3$ $Ix_{strut} := 41.4in^4$ $K_{strut} := 1.0$

$tf_{strut} := 0.365in$ $tw_{strut} := 0.26in$ $ry_{strut} := 1.5in$ $Sy_{strut} := 4.41in^3$ $Iy_{strut} := 13.3in^4$ $L_{strut} = 1.563\,ft$

B.) Loading Combination 1 (FT+FL)

Strut Forces : $R_{T\_Btm} := F_T \cdot \frac{H_1}{H_2} = 14.917 \cdot K$ *(Compression)* $R_{L\_Btm} := F_L \cdot \frac{H_1}{H_2} = 1.865 \cdot K$ *(Bending)*

Allowable Axial Compression (Table 10.32.1A) : $C_c := 107$

$\frac{K_{strut} \cdot L_{strut}}{ry_{strut}} \le C_c = 1$ *~ Therefore ~* $Fa := 23580 - 1.03 \cdot \left(\frac{K_{strut} \cdot L_{strut}}{ry_{strut}}\right)^2$ $Fa = 23.419 \cdot ksi$

Euler Buckling Stress (10.36) : $F'_e := \frac{\pi^2 \cdot E_s}{2.12 \cdot \left(\frac{K_{strut} \cdot L_{strut}}{ry_{strut}}\right)^2}$ $F'_e = 864.056 \cdot ksi$

Applied Bending Stress : $fb_{L\_strut} := \frac{R_{L\_Btm} \cdot L_{strut}}{Sy_{strut}}$ $fb_{L\_strut} = 7.928 \cdot ksi$

Applied Compressive Stress : $fa_{T\_strut} := \frac{R_{T\_Btm}}{A_{strut}}$ $fa_{T\_strut} = 2.541 \cdot ksi$

Combined Stresses (10.36): $C_m := 1.0$

$$\frac{fa_{T\_strut}}{Fa} + \frac{C_m \cdot fb_{L\_strut}}{\left(1 - \frac{fa_{T\_strut}}{F'_e}\right) \cdot Fb_{all}} \le 1 = 1$$

~ Combined Stresses O.K. ~

C.) Loading Combination 2 (FIN)

Strut Force : $R_{IN\_Btm} := F_{IN} \cdot \frac{H_1}{H_2} = 3.729 \cdot K$ ***(Tension)***

Allowable Tension (Table 10.32.1A) : $F_t := Fb_{all}$

Applied Tensile Stress : $f_{t\_strut} := \frac{R_{IN\_Btm}}{A_{strut}}$ $f_{t\_strut} = 0.635 \cdot ksi$ $f_{t\_strut} \le F_t = 1$

~ Tension O.K. ~

10.) Guardrail Connection Design

A.) Loading Combination 1 (FT+FL)

Bolt Forces : $R_{T\_Top} := F_T \cdot \frac{(H_1 + H_2)}{H_2} = 24.917 \cdot K$ ***(Tension)*** $R_{L\_Top} := F_L \cdot \frac{(H_1 + H_2)}{H_2} = 3.115 \cdot K$ ***(Shear)***

Combined Tension And Shear (10.32.3.3.3) : ***(7/8" ASTM A325 Bolts)***

Nominal Slip Resistance (Table 10.32.3C) : $F_S := 15.0 ksi$ ***(Class A Finish)***

Bolt Ultimate Strength : $F_{U\_bolt} := 120 ksi$ ***(Up to 1" Diameter)***

Bolt Properties : $d_{bolt} := 0.875 in$ $A_{bolt} := \frac{\pi}{4} \cdot d_{bolt}^2$ $A_{bolt} = 0.601 \cdot in^2$

Applied Tensile Stress : $f_{t\_Top} := \frac{R_{T\_Top}}{2 \cdot A_{bolt}}$ $f_{t\_Top} = 20.718 \cdot ksi$ ***(2 bolts resist tension)***

Applied Shear Stress : $f_{v\_Top} := \frac{R_{L\_Top}}{2 \cdot A_{bolt}}$ $f_{v\_Top} = 2.59 \cdot ksi$ ***(2 bolts resist shear)***

Slip Resistance/Unit Bolt Area : $f_{v\_all} := F_S \cdot \left(1 - \frac{1.88 \cdot f_{t\_Top}}{F_{U\_bolt}}\right)$ $f_{v\_all} = 10.131 \cdot ksi$

Allowable Shear Stress (Table 10.32.3B) : $F_{V\_all} := 19.0 ksi$ ***(Threads Included)***

Allowable Tensile Stress (Table 10.32.3B) : $F_{t\_all} := 38.0 ksi$

$$\frac{f_{v\_Top}}{F_{V\_all}} = 0.136$$ $F'_t := F_{t\_all}$

$f_{v\_Top} \le f_{v\_all} = 1$ *~ Shear O.K. ~* $f_{t\_Top} \le F'_t = 1$ *~ Tension O.K. ~*

B.) Loading Combination 2 (FIN)

Bolt Forces : $R_{IN\_Btm} = 3.729 \cdot K$ ***(Tension)***

Allowable Tensile Stress (Table 10.32.3B) : $F_{t\_all} = 38 \cdot ksi$

Applied Tensile Stress : $f_{t\_Btm} := \frac{R_{IN\_Btm}}{2 \cdot A_{bolt}}$ $f_{t\_Btm} = 3.101 \cdot ksi$ ***(2 bolts resist tension)***

$f_{t\_Btm} \le F_{t\_all} = 1$ ***~ Tension O.K. ~***

C.) Loading Combination 3 (FV)

Bolt Forces : $R_{V\_Top} := F_V \cdot \frac{(H_1 + H_2)}{H_2} = 6.229 \cdot K$ ***(Shear)***

Allowable Shear Stress (Table 10.32.3B) : $F_{V\_all} = 19 \cdot ksi$

Applied Shear Stress : $f_{V\_Top} := \frac{R_{V\_Top}}{2 \cdot A_{bolt}}$ $f_{V\_Top} = 5.18 \cdot ksi$ ***(2 bolts resist shear)***

$f_{V\_Top} \le F_{V\_all} = 1$ ***~ Shear O.K. ~***

11.) Guardrail Design ***(AASHTO LRFD 4th ED. A13.3.2)***

A.) Guardrail Post Plastic Capacity

Post Section Section Modulus: $Zx_P := 14.9 in^3$

Height of Center of Rail Above Deck: $y_{rail} := 1.9896 ft$

Post Spacing: $S_p := 6.25 ft$

Plastic Moment Capacity: $Mp_P := Zx_P \cdot F_y$ $Mp_P = 62.083 \cdot K \cdot ft$

Single Post Load Resistance: $P_P := \frac{Mp_P}{y_{rail}}$ $P_P = 31.204 \cdot K$

B.) Guard Rail Properties ***((1) Layer of 12 ga W-Beam)*** ✓

W-Beam Plastic Section Modulus: $Zx_W := 1.78 in^3$

W-Beam Yield Strength: $Fy_W := 50 ksi$

C.) Guard Rail Load Resistance

Plastic Moment Capacity: $Mp_R := Zx_W \cdot Fy_W$ $Mp_R = 7.417 \cdot K \cdot ft$

Long. length of distribution of Impact force (TL-1 Rating): $L_t := 4ft$

Single Span Failure Resistance: $N_1 := 1$

$$R_1 := \frac{16 \cdot Mp_R + (N_1 - 1) \cdot (N_1 + 1) \cdot P_P \cdot S_p}{2 \cdot N_1 \cdot S_p - L_t} \qquad R_1 = 13.961 \cdot K$$

Two Span Failure Resistance: $N_2 := 2$

$$R_2 := \frac{16 \cdot Mp_R + N_2^{\,2} \cdot P_P \cdot S_p}{2 \cdot N_2 \cdot S_p - L_t} \qquad R_2 = 42.798 \cdot K$$

Three Span Failure Resistance: $N_3 := 3$

$$R_3 := \frac{16 \cdot Mp_R + (N_3 - 1) \cdot (N_3 + 1) \cdot P_P \cdot S_p}{2 \cdot N_3 \cdot S_p - L_t} \qquad R_3 = 50.115 \cdot K$$

Minimum Transverse Load for TL-1 Rated Railing: $Ft_{TL1} := 13.5K$

Railing Resistance Check: $\min(R_1, R_2, R_3) \geq Ft_{TL1} = 1$ ~ *Railing O.K.* ~

where:

R_i = resistance of the rail (kips)

Y_i = distance from bridge deck to the ith rail (ft)

All forces shall be applied to the longitudinal rail elements. The distribution of longitudinal loads to posts shall be consistent with the continuity of rail elements. Distribution of transverse loads shall be consistent with the assumed failure mechanism of the railing system.

Eq. A13.2-1 has been found to give reasonable predictions of effective railing height requirements to prevent rollover.

If the design load located at H_e falls between rail elements, it should be distributed proportionally to rail elements above and below such that $Y \geq H_e$.

As an example of the significance of the data in Table A13.2-1, the length of 4.0 ft for L_t and L_L is the length of significant contact between the vehicle and railing that has been observed in films of crash tests. The length of 3.5 ft for TL-4 is the rear-axle tire diameter of the truck. The length of 8.0 ft for TL-5 and TL-6 is the length of the tractor rear tandem axles: two 3.5-ft diameter tires, plus 1.0 ft between them.

F_v, the weight of the vehicle lying on top of the bridge rail, is distributed over the length of the vehicle in contact with the rail, L_v.

For concrete railings, Eq. A13.2-1 results in a theoretically-required height, H, of 34.0 in. for TL-4. However, a height of 32.0 in., shown in Table A13.2-1, was considered to be acceptable because many railings of that height have been built and appear to be performing acceptably.

The minimum height, H, listed for TL-1, TL-2, and TL-3 is based on the minimum railings height used in the past. The minimum effective height, H_e, for TL-1 is an estimate based on the limited information available for this test level.

The minimum height, H, of 42.0 in., shown in Table A13.2-1, for TL-5 is based on the height used for successfully crash-tested concrete barrier engaging only the tires of the truck. For post-and-beam metal bridge railings, it may be prudent to increase the height by 12.0 in. so as to engage the bed of the truck.

The minimum height, H, shown in Table A13.2-1, for TL-6 is the height required to engage the side of the tank as determined by crash test.

Table A13.2-1—Design Forces for Traffic Railings

Design Forces and Designations	Railing Test Levels					
	TL-1	TL-2	TL-3	TL-4	TL-5	TL-6
F_t Transverse (kips)	13.5	27.0	54.0	54.0	124.0	175.0
F_L Longitudinal (kips)	4.5	9.0	18.0	18.0	41.0	58.0
F_v Vertical (kips) Down	4.5	4.5	4.5	18.0	80.0	80.0
L_t and L_L (ft)	4.0	4.0	4.0	3.5	8.0	8.0
L_v (ft)	18.0	18.0	18.0	18.0	40.0	40.0
H_e (min) (in.)	18.0	20.0	24.0	32.0	42.0	56.0
Minimum H Height of Rail (in.)	27.0	27.0	27.0	32.0	42.0	90.0

12.) Side Dam Deck Connection

A.) Deck Reaction Due To Vehicular Impact

Truck Impact Reaction : $R_{T\_Top} = 24.917 \cdot K$

Electrode Strength : $F_{E70xx} := 70ksi$ ✓

Allowable Weld Stress : $F_w := 0.3 \cdot F_{E70xx}$ $\boxed{F_w = 21 \cdot ksi}$ ✓

Effective Weld Size : $w_{fil} := 0.125in$

$w_l := 0.707 \cdot w_{fil}$ $\boxed{w_l = 0.088 \cdot in}$

Required Length : $W_L := \dfrac{R_{T\_Top}}{F_w \cdot w_l}$ $\boxed{W_L = 13.426 \cdot in}$ ***~ 24 in Provided ~***

13.) Deck Design

A.) Deck Properties (12 x 4 1/4 x 7Ga. Type A)

Deck Yield Strength : $Fy_{deck} := 50ksi$

Surfacing Thickness : $\boxed{t_{gravel} = 3 \cdot in}$

Deck Section Modulus : $Sx_{deck} := 4.78 \dfrac{in^3}{ft}$

Neutral Axis : $Cg := 2.209in$

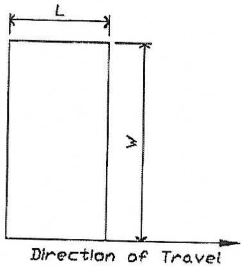
Girder Flange Width : $\boxed{b_f = 8.99 \cdot in}$

Gravel Unit Area : $A_{gravel} := 0.41050ft^2$

B.) Tire Contact Area:

~ AASHTO 3.30

$P_{Tire} := 16000lb$ $A_T := .01 \cdot P_{Tire} \cdot \dfrac{in^2}{lb}$ $\boxed{A_T = 160 \cdot in^2}$

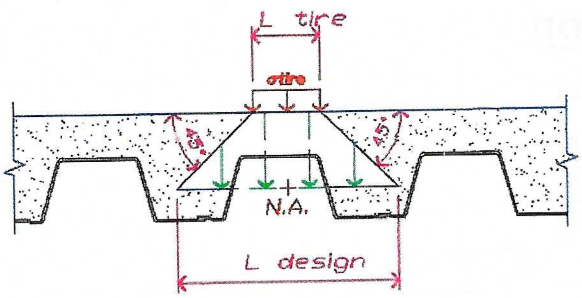


$W_T := \sqrt{A_T \cdot 2.5}$ $\boxed{W_T = 20 \cdot in}$

$L_T := \dfrac{A_T}{W_T}$ $\boxed{L_T = 8 \cdot in}$

$W_e := W_T + 2 \cdot (Cg + t_{gravel})$ $\boxed{W_e = 30.418 \cdot in}$

$L_e := L_T + 2 \cdot (Cg + t_{gravel})$ $\boxed{L_e = 18.418 \cdot in}$



$P_I := P_{Tire} \cdot (1 + I_M)$ $\quad P_I = 20.8 \cdot K$

$A_e := L_e \cdot W_e$ $\quad A_e = 560.239 \cdot in^2$

$DF := \frac{12in}{L_e}$ $\quad DF = 0.652$

C.) Applied Load:

$W_{LL\_deck} := \frac{P_I}{W_e} \cdot DF$ $\quad W_{LL\_deck} = 5.346 \cdot \frac{K}{ft}$

$W_{DL\_deck} := Wt_{deck} \cdot 1ft + A_{gravel} \cdot \gamma_{gravel}$ $\quad W_{DL\_deck} = 0.062 \cdot \frac{K}{ft}$

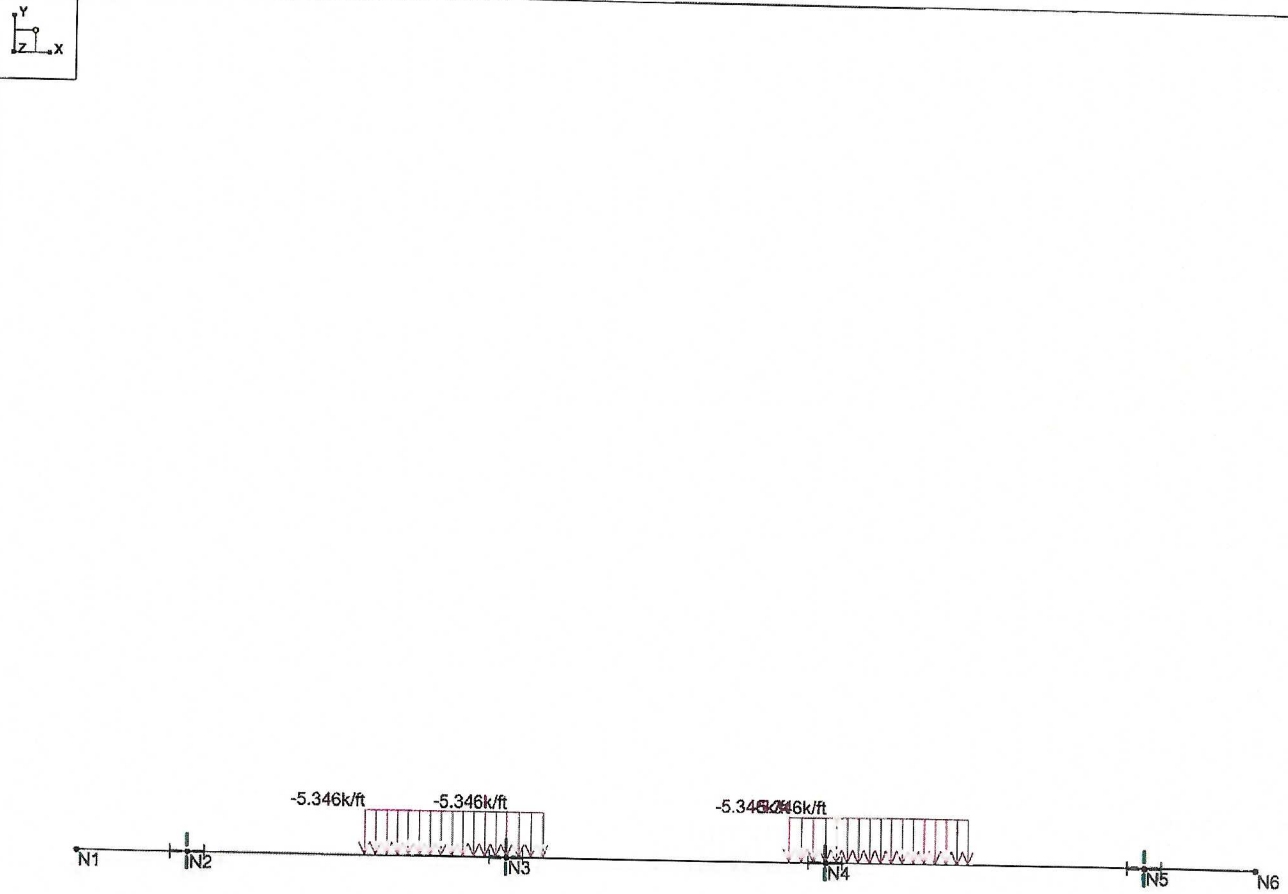
$M_{deck} := 6.020 \frac{K \cdot ft}{ft}$ **~ From Risa 3D ~**

See Index #18

$f_{b\_deck} := \frac{M_{deck}}{Sx_{deck}}$ $\quad f_{b\_deck} = 15.113 \cdot ksi$

$f_{all\_deck} := .6 \cdot Fy_{deck}$ $\quad f_{all\_deck} = 30 \cdot ksi$

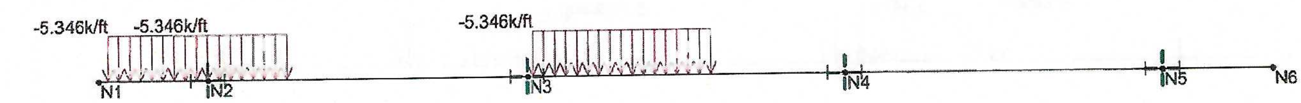
$f_{all\_deck} \geq f_{b\_deck} = 1$



$M_{MAX(D+L)} = 4.666^{k\text{-}ft}$

Loads: BLC 2, Live (Truck @ Center)

	Truck at Centerline of Travelway	1
		June 20, 2024 at 3:13 PM
		605 Deck Design.r3d



$M_{MAX(D+L)} = 6.020^{k\text{-}ft}$

Loads: BLC 3, Live (Truck @ Edge)

		2
		June 20, 2024 at 3:14 PM
	Truck at Edge of Travelway	605 Deck Design.r3d

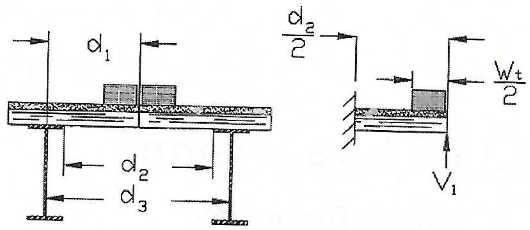
D.) Case 1 (Wheel Centered on Splice):

Maximum Shear at Connection

$d_1 := \frac{Sp}{2} = 27 \cdot in$

$d_2 := Sp - b_f = 45.01 \cdot in$

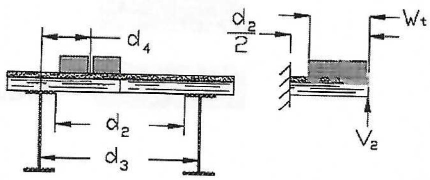
$d_3 := Sp - t_w = 53.56 \cdot in$



$$V_1 := \frac{\left[\frac{P_I}{2} \cdot \left(\frac{d_2}{2} - \frac{W_e}{4}\right)\right]^2}{2\left(\frac{d_2}{2}\right)^3} \cdot \left(\frac{W_e}{4} + 2\frac{d_2}{2}\right)$$

$V_1 = 5.329 \cdot K$ ~ **Maximum Shear for Case 1**

E.) Case 2 (Wheel on One Side of Splice):



Maximum Shear at Connection

$d_4 := \frac{d_2}{2} - \frac{W_e}{2}$ $d_4 = 7.296 \cdot in$

$$V_2 := \frac{\left(P_I \cdot d_4^{\,2}\right)}{2\left(\frac{d_2}{2}\right)^3} \cdot \left(\frac{W_e}{2} + 2\frac{d_2}{2}\right)$$

$V_2 = 2.925 \cdot K$ ~ **Maximum Shear for Case 2**

F.) Deck Splice Design:

Bolt Diameter: $d_{bolt} = 0.875 \cdot in$

Allowable Shear Load for Oversize Hole: $SR := 19ksi$

Allowable Shear per 7/8" Bolt: $V_{All} := \left(\frac{\pi}{4} \cdot d_{bolt}^{\,2}\right) \cdot SR$ $V_{All} = 11.425 \cdot K$

Bolt Spacing: $BS := \frac{V_{All}}{(V_1)}$ $BS = 2.144$ 7/8" A325 Bolts at 2'-0" c-c ✓

G.) Deck Weld Design:

$F_w = 21 \cdot ksi$

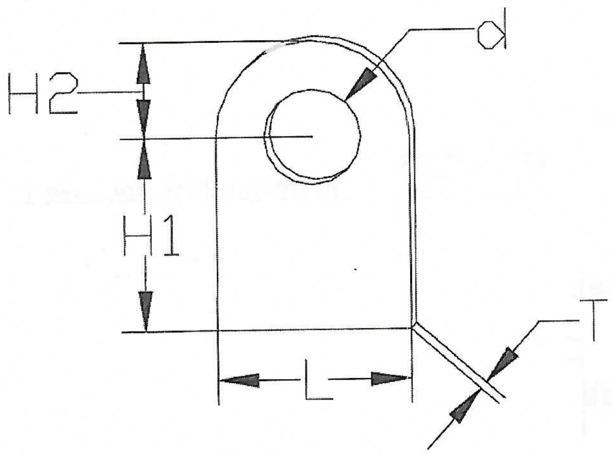
1/8" Fillet Resisting $w_{filD} := 0.125in$ $V_{deck} := V_1$

$w_{lD} := 0.707 \cdot w_{filD}$ $\boxed{w_{lD} = 0.088 \cdot in}$

$W_{LD} := \frac{V_{deck}}{F_w \cdot w_{lD}}$ $\boxed{W_{LD} = 2.872 \cdot in}$ ~ **Weld Length Required**

14.) Padeye Design

A.) Padeye Dimensions



$\phi_{hole} := 1.625in$

$T_{PL} := 0.75in$

$L_{PL} := 4in$

$H1_{hole} := 2in$

$H2_{hole} := 2in$

$L_{prov} := 8.0in$ *(Provided Weld Length)*

B.) Padeye Loading

Module Weight : $W_M := 12.8K$ ✓

Load Per Padeye : $W_P := \frac{W_M}{4}$ $\boxed{W_P = 3.2 \cdot K}$

Effective Area : $A_{Efec} := (L_{PL} \cdot T_{PL}) - (\phi_{hole} \cdot T_{PL})$ $\boxed{A_{Efec} = 1.781 \cdot in^2}$

Applied Tension : $f_t := \frac{W_P}{A_{Efec}}$ $\boxed{f_t = 1.796 \cdot ksi}$

Allowable Tension : $Ft_{all} := 27.5ksi$

$\boxed{f_t \le Ft_{all} = 1}$ *~ Tension O.K. ~*

Effective Weld Size : $w_{padeye} := 0.25in$

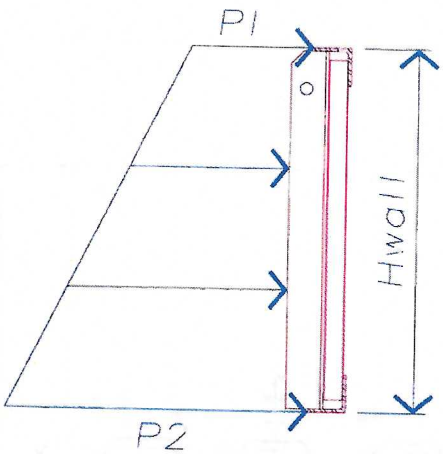
$w1 := 0.707 \cdot w_{padeye}$ $\boxed{w1 = 0.177 \cdot in}$

Required Length : $L_{padeye} := \frac{W_P}{F_w \cdot w1}$ $\boxed{L_{padeye} = 0.862 \cdot in}$

$\boxed{L_{prov} \ge L_{padeye} = 1}$ ✓ *~ Weld O.K. ~*

15.) Backwall Design

A.) Backwall Geometry (10 Ga. Backwall Sheet)



Wall Height : $H_{wall} := 32.40625in$

Backwall Section Modulus : $S_{pos} := 1.350 \frac{in^3}{ft}$

$S_{neg} := 1.151 \frac{in^3}{ft}$

Backwall Yield Strength : $Fy_{BW} := 38ksi$

Soil Density : $\gamma_{soil} := 0.12kcf$

Soil Friction Angle : $\phi_{soil} := 30deg$

B.) Backwall Loading

At Rest Pressure Coefficient : $K_o := 1 - \sin(\phi_{soil})$ $\quad K_o = 0.5$

At Rest Soil Pressure : $P_{rest} := \gamma_{soil} \cdot K_o$ $\quad P_{rest} = 0.06 \cdot kcf$

$P_{wall} := P_{rest} \cdot H_{wall}$ $\quad P_{wall} = 0.162 \cdot ksf$

Surcharge Pressure : $H_{sur} := 2.0ft$

$P1_{wall} := H_{sur} \cdot P_{rest}$ $\quad P1_{wall} = 0.12 \cdot ksf$

Pressure at Base of Wall : $P2_{wall} := P1_{wall} + P_{wall}$ $\quad P2_{wall} = 0.282 \cdot ksf$

C.) Backwall Bending Stress

Sheet Moment : $M_{wall} := 0.184 \frac{K \cdot ft}{ft}$

Allowable Sheet Bending Stress : $Fb_{all\_sheet} := 0.60 \cdot Fy_{BW}$ $\quad Fb_{all\_sheet} = 22.8 \cdot ksi$

Applied Sheet Bending Stress : $fb_{sheet} := \frac{M_{wall}}{\min(S_{pos}, S_{neg})}$ $\quad fb_{sheet} = 1.918 \cdot ksi$

$fb_{sheet} \leq Fb_{all\_sheet} = 1$

~ Bending Stress O.K. ~

Company : RTI FABRICATION, INC.
Designer :
Job Number:

Apr 2, 2018
09:52 AM
Checked By:______

Section Properties: Section1_Standard Backwall Sheathing 2018.dxf

Section Information:

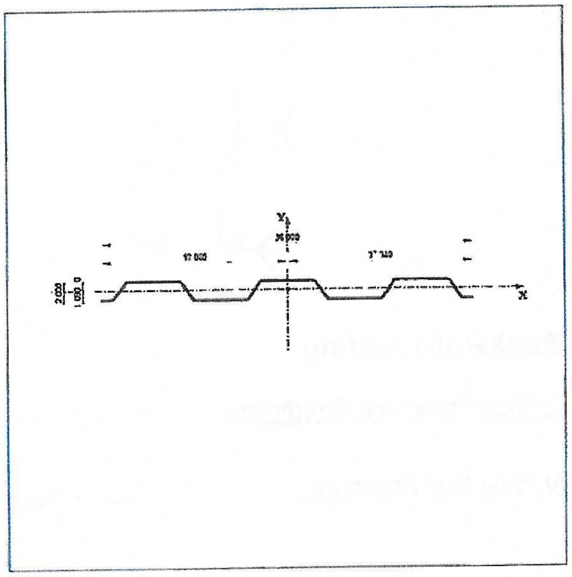
Material Type	=	General	
Shape Type	=	Arbitrary	
Number of Shapes	=	1	

Basic Properties:

Total Width	=	36.000	in
Total Height	=	2.000	in
Centroid, Xo	=	18.787	in
Centroid, Yo	=	1.080	in
X-Bar (Right)	=	17.940	in
X-Bar (Left)	=	18.060	in
Y-Bar (Top)	=	0.920	in
Y-Bar (Bot)	=	1.080	in
Max Thick	=	36.000	in

Equivalent Properties:

Area, Ax	=	5.535	in^2
Inertia, Ixx	=	3.727	in^4
Inertia, Iyy	=	605.56	in^4
Inertia, Ixy	=	-0.693	in^4
Sx (Top)	=	4.049	in^3
Sx (Bot)	=	3.452	in^3
Sy (Left)	=	33.531	in^3
Sy (Right)	=	33.755	in^3
rx	=	0.821	in
ry	=	10.460	in
Plastic Zx	=	4.263	in^3
Plastic Zy	=	50.212	in^3
Torsional J	=	0.034	in^4
As-xx Def	=	1.000	
As-yy Def	=	1.000	
As-xx Stress	=	1.000	
As-yy Stress	=	1.000	



Section Diagram

$$S_{X(TOP)} = \frac{4.049\ in^3}{3\ ft} = 1.350\ in^3/ft$$

$$S_{X(BOT)} = \frac{3.452\ in^3}{3\ ft} = 1.151\ in^3/ft$$

D.) Bottom Angle (L5x3x3/8)

Angle Properties : $Sx_{angle} := 2.22in^3$ $Fy_{angle} := 50ksi$ $L_{end} := 5.0ft$

Base Load : $w_{base} := \frac{(P1_{wall} \cdot H_{wall})}{2} + \frac{(P_{wall} \cdot H_{wall})}{3}$ $w_{base} = 307.888 \frac{lb}{ft}$

Bending Moment : $M_{angle} := w_{base} \cdot \frac{L_{end}^2}{2}$ $M_{angle} = 3.849 \cdot K \cdot ft$

Allowable Bending Stress : $Fb_{all\_angle} := .55 \cdot Fy_{angle}$ $Fb_{all\_angle} = 27.5 \cdot ksi$

Applied Bending Stress : $fb_{angle} := \frac{M_{angle}}{Sx_{angle}}$ $fb_{angle} = 20.803 \cdot ksi$ ✓

$fb_{angle} \le Fb_{all\_angle} = 1$

16.) Abutment Design

A.) Abutment Soil Pressure

Dead Load Reaction (Per Bearing) : $R_{DL} = 7.254 \cdot K$

Truck Load Reaction (Per Lane) : $V_{Truck} = 52.923 \cdot K$ *~ No Impact ~*

Lane Load Reaction (Per Lane) : $R_{Lane} := \frac{Lane \cdot 10ft \cdot L_{span}}{2}$ $R_{Lane} = 12.48 \cdot K$ ✓

Backwall Dead Load : $P_{BW} := 0.90K$

Allowable Bearing Capacity of Soil: $Q_{allow} := 4.0ksf$ *~ Assumed ~*

Concrete Density : $\gamma_{conc} := 0.15kcf$

Soil Fill Area : $A_{soil} := 2.62200ft^2$

Abutment Weight : $L_{Abut} := 16ft$ $W_{Abut} := 2.5ft$ $H_{Abut} := 1.0ft$

$W_{Ped} := 8in$ $H_{Ped} := 0.5ft$

$Wt_{Abut} := \gamma_{conc} \cdot L_{Abut} \cdot (W_{Abut} \cdot H_{Abut} + W_{Ped} \cdot H_{Ped})$ $Wt_{Abut} = 6.8 \cdot K$

Dead Load Soil Pressure: $q_{DL} := \frac{N_{gird} \cdot R_{DL} + Wt_{Abut} + P_{BW}}{W_{Abut} \cdot L_{Abut}}$ $q_{DL} = 0.918 \cdot ksf$

Service Live Load Soil Pressure: $q_{LL} := \frac{(V_{Truck} + R_{Lane}) \cdot N_{lane} + (A_{soil} \cdot \gamma_{soil} \cdot L_{Abut})}{W_{Abut} \cdot L_{Abut}}$ $q_{LL} = 1.761 \cdot ksf$

~ Soil Load Conservatively Taken as Live Load ~

Total Service Load Soil Pressure: $q_{tot} := q_{DL} + q_{LL}$ $q_{tot} = 2.679 \cdot ksf$ ✓

$q_{tot} \le Q_{allow} = 1$ *~ Therefore Soil Pressure OK ~*

B.) Abutment Positive Reinforcement

Dead Load Moment : $M_{DeadP} := 2.840 \frac{K \cdot ft}{ft}$ Live Load Moment : $M_{LiveP} := 5.450 \frac{K \cdot ft}{ft}$

Group Load Factor	Dead Load Factor	Live Load Factor
$\gamma_1 := 1.30$	$\beta_D := 1.0$	$\beta_L := 1.67$

Design Abutment Moment :

$$Mu_{AbutP} := \gamma_1 \cdot [[\beta_D \cdot (M_{DeadP})] + (\beta_L \cdot M_{LiveP})] \qquad Mu_{AbutP} = 15.524 \cdot \frac{K \cdot ft}{ft}$$

Abutment Thickness : $t_{Abut} := 12in$ Bar Diameter : $\phi_s := 0.625in$

Design Width : $b_{Abut} := 30in$ Clear Cover : $Clr_{AbutP} := 2.5in$

Reinforcement Yield Strength : $Fy_r := 60.0ksi$

Concrete Compressive Strength : $f'c := 5.0ksi$

Section Modulus : $Sx_{Abut} := \frac{1}{6} \cdot b_{Abut} \cdot t_{Abut}^2$ $Sx_{Abut} = 720 \cdot in^3$

Modulus of Rupture : $f_r := 7.5 \cdot \sqrt{(f'c \cdot 1000)}$

$f_r = 0.53 \cdot ksi$

Cracking Moment : $Mcr_{Abut} := f_r \cdot Sx_{Abut}$ $Mcr_{Abut} = 31.82 \cdot K \cdot ft$

$1.2Mcr_{Abut} \ge Mu_{AbutP} = 1$

*~ UnCracked Section, i.e. design for 1.2*Mcr ~*

Strength Reduction Factor :

$\theta_f := 0.90$

Equivalent Rectangle Factor :

$\beta_1 := 0.85 - 0.05 \cdot (f'c - 4.0)$ $\quad \beta_1 = 0.8$

Depth to Extreme Compression Face : $d_{AbutP} := t_{Abut} - Clr_{AbutP} - 0.5 \cdot \phi_5$ $\quad d_{AbutP} = 9.188 \cdot in$

Coefficient of Resistance :

$$Rn_{AbutP} := \frac{\max(1.2 \cdot Mcr_{Abut}, Mu_{AbutP})}{\theta_f \cdot b_{Abut} \cdot d_{AbutP}^2} \qquad Rn_{AbutP} = 0.201 \cdot ksi$$

Required Reinforcement Ratio:

$$\rho req_{AbutP} := \frac{0.85 \cdot f'c}{Fy_r} \left(1 - \sqrt{1 - \frac{2 \cdot Rn_{AbutP}}{0.85 \cdot f'c}}\right) \qquad \rho req_{AbutP} = 0.003$$

Area of Steel Required: $As_{req\_AbutP} := \rho req_{AbutP} \cdot b_{Abut} \cdot d_{AbutP}$ $\quad As_{req\_AbutP} = 0.947 \cdot in^2$

Area of Steel Provided: $As_{prov\_AbutP} := 1.24 in^2$ ***~ Provide (4) #5 Bars ~***

Provided Reiinforcement Area:

$$\rho_{prov\_AbutP} := \frac{As_{prov\_AbutP}}{b_{Abut} \cdot d_{AbutP}} \qquad \rho_{prov\_AbutP} = 0.004$$

Nominal Moment Capacity:

$$Mn_{AbutP} := As_{prov\_AbutP} \cdot Fy_r \cdot d_{AbutP} \cdot \left(1 - \frac{0.59 \cdot \rho_{prov\_AbutP} \cdot Fy_r}{f'c}\right) \qquad Mn_{AbutP} = 55.148 \cdot K \cdot ft$$

Design Moment Capacity: $\theta_f \cdot Mn_{AbutP} = 49.633 \cdot K \cdot ft$

$\theta_f \cdot Mn_{AbutP} \geq \max(Mu_{AbutP}, 1.2Mcr_{Abut}) = 1$ ***~ Flexural Reinforcement O.K. ~***

Depth of Stress Block:

$$a_{AbutP} := \frac{As_{prov\_AbutP} \cdot Fy_r}{0.85 \cdot f'c \cdot b_{Abut}} \qquad a_{AbutP} = 0.584 \cdot in$$

Compression Fiber to Neutral Axis:

$$c_{AbutP} := \frac{a_{AbutP}}{\beta_1} \qquad c_{AbutP} = 0.729 \cdot in$$

Strain in Tension Reinforcement:

$$\varepsilon t_{AbutP} := \frac{d_{AbutP} - c_{AbutP}}{c_{AbutP}} \cdot (0.003) \qquad \varepsilon t_{AbutP} = 0.035$$

$\varepsilon t_{AbutP} \geq 0.005 = 1$ ***~ Tension Controlled ~***

C.) Abutment Negative Reinforcement

Dead Load Moment : $M_{DeadN} := 4.277 \frac{K \cdot ft}{ft}$ Live Load Moment : $M_{LiveN} := 8.206 \frac{K \cdot ft}{ft}$

Design Abutment Moment :

$$Mu_{AbutN} := \gamma_1 \cdot \left[\left[\beta_D \cdot \left(M_{DeadN} \right) \right] + \left(\beta_L \cdot M_{LiveN} \right) \right] \qquad Mu_{AbutN} = 23.375 \cdot \frac{K \cdot ft}{ft}$$

Clear Cover : $Clr_{AbutN} := 2.0in$ *~ Top Clear Cover ~*

Strength Reduction Factor : $\theta_{fN} := 0.9$

Cracking Moment : $Mcr_{Abut} = 31.82 \cdot K \cdot ft$

$1.2Mcr_{Abut} \geq Mu_{AbutN} = 1$

~ UnCracked Section, i.e. design for 1.2*Mcr ~

Depth to Extreme Compression Face : $d_{AbutN} := t_{Abut} - Clr_{AbutN}$ $\quad d_{AbutN} = 10 \cdot in$

Coefficient of Resistance :

$$Rn_{AbutN} := \frac{\max\left(1.2 \cdot Mcr_{Abut}, Mu_{AbutN}\right)}{\theta_f \cdot b_{Abut} \cdot d_{AbutN}^2} \qquad Rn_{AbutN} = 0.17 \cdot ksi$$

Required Reinforcement Ratio :

$$\rho req_{AbutN} := \frac{0.85 \cdot f'c}{Fy_r} \left(1 - \sqrt{1 - \frac{2 \cdot Rn_{AbutN}}{0.85 \cdot f'c}} \right) \qquad \rho req_{AbutN} = 0.003$$

Area of Steel Required :

$$As_{req\_AbutN} := \rho req_{AbutN} \cdot b_{Abut} \cdot d_{AbutN} \qquad As_{req\_AbutN} = 0.866 \cdot in^2$$

Area of Steel Provided : $As_{prov\_AbutN} := 1.24in^2$ ***~ Provide (4) #5 Bars ~*** ✓

Provided Reiinforcement Area :

$$\rho_{prov\_AbutN} := \frac{As_{prov\_AbutN}}{b_{Abut} \cdot d_{AbutN}} \qquad \rho_{prov\_AbutN} = 0.004$$

Nominal Moment Capacity :

$$Mn_{AbutN} := As_{prov\_AbutN} \cdot Fy_r \cdot d_{AbutN} \left(1 - \frac{0.59 \cdot \rho_{prov\_AbutN} \cdot Fy_r}{f'c} \right) \qquad Mn_{AbutN} = 60.186 \cdot K \cdot ft$$

Design Moment Capacity : $\theta_{fN} \cdot Mn_{AbutN} = 54.167 \cdot K \cdot ft$

$\theta_{fN} \cdot Mn_{AbutN} \geq Mu_{AbutN} = 1$ ***~ Flexural Reinforcement O.K. ~***

Depth of Stress Block : $a_{AbutN} := \frac{As_{prov\_AbutN} \cdot Fy_r}{0.85 \cdot f'c \cdot b_{Abut}}$ $a_{AbutN} = 0.584 \cdot in$

Compression Fiber to Neutral Axis : $c_{AbutN} := \frac{a_{AbutN}}{\beta_1}$ $c_{AbutN} = 0.729 \cdot in$

Strain in Tension Reinforcement : $\varepsilon t_{AbutN} := \frac{d_{AbutN} - c_{AbutN}}{c_{AbutN}} \cdot (0.003)$ $\varepsilon t_{AbutN} = 0.038$

$\varepsilon t_{AbutN} \geq 0.005 = 1$ ***~ Tension Controlled ~***

D.) Overhang Design

Overhang Length : $L_{Sill\_OH} := 0.9167ft$

Design Width : $b_{OH} := 12in$

Dead Load Moment : $M_{Dead\_OH} := \frac{q_{DL} \cdot b_{OH} \cdot L_{Sill\_OH}^2}{2}$ $M_{Dead\_OH} = 0.386 \cdot K \cdot ft$

Live Load Moment : $M_{Live\_OH} := \frac{q_{LL} \cdot b_{OH} \cdot L_{Sill\_OH}^2}{2}$ $M_{Live\_OH} = 0.74 \cdot K \cdot ft$

Design Abutment Moment : $Mu_{OH} := \gamma_1 \cdot \left[\left[\beta_D \cdot \left(M_{Dead\_OH}\right)\right] + \left(\beta_L \cdot M_{Live\_OH}\right)\right]$

$Mu_{OH} = 2.108 \cdot K \cdot ft$

Hoop Diameter : $\phi_{hoop} := .5in$ Clear Cover : $Clr_{OH} := 2in$

Reinforcement Yield Strength : $Fy_r = 60 \cdot ksi$

Concrete Compressive Strength : $f'c = 5 \cdot ksi$

Strength Reduction Factor : $\theta_f = 0.9$ Equivalent Rectangle Factor : $\beta_1 = 0.8$

Depth to Extreme Compression Face : $d_{OH} := t_{Abut} - Clr_{OH} - 0.5 \cdot \phi_{hoop}$ $d_{OH} = 9.75 \cdot in$

Coefficient of Resistance : $Rn_{OH} := \frac{Mu_{OH}}{\theta_f \cdot b_{OH} \cdot d_{OH}^2}$ $Rn_{OH} = 0.025 \cdot ksi$

Required Reinforcement Ratio : $\rho req_{OH} := \frac{0.85 \cdot f'c}{Fy_r}\left(1 - \sqrt{1 - \frac{2 \cdot Rn_{OH}}{0.85 \cdot f'c}}\right)$ $\rho req_{OH} = 0$

Area of Steel Required : $As_{req\_OH} := \rho req_{OH} \cdot b_{OH} \cdot d_{OH}$ $As_{req\_OH} = 0.048 \cdot in^2$

Area of Steel Provided : $As_{prov\_OH} := 0.20in^2$ *~ #4 Hoops at 12" O/C ~*

Provided Reiinforcement Area : $\rho_{prov\_OH} := \frac{As_{prov\_OH}}{b_{OH} \cdot d_{OH}}$ $\rho_{prov\_OH} = 0.002$

Nominal Moment Capacity :

$$Mn_{OH} := As_{prov\_OH} \cdot Fy_r \cdot d_{OH} \cdot \left(1 - \frac{0.59 \cdot \rho_{prov\_OH} \cdot Fy_r}{f'c}\right)$$ $Mn_{OH} = 9.632 \cdot K \cdot ft$

Design Moment Capacity: $\theta_f \cdot Mn_{OH} = 8.669 \cdot K \cdot ft$

$\theta_f \cdot Mn_{OH} \geq Mu_{OH} = 1$ *~ Flexural Reinforcement O.K. ~*

Depth of Stress Block: $a_{OH} := \frac{As_{prov\_OH} \cdot Fy_r}{0.85 \cdot f'c \cdot b_{OH}}$ $a_{OH} = 0.235 \cdot in$

Compression Fiber to Neutral Axis: $c_{OH} := \frac{a_{OH}}{\beta_1}$ $c_{OH} = 0.294 \cdot in$

Strain in Tension Reinforcement: $\varepsilon t_{OH} := \frac{d_{OH} - c_{OH}}{c_{OH}} \cdot (0.003)$ $\varepsilon t_{OH} = 0.096$

$\varepsilon t_{OH} \geq 0.005 = 1$ *~ Tension Controlled ~*

END DESIGN

GENERAL NOTES

STEEL: All structural steel shapes and plates shall conform to the requirements of AASHTO M270 Grade 50W (ASTM A588) unless noted otherwise.

CONNECTERS: All structural steel connections shall be made with high strength bolts and washer conforming to AASHTO M164 (ASTM F3125 Grade A325 Type 3).

STEEL DECKING: Steel decking shall be 4.25" deep by 12" lay length by 7 gauge "Type A" galvanized corrugated steel conforming to ASTM A653 Grade 50. Steel decking shall be installed perpendicular to the direction of the supporting girders.

TESTING: Certified Mill Test Reports shall be furnished for the steel stringers, structural steel plates and shapes, and high strength bolts.

WELDING: All Welding shall be in accordance with AWS D1.5. All electrodes shall be E70XX or E71-T.

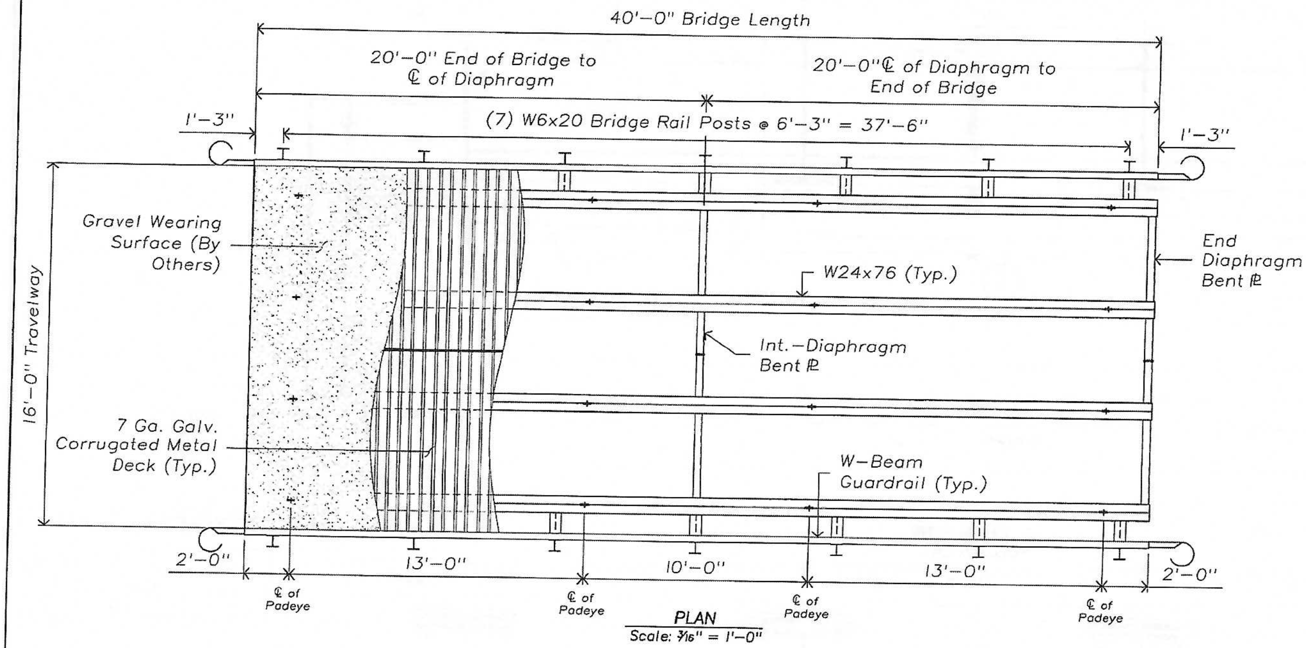
BEARING PADS: Bearing pads shall be 60 Durometer elastomeric bearing pads with a shear modulus of 180 psi (±15%).

BRIDGE RAIL: 12 Ga. W-Beam shall conform to the requirements of **Weathering Steel** ASTM A375 or AASTHO M180. Connections shall utilize ⅝"Ø button head bolts, square washers, and nut, conforming to the requirements of AASHTO M242. Rail system meets **TL-1** requirements; rail system is owner designated and has not been crash tested.

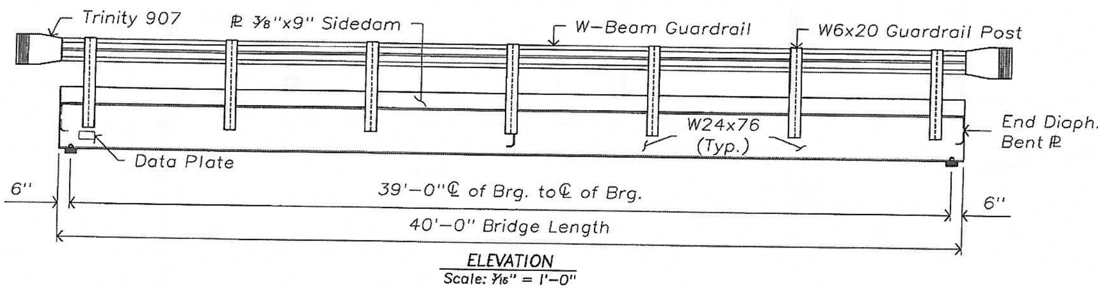
REFLECTORS: Place a butterfly reflector at approximately equal spacing (not to exceed 20 feet) between end rail posts. Both faces of reflector to have reflectorized sheeting.

END TREATMENT: End treatment shall be Trinity 907 with Delineator Panels **(Weathering Steel)**.

FINISH: Exterior Surfaces shall be cleaned per SSPC SP7 "Brush-Off Blast" prior to shipment to assure uniform weathering.



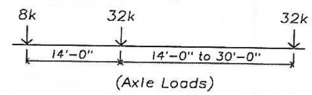
PLAN
Scale: 3/16" = 1'-0"



ELEVATION
Scale: 3/16" = 1'-0"

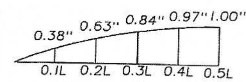
DESIGN NOTES

1. Design Live Load: **HL93 (GVW 36 Tons)**



+ Lane Load 640 lb/ft

2. Design is based on AASHTO Standard Specifications for Highway Bridges 17th Edition, 2002 and all interim Specifications.
3. Live Load Deflection at Midspan is L/773
4. Bridge Weight: Approx 25,532 lb
   Module Weight: Approx **12,766 lb**
   (Bridge Weight Does Not Include Wearing Surface)



Camber Diagram
Not to Scale

MONTANA FRANKLIN R. MUTH 4469E REGISTERED PROFESSIONAL ENGINEER

MUTH CONSULTING ENGINEERS
MISSOULA, MONTANA

RTI Fabrication, Inc.
Plains, Montana

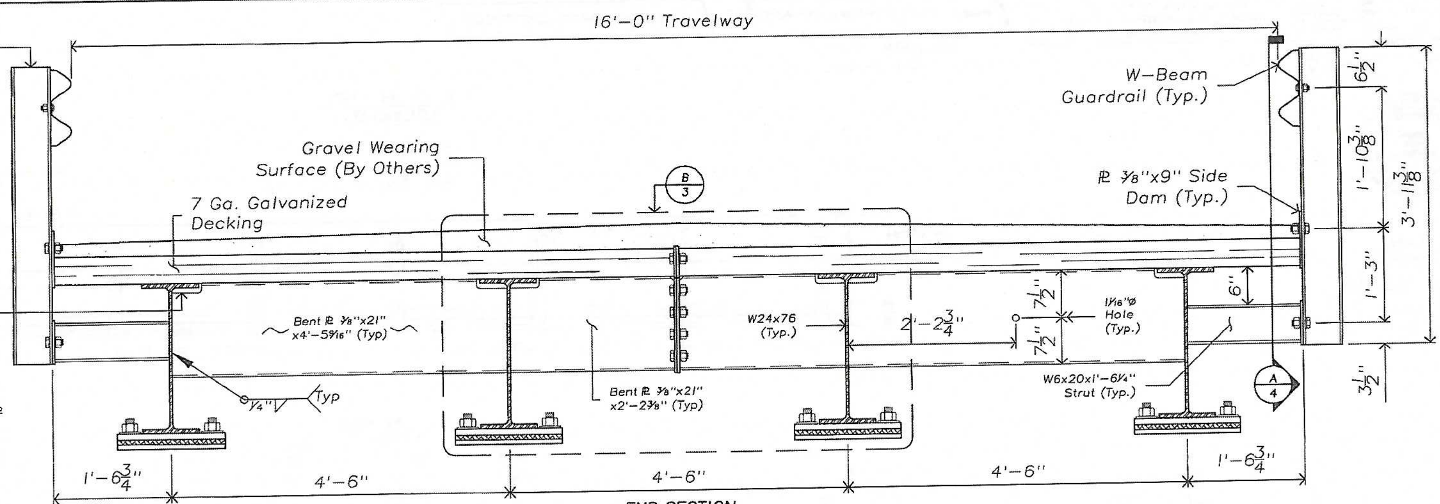
PRELIMINARY PLANS

S/N 40-16-HL93-10-3384

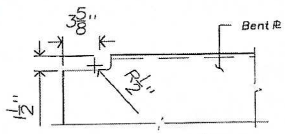
Roger Cliff
40'-0" Length x 16'-0" Width
Twin Creek Ranch Bridge
Lincoln County, MT

△ Date_______ Revised	
△ Date_______ Revised	
Engineers' Project No. : 24-M-605	Sheet S1 of S7
Designed : A.B. Drawn : A.B. Checked : FRM Approved :	Sheet Title : General Layout

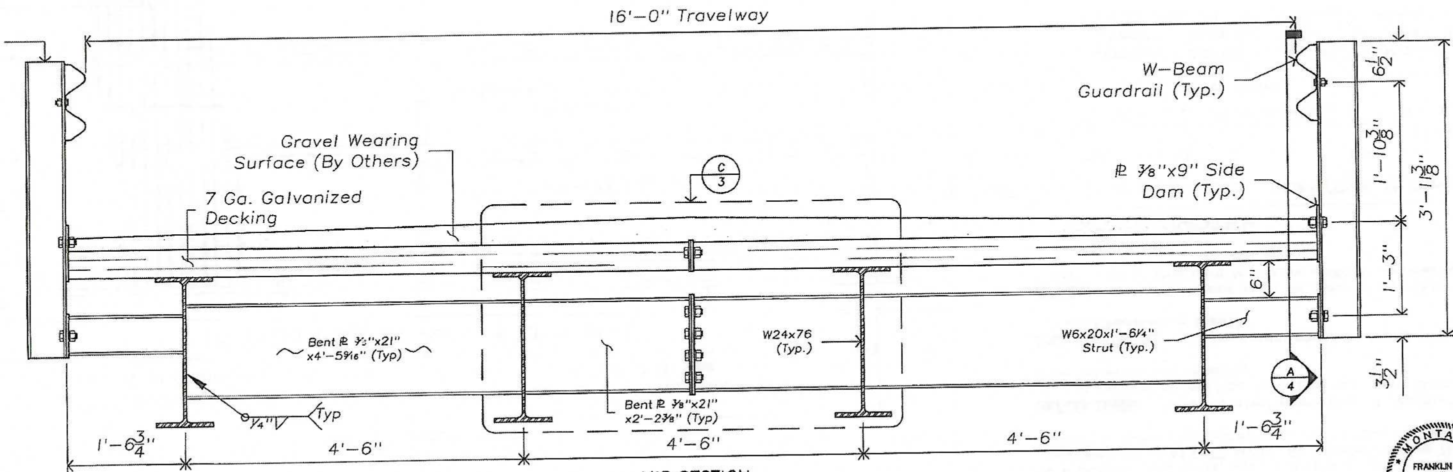
Plot Date: 6/21/2024



END SECTION
Scale: ⅝" = 1'-0"



Cope Detail
Scale: 1" = 1'-0"



MID SECTION
Scale: ⅝" = 1'-0"

MONTANA FRANKLIN R. MUTH 4489E REGISTERED PROFESSIONAL ENGINEER

MUTH CONSULTING ENGINEERS MISSOULA, MONTANA

RTI Fabrication, Inc.
Plains, Montana

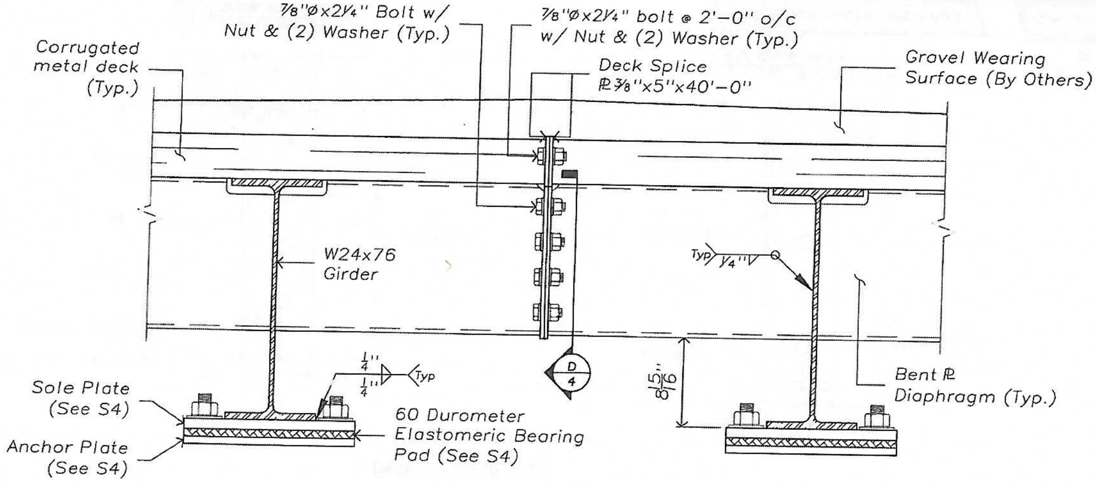
PRELIMINARY PLANS

S/N 40-16-HL93-10-3384

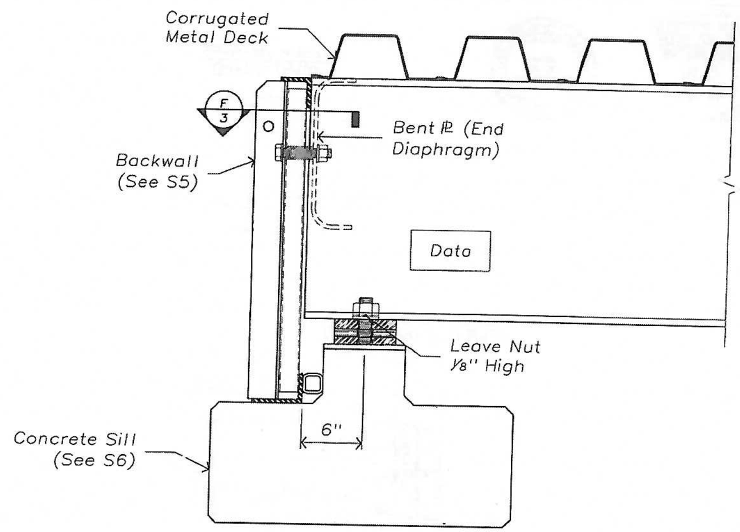
Roger Cliff
40'-0" Length x 16'-0" Width
Twin Creek Ranch Bridge
Lincoln County, MT

△ Date______ Revised______		
△ Date______ Revised______		
Engineers' Project No. : 24-M-605	Sheet S2 of S7	
Designed : AJB Drawn : AJB Checked : FRM Approved :	Sheet Title : Sections	

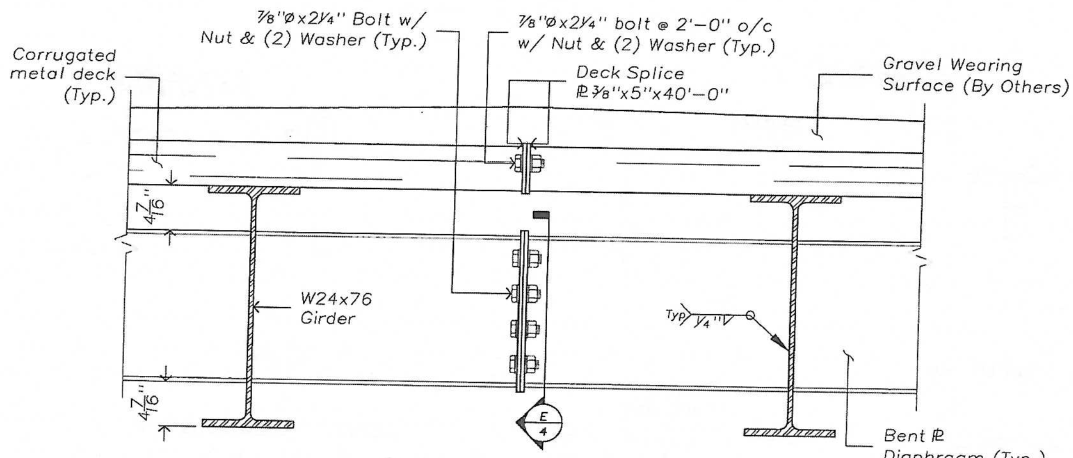
Plot Date: 6/21/2024



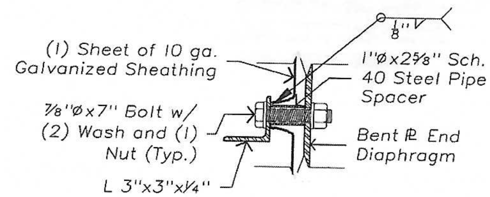
B/2 **DETAIL @ End Diaphragm**
Scale: 1" = 1'-0"



ABUTMENT DETAIL
Scale: ¾" = 1'-0"



C/2 **DETAIL @ Intermediate Diaphragm**
Scale: 1" = 1'-0"



F/3 **Backwall Connection**
Scale: 1½" = 1'-0"

FRANKLIN R. MUTH 4469E — MONTANA — REGISTERED PROFESSIONAL ENGINEER

MUTH CONSULTING ENGINEERS
MISSOULA, MONTANA

PRELIMINARY PLANS

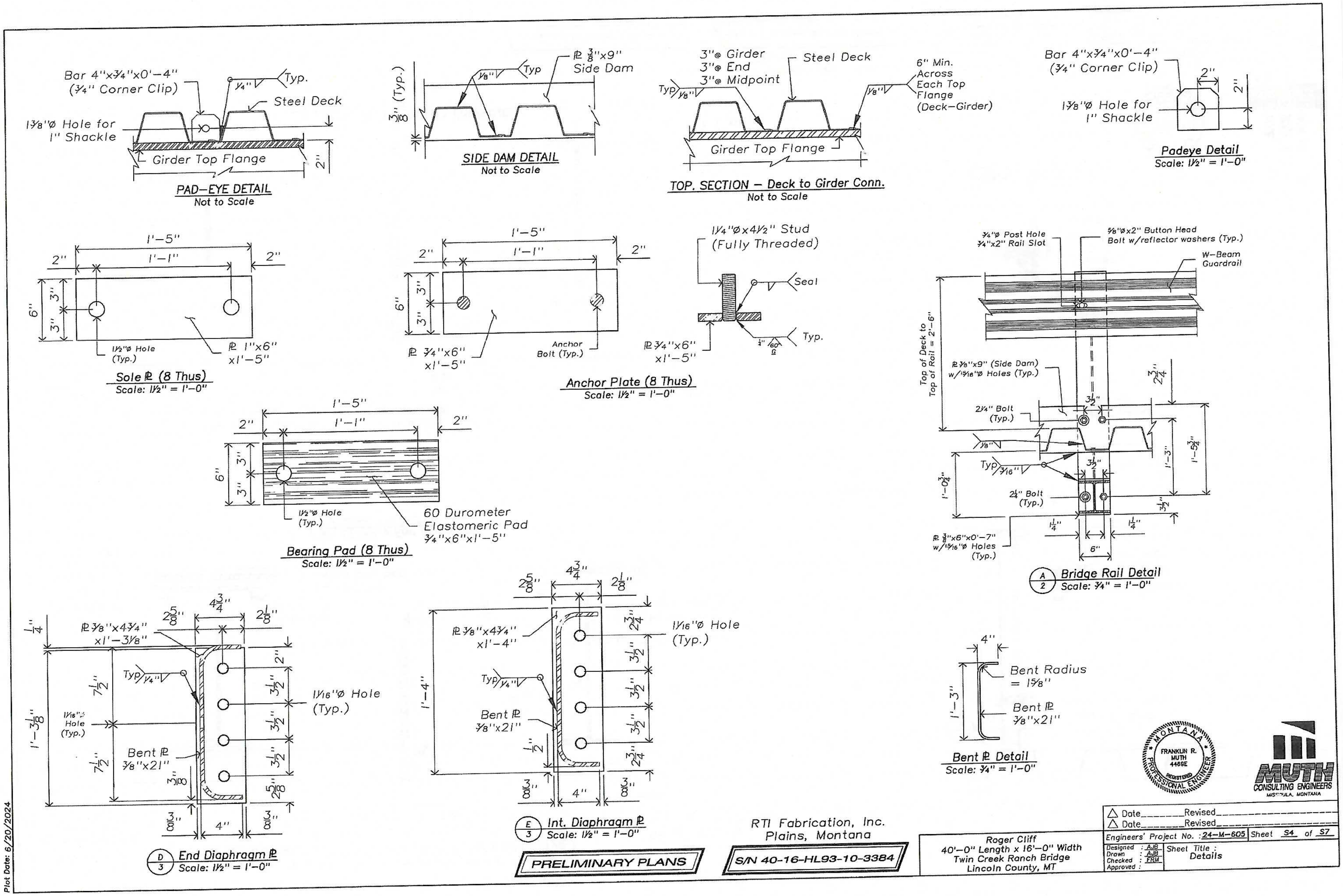
RTI Fabrication, Inc.
Plains, Montana

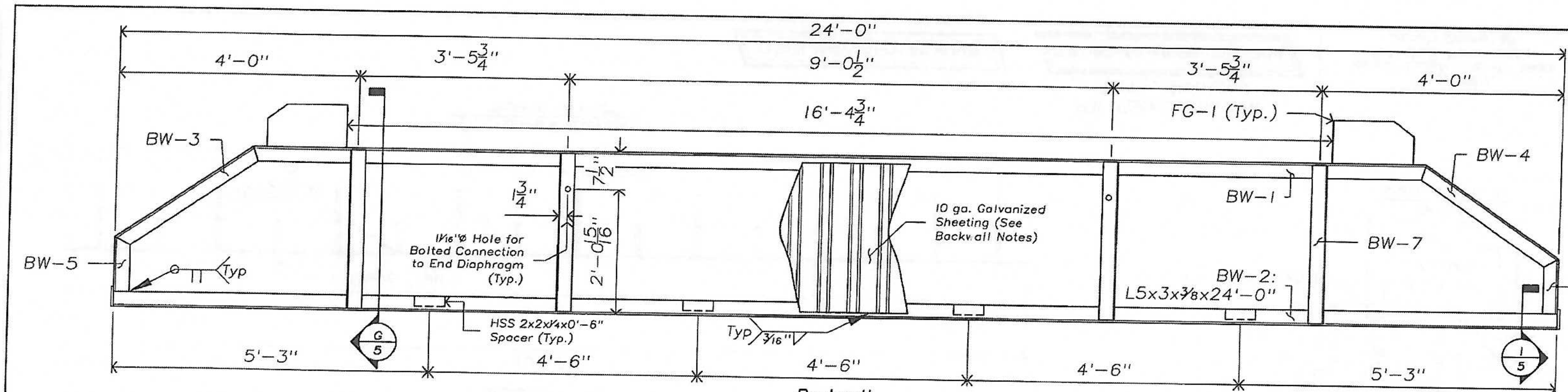
S/N 40-16-HL93-10-3384

Roger Cliff
40'-0" Length x 16'-0" Width
Twin Creek Ranch Bridge
Lincoln County, MT

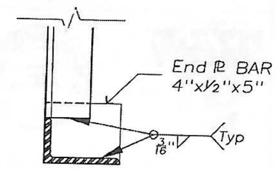
△ Date______ Revised______	
△ Date______ Revised______	
Engineers' Project No. : 24-M-605	Sheet S3 of S7
Designed : AJB Drawn : AJB Checked : FRM Approved :	Sheet Title : Details

Plot Date: 6/21/2024

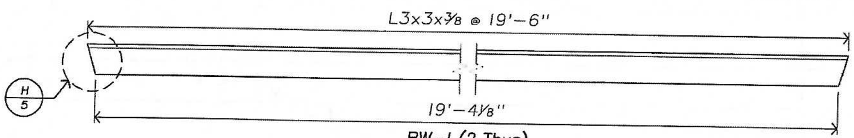

PAD-EYE DETAIL
Not to Scale
Bar 4"x¾"x0'-4" (¾" Corner Clip)
1⅜"Ø Hole for 1" Shackle
Steel Deck
Girder Top Flange
SIDE DAM DETAIL
Not to Scale
PL ⅜"x9" Side Dam
TOP. SECTION – Deck to Girder Conn.
Not to Scale
3"@ Girder
3"@ End
3"@ Midpoint
6" Min. Across Each Top Flange (Deck-Girder)
Padeye Detail
Scale: 1½" = 1'-0"
Sole PL (8 Thus)
Scale: 1½" = 1'-0"
PL 1"x6" x1'-5"
1½"Ø Hole (Typ.)
Anchor Plate (8 Thus)
Scale: 1½" = 1'-0"
PL ¾"x6" x1'-5"
Anchor Bolt (Typ.)
1¼"Ø x4½" Stud (Fully Threaded)
Seal
Bearing Pad (8 Thus)
Scale: 1½" = 1'-0"
60 Durometer Elastomeric Pad ¾"x6"x1'-5"
Bridge Rail Detail
Scale: ¾" = 1'-0"
¾"Ø Post Hole ¾"x2" Rail Slot
⅝"Øx2" Button Head Bolt w/reflector washers (Typ.)
W-Beam Guardrail
Top of Deck to Top of Rail = 2'-6"
PL ⅜"x9" (Side Dam) w/15/16"Ø Holes (Typ.)
2¼" Bolt (Typ.)
PL ⅜"x6"x0'-7" w/15/16"Ø Holes (Typ.)
End Diaphragm PL
Scale: 1½" = 1'-0"
PL ⅜"x4¾" x1'-3⅜"
1⅟16"Ø Hole (Typ.)
Bent PL ⅜"x21"
Int. Diaphragm PL
Scale: 1½" = 1'-0"
PL ⅜"x4¾" x1'-4"
Bent PL Detail
Scale: ¾" = 1'-0"
Bent Radius = 1⅝"
PRELIMINARY PLANS
RTI Fabrication, Inc.
Plains, Montana
S/N 40-16-HL93-10-3384
Roger Cliff
40'-0" Length x 16'-0" Width
Twin Creek Ranch Bridge
Lincoln County, MT
MONTANA FRANKLIN R. MUTH 4469E REGISTERED PROFESSIONAL ENGINEER
MUTH CONSULTING ENGINEERS
Engineers' Project No. : 24-M-605
Sheet S4 of S7
Designed : AJB
Drawn : AJB
Checked : FRM
Sheet Title : Details
Plot Date: 6/20/2024



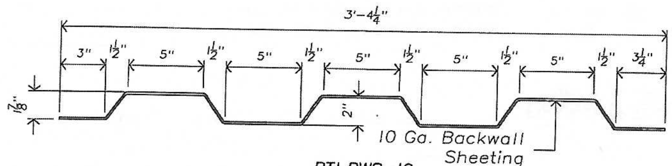
Backwall
Scale: ½" = 1'-0"



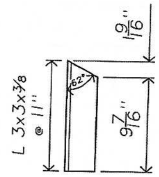
End ℙ Detail (1/5)
Scale: 1½" = 1'-0"



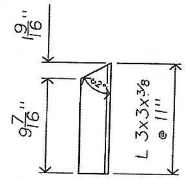
BW-1 (2 Thus)
Scale: 1" = 1'-0"



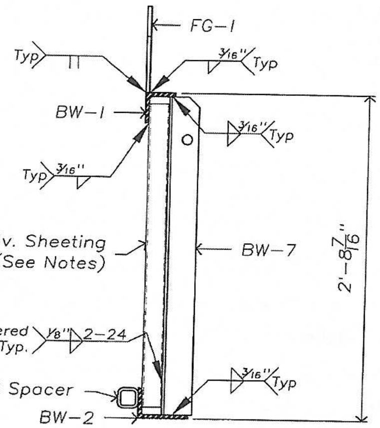
RTI BWS-10
Scale: 3" = 1'-0"



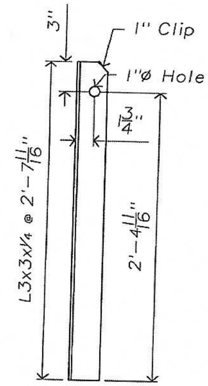
BW-5 (2 Thus)
Scale: 1" = 1'-0"



BW-6 (2 Thus)
Scale: 1" = 1'-0"



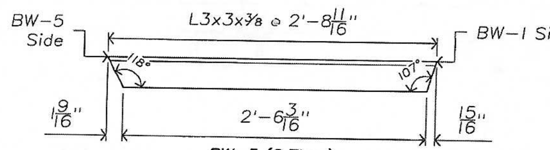
Section (G/5)
Scale: 1" = 1'-0"



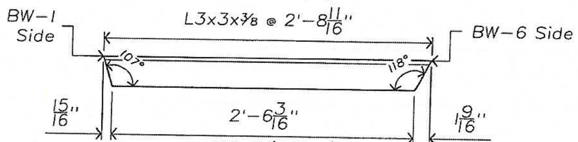
BW-7 (8 Thus)
Scale: 1" = 1'-0"

BACKWALL NOTES

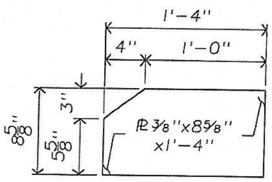
1. All backwall angles shall conform to the requirements of ASTM A572 Grade 50.
2. Steel backwall sheeting to be 2" deep by 40¼" lay length by 10 gauge galvanized "RTI BWS-10" conforming to the requirements of ASTM A653 (Grade 38 Minimum). Install with corrugations spanning vertically.
3. All black steel to be painted with Carboline Bitumastic 50 coal tar (Black) prior to shipment.
4. Approx. Backwall Weight = 900 lbs



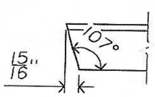
BW-3 (2 Thus)
Scale: 1" = 1'-0"



BW-4 (2 Thus)
Scale: 1" = 1'-0"



FG-1 (4 Thus)
Scale: 1" = 1'-0"



Detail (H/5)
Scale: 1½" = 1'-0"

RTI Fabrication, Inc.
Plains, Montana

PRELIMINARY PLANS

S/N 40-16-HL93-10-3384

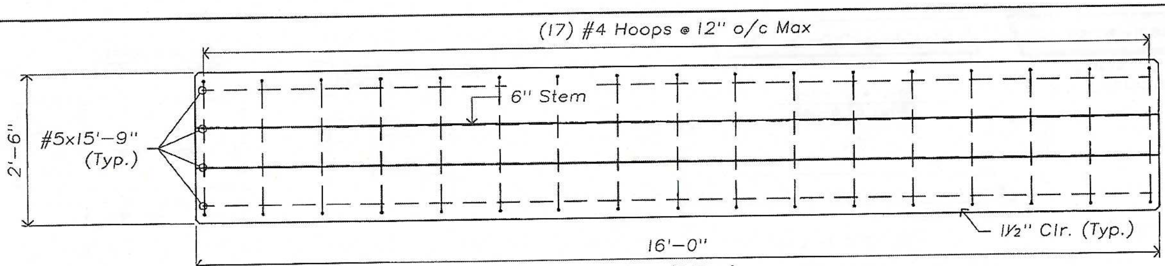
Roger Cliff
40'-0" Length x 16'-0" Width
Twin Creek Ranch Bridge
Lincoln County, MT

MONTANA — FRANKLIN R. MUTH 4469E — REGISTERED PROFESSIONAL ENGINEER

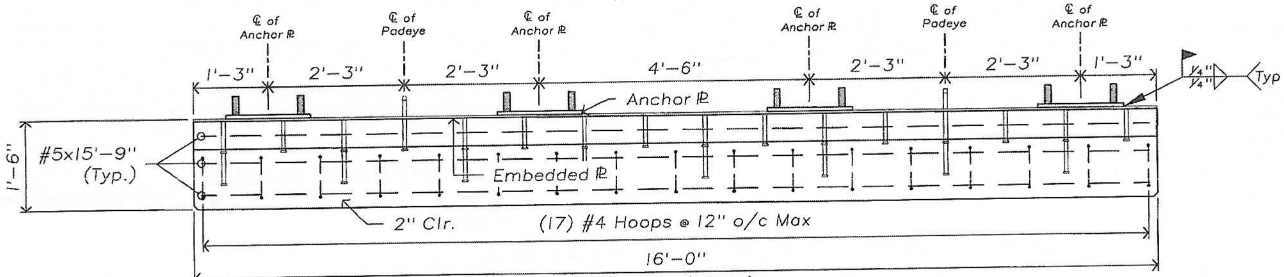
MUTH CONSULTING ENGINEERS
MISSOULA, MONTANA

△ Date________	Revised________
△ Date________	Revised________
Engineers' Project No. : 24-M-605	Sheet S5 of S7
Designed : AJB Drawn : AJB Checked : FRM Approved :	Sheet Title : Backwall

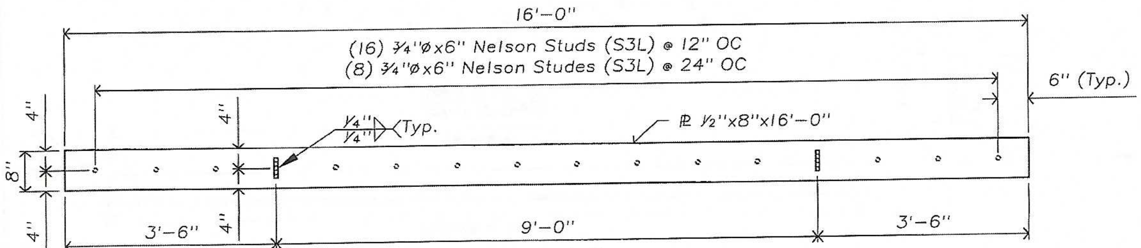
Plot Date: 6/20/2024



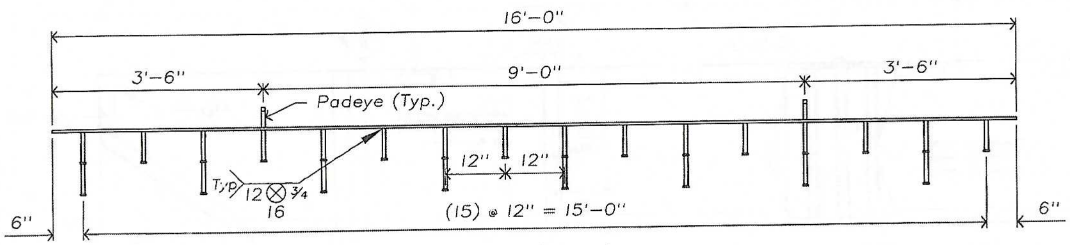
Plan (2 Thus)
Scale: ½" = 1'-0"



Elevation (2 Thus)
Scale: ½" = 1'-0"



Embedded ℘ Plan
Scale: ½" = 1'-0"



Embedded ℘ Elevation
Scale: ½" = 1'-0"

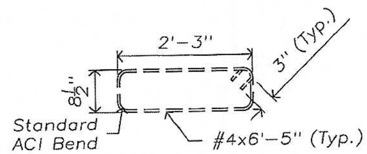
CONCRETE/REINFORCING NOTES

1. Mild steel reinforcing shall conform to the requirements of ASTM A615, Grade 60.
2. Embedment plate shall conform to the requirements of ASTM A588.
3. Shear studs to be ¾"Øx6" Nelson (S3L) Studs.
4. All concrete shall have 28 day compressive strength equal to or greater than f'c = 4000 psi.
5. All concrete shall have a compressive strength equal to or greater than f'ci = 3000 psi prior to shipping and handling.
6. All concrete shall be air entrained 5% ± 1%
7. ¾" Chamfer all exposed edges.
8. Surface finish to be "Mag Finish".

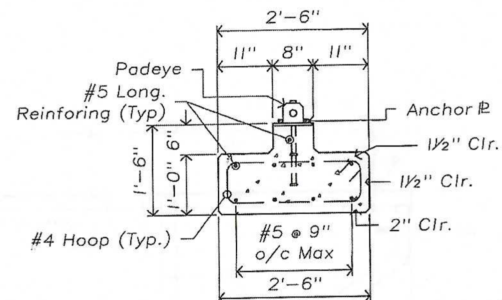
SILL SUMMARY

- (9) #5 x 15'-9"
- (17) #4 x 6'-5"
- V.C. Sill = 1.68 CY
- WT = 7,050 lb
- qsoil = 2.68 ksf (DL+LL)

(2 Thus)



Hoop Detail
Not to Scale



Section
Scale: ½" = 1'-0"

MONTANA FRANKLIN R. MUTH 4469E REGISTERED PROFESSIONAL ENGINEER

MUTH CONSULTING ENGINEERS
MISSOULA, MONTANA

RTI Fabrication, Inc.
Plains, Montana

PRELIMINARY PLANS

S/N 40-16-HL93-10-3384

Roger Cliff
40'-0" Length x 16'-0" Width
Twin Creek Ranch Bridge
Lincoln County, MT

△ Date________ Revised________	
△ Date________ Revised________	
Engineers' Project No. : 24-M-605	Sheet S6 of S7
Designed : AJB Drawn : AJB Checked : FRM Approved :	Sheet Title : Precast Sill

Plot Date: 6/20/2024

SUPERSTRUCTURE SUMMARY			
DESCRIPTION	DIMENSIONS	QUANTITY	TOTAL WEIGHT (lb)
Girder	W24x76x40'–0"	4	12,160.0
Diaphragm	Bent ℙ 3/8"x21"x4'–5 9/16"	6	717.6
Diaphragm	Bent ℙ 3/8"x21"x2'–2 3/8"	6	353.4
End–Diaph. Plate	ℙ 3/8"x4 3/4"x1'–3 1/8"	4	30.6
Intermediate Diaph. Plate	ℙ 3/8"x4 3/4"x1'–4"	2	16.2
Guard Rail Post	W6x20x3'–11 3/8"	14	1,105.4
Guard Rail Strut	W6x20x1'–6 1/4"	14	425.8
Strut Plate	ℙ 3/8"x6"x0'–7"	14	62.5
Deck Splice	ℙ 3/8"x5"x40'–0"	2	510.4
Padeye	Bar 4"x3/4"x0'–4"	16	54.4
Sole Plate	ℙ 1"x6"x1'–5"	8	231.4
7 Ga. Decking Type A	7 gage Decking x 8'–3"	80	8,316.0
Side Dam	ℙ 3/8"x9"x40'–0"	2	918.8
W–Beam Guardrail	12 gage x 40'–0"	2	540.8
End Terminal	Trinity 907	4	88.0

PRECAST SILL SUMMARY			
DESCRIPTION	DIMENSIONS	QTY	TOTAL WEIGHT (lb)
#5 Rebar (Straight)	#5 x 15'–9"	18	295.7
#4 Rebar (Hoops)	#4 x 6'–5"	34	145.7
Embedment Plate	ℙ 1/2"x8"x16'–0"	2	435.6
Nelson Studs (S3L)	3/4"⌀ x 6"	48	36.1
Padeye	Bar 4"x3/4"x0'–4"	4	13.6
Anchor Plate	ℙ 3/4"x6"x1'–5"	8	163.3

BACKWALL SUMMARY			
DESCRIPTION	DIMENSIONS	QUANTITY	TOTAL WEIGHT (lb)
10 Gage Galv. Sheeting	10 gage x 2'–6 3/16"x24'–0"	2	748.8
Top Chord (BW–1)	L 3x3x3/8x19'–6"	2	280.8
Bot. Chord (BW–2)	L 5x3x3/8x24'–0"	2	470.4
Diagonal Support (BW–3&4)	L 3x3x3/8x2'–8 11/16"	4	78.5
Side Support (BW–5&6)	L 3x3x3/8x0'–11"	4	26.4
Vertical Support (BW–7)	L 3x3x1/4x2'–7 11/16"	8	103.5
Fill Plate (FG–1)	ℙ 3/8"x8 5/8"x1'–4"	4	58.7
End Plate	BAR 4"x1/2"x0'–5"	4	11.3
HSS Spacer	HSS 2x2x1/4x0'–6"	8	21.6

BEARING PAD SUMMARY			
DESCRIPTION	DIMENSIONS	QUANTITY	Weight
60 Durometer Elastomeric Bearing Pad	3/4"x6"x1'–5"	8	–

CONNECTOR SUMMARY		
DESCRIPTION	LENGTH	QUANTITY
5/8"⌀ Buttonhead	2"	30
Reflector	––	2
5/8"⌀ Guardrail Nut	––	30
7/8"⌀ ASTM F3125 Grade A325 Type 3	2 1/4"	89
7/8"⌀ ASTM F3125 Grade A325 Type 3 (Backwall)	7"	4
7/8"⌀ Washer F436–3	––	186
7/8"⌀ Nut A563–3 DH	––	93
1"⌀ Pipe Sleeve	2 5/8"	4
1 1/4"⌀ B7 Anchor Bar	4 1/2"	16
1 1/4"⌀ Washer F436	––	16
1 1/4"⌀ Nut ASTM A563 DH	––	16

RTI BRIDGE & FABRICATION
89 Kruger Road
Plains, MT 59859
406–826–5932

S/N: 40–16–HL93–10–3384
Mfg Date: June 20, 2024
Design Live Load: HL93

Data Plate

PRELIMINARY PLANS

RTI Fabrication, Inc.
Plains, Montana

S/N 40-16-HL93-10-3384

Roger Cliff
40'–0" Length x 16'–0" Width
Twin Creek Ranch Bridge
Lincoln County, MT

MONTANA FRANKLIN R. MUTH 4469E REGISTERED PROFESSIONAL ENGINEER

MUTH CONSULTING ENGINEERS
MISSOULA, MONTANA

△ Date_______Revised_______
△ Date_______Revised_______
Engineers' Project No. :24–M–605 Sheet S7 of S7
Designed : AJB
Drawn : AJB
Checked : FRM
Approved :
Sheet Title : Material List

Plot Date: 6/20/2024

Form 273 (Rev. 09/22/03) (file name 273-03.doc)

Li-09-03-24, Clift, Sinclair
APPLICATION NO.
DECISION DATE 09-18-24

310 PERMIT
CONSERVATION DISTRICT'S DECISION

Notice: THIS AUTHORIZATION DOES NOT GIVE PERMISSION TO CARRY OUT A PROJECT ON LAND THAT IS NOT OWNED BY THE HOLDER OF THIS PERMIT. Landowner permission, easements or other federal, state, or local permits, licenses, special use permits, or authorizations may be required before construction of the project. It is the duty of the holder of this permit to determine which are necessary and obtain them prior to construction of the project.

Name of Applicant Roger Clift

Address 117 Glen Way City Eureka State Mt Zip

Perennial Stream Sinclair Creek

Supervisors' Decision (circle): (Approved) Approved w/ Modification Denied Not a Project

Explanation:

☑ See attached (if more room is necessary)

Waive 15 day

COPY

Permit Expiration Date 9-20-25 Work may begin on or after: 9-20-24

Date Transmitted to Applicant and DFWP 9-19-24

Supervisors' Signatures:

[signatures]

TO BE COMPLETED BY THE APPLICANT

Check the appropriate box, sign and return a copy to the district office **within 30 days** of receipt of this permit.

☐ I agree to proceed with the project in accordance with the approved application and specifications outlined in this permit and will allow a follow-up inspection.

☐ I disagree with the terms of this permit and I will seek judicial review in district court within 30 days of receipt of this permit. (This box may only be checked if you did not sign an arbitration agreement when you submitted your application.)

☐ I disagree with the terms of this permit and hereby request arbitration. I agree to abide by the arbitration agreement attached to or on the reverse of this form – OR, if an arbitration agreement was signed when the permit application was submitted, I will abide that agreement.

Signature
Applicant:________________________ Date________________ of

Form 271 (Revised (09/22/03)

NATURAL STREAMBED AND LAND PRESERVATION ACT - ARBITRATION AGREEMENT

The Natural Streambed and Land Preservation Act arbitration process is governed by the Uniform Arbitration Act, MCA §27-5-111 through §27-5-324, except as expressly provided as provided herein. According to MCA §75-7-112, any team member may request arbitration. The team includes the applicant, a representative of the Department of Fish, Wildlife and Parks, and a representative of the conservation district.

1. Parties. The applicant and the conservation district are always a party to the arbitration process. If the applicant requests arbitration, parties will include the applicant and the conservation district. If the Department of Fish, Wildlife and Parks requests arbitration, parties will include the Department of Fish, Wildlife and Parks, the applicant, and the conservation district. If the conservation district representative requests arbitration, the parties will include the conservation district, the conservation district's representative, and the applicant. The team member requesting arbitration is the contesting party.

2. Administering Agency. The conservation district or the county attorney will act as the administering agency for the arbitration process. The conservation district shall provide clerical services to collect fees associated with the costs of the arbitration panel.

3. Selection of the Arbitration Panel. Within 30 days of the request for arbitration, the contesting party and the conservation district will submit to the administering agency the names and qualifications of three consenting persons who reside in the judicial district in which the dispute is taking place. The consenting persons must reside in the judicial district in which the dispute takes place. The parties may agree on a list of no less than four consenting persons to act as the arbitrators to be submitted to the senior judge. That list shall contain all of the names and qualifications of the consenting persons without designating the party submitting the names to the conservation district. The senior judge will select three persons from the list who, from a review of the qualifications, appear to be the most impartial to serve as arbitrators. If the contesting party fails to submit names within 30 days, the request for arbitration is deemed withdrawn. If the other parties fail to submit names and qualifications, the arbitrators must be selected from the list provided by the administrating agency by the senior district judge. The arbitration panel shall only sit for the period of time necessary to settle the dispute before it and will review the proposed project pursuant to this arbitration agreement and in accordance with the statutory criteria set forth in MCA §75-7-112, implementing rules, and the policy set forth by MCA §75-7-102. The panel may appoint a chair. The powers of the arbitration panel shall be exercised by majority agreement of the panel. If during the course of the hearing an arbitrator ceases to act, the remaining panel members may continue with the hearing and make a determination on the dispute.

4. Costs of the Arbitration. Costs of the arbitration panel, computed as for jurors' fees under MCA §3-15-201, shall be borne by the contesting party. Clerical costs of the panel shall be paid by the nonprevailing party as determined by the panel. For all other expenses, including counsel fees, each party shall bear its own costs.

5. Prehearing. The panel may call a prehearing conference to set the arbitration schedule, and to request specific written information from the parties.

6. Date, Time, and Place of Hearing. The panel will select the time and place for the hearing. The hearing must be held in the judicial district in which the dispute takes place. The panel may consider requests for specific locations for the hearing. The panel may conduct on-site inspections. The panel may require the parties to submit copies of exhibits and a summary of its case, including a list of witnesses, to the panel and all other parties, prior to the hearing.

7. Notice of Hearing. Not less than ten days before the hearing, the administering agency shall give notice to each party. The notice must be by personal delivery or by certified mail. The notice shall include a description of the subjects and issues involved and the time and place of the hearing.

8. Representation. All parties have the right to be represented by an attorney. The arbitration panel may request the district court issue subpoenas for the attendance of witnesses and the production of books, records, documents, and other evidence and may administer oaths. The provisions of law providing for service of subpoenas are applicable. The arbitration panel may permit a deposition to be taken of a witness who cannot be subpoenaed or is unable to attend the hearing. At the conclusion of the hearing, the panel may take the matter under advisement. A majority of the panel will render a final decision.

9. Procedure at the Hearing. Each party may give opening statements, describing, generally, their position on the supervisors' decision. The contesting party will then present its witnesses and evidence. If there is more than one contesting party, then the chair shall determine the order of presentation by the contesting parties. The other parties will follow, in turn as directed by the chair, with their witnesses and evidence. A witness is subject to cross-examination by the parties to the proceeding. A panel member may ask questions of any witness or party to the dispute. Each party may conclude with closing remarks or statements summarizing their positions and evidence. The hearing must be tape-recorded. If the judicial review is necessary, the tapes or relevant portions of the tapes may be transcribed. The parties may arrange for a transcription of the hearing at their own cost.

10. Award. The award is the final decision of the arbitration panel. The award must be in writing and signed by the arbitrators. The arbitration panel's award must be issued within 60 days after the hearing. The arbitration panel shall deliver a copy of the decision to each of the parties and the district judge either personally or by certified mail. The district court shall confirm the panel's award, unless a party applies and shows grounds for vacating, modifying, or correcting the award.

11. Judicial Review. If the panel's decision is contested, the court will review the panel's decision in accordance with MCA §27-5-312 and 313, Uniform Arbitration Act.

12.Other. Please specify.

______________________________ Date:____________
Requesting Party

______________________________ Date:____________
Conservation District

Lincoln
CONSERVATION DISTRICT

Lincoln Conservation District
66121 MT Hwy 37
Eureka, MT 59917

406-297-2233
www.lincolncd.org
lincolncd@interbel.net

September 19, 2024

Roger Clift
117 Glen Way
Eureka, Montana 59917

COPY

Re: Li-09-03-24 Permit Application
Perennial Stream: Sinclair Creek

Dear Mr. Clift:

The Lincoln Conservation District met on September 18, 2024, to review your application for a 310 Permit under the Natural Streambed and Land Preservation Act (310 Law). The Supervisors approved your application as submitted.

Enclosed with this letter is the 310 Permit Decision Form and plastic 310 approval sign. Please complete, sign, and return the 310 Permit Decision Form prior to starting your project. The plastic 310 approval sign is to be posted on the project site while work is being performed. When your project is completed, please return the 310 Work Completion Form as well as the plastic 310 approval sign so a follow-up inspection can be scheduled if deemed necessary.

The supervisors strongly encourage you to check and apply for all other permits that may be necessary to complete your project, i.e. Army Corps of Engineers 404 permit, (406) 441-1375, Water Quality permits, (406)444-4323, Lincoln County Floodplain Development permit, (406) 283-2456 and U.S. Fish and Wildlife Service regarding consultation about Bull trout, (406) 758-6882.

If you have any questions or comments concerning this matter, please do not hesitate to contact the District Office.

Sincerely,

Rhonda Rockwell

Rhonda Rockwell
District Administrator

cc: Brian Stephens, Montana Dept. of Fish, Wildlife and Parks, Libby

Enclosure