

MISSOURI CONSERVATION HERITAGE FOUNDATION  
STREAM STEWARDSHIP TRUST FUND – GRANT PROGRAM  
**REQUEST FOR MITIGATION PLAN APPROVAL**

**The Stream Stewardship Trust Fund is available to restore, enhance, and/or protect stream systems and associated riparian habitats.** Proposed projects will be prioritized and funded by the Foundation based on regional stream needs, maximum return on expended monies, level of threat to the stream system, and overall anticipated benefits to stream resources. Proposed projects should be located within the ecological drainage unit (EDU) where participating stream impacts occurred. Approval will be limited to projects that restore, enhance, or preserve Missouri’s diverse stream systems.

This request form will be used by MCHF Board members assigned to the Stream Stewardship Trust Fund – Grant Program Action Team. Proposals submitted for funding consideration need to clearly explain elements of stream-based projects listed below which warrant consideration during the approval process. Spaces provided in the elements below are not to be considered limiting, and the attachment of additional pages of explanation is encouraged in order to provide full details.

*The Goal of the MCHF’s Stream Stewardship Trust Fund is to provide an innovative tool for the restoration, enhancement, and protection of Missouri’s streams and aquatic resources.*

- 1) Project Title **Roundhouse Road Bridge Replacement**

Landowner Name **Stone County Road & Bridge**

- 2) County **Stone** MDC region **Southwest**

- 3) Project objectives **The objective of this project is to maintain and improve aquatic organism passage in the upper portions of Crane Creek, one of the Missouri Department of Conservation’s (MDC) highest profile Wild Trout Management Areas. The existing bridge is a span bridge, but has remnants of an old low water crossing still in place beneath it. The roadway that the bridge is located on serves as a vital connection for people who live in the area and is used by emergency responders, school buses, and the postal service. The existing structure is deteriorating and is experiencing excessive deflections due to heavy loads. Due to funding restrictions, Stone County plans to replace the existing bridge with a series of corrugated metal pipe culverts that will create fish passage barriers and could lead to increased erosion and sedimentation at the site of the crossing. By supplementing the funds available from Stone County, the bridge can be replaced with a new span bridge that will minimize the related impacts on the stream fishery, facilitate sediment transport, improve fish passage, and increase public appreciation for the stream resources. These objectives will all address specific areas of concern discussed in the Compensation Planning**

**Framework for the Ozark/White EDU including aquatic resource problems, water quality problems, and aquatic resource conditions. The portions of Crane Creek flowing through the upper Wire Road Conservation Area will be used as a reference reach to help establish achievement of the defined objectives.**

- 4) The project submitted for consideration is in the Ozark/White EDU watershed and is considered a priority by MDC for the following reasons (include how project achieves watershed objectives and describe the rationale for site selection). **Crane Creek is an MDC Priority Watershed, under which one of the objectives is to reduce aquatic organism passage barriers. It flows into the James River, which is another MDC Priority Watershed. A self-sustaining population of Rainbow Trout thrives in the upper reaches of Crane Creek where this project is located. Maintaining and improving fish passage through this project area to the headwaters of Crane Creek is critical to the continued success of this fishery, as well as the spawning success of the Rainbow Trout and other aquatic species. MDC has worked with Stone County on several bridge replacements in the Crane Creek Watershed in the past, several of which have utilized SSTF funding. As a result, Stone County has become aware of the importance of this fishery and continued fish passage and has contacted MDC for assistance. Partnering on this project will strengthen our relationship with Stone County and will help facilitate future watershed scale improvements within two of the MDC's priority watersheds (Crane Creek and James River) and one of MDC's premier Blue Ribbon Trout Areas.**

- 5) Site protection instrument (circle):

Acquisition      Perpetual easement      **Special management agreement**

- 6) Describe the details of the site protection instrument (ownership, legal arrangements, how the instrument assures the long term protection of the proposed mitigation site): **The bridge is owned by Stone County and maintained by the Road and Bridge department. MDC owns the land surrounding Crane Creek directly downstream of the bridge and the land is privately owned above. Stone County will install and maintain the new bridge and MDC will provide financial and technical assistance, these details will be included in a Memorandum of Agreement.**

- 7) Baseline information

- a. Describe the ecological characteristics of the proposed project site: **The project site is located in Section 30, Township 26 North, Range 24 West in Stone County, Missouri. The bridge crosses Crane Creek at the northwest boundary of MDC's Wire Road Conservation Area and falls within the uppermost portion of the Blue Ribbon Trout Management Area. At this site, Crane Creek is a 4<sup>th</sup> order stream with a watershed of 19.5 square miles. The landscape largely falls within the White River Hills Ecological Subsection, having a high density of springs and streams with relatively high gradients.**
- b. Historic and existing plant communities, hydrology and soils of the proposed project site: **The land surrounding the stream at this site has adequate riparian corridor. The relatively deep soils are comprised of cherty limestone and capped with a thin**

**mantle of loess as the surface material. Surface textures consist of cherty and silty loams with moderate to slow infiltration rates. The stream is clear, with high base flows, and low suspended sediment loads. Substrates are comprised mainly of chert gravel and cobble, with well-defined riffles and gravel bars. Extensive stretches of bedrock channels also exist. The steep slopes combined with the moderate to slow infiltration rates of the soils results in this stream having a flashy hydrograph with flooding common during and after intense rainfall events.**

- c. Project application must include maps identifying the proposed project boundary with lat/long boundaries in decimal degrees and a GIS shape file with metadata of the delineated boundary. **See attached figures for project location and details.**
  - d. Describe existing hydro-system connectivity between the stream project site and any wetlands or other waters including tributaries connecting to receiving waters: **Crane Creek is a 4<sup>th</sup> order stream at the project site and has one 3<sup>rd</sup> order unnamed tributary that enters about 300 feet above the project site. Little Crane Creek, a 3<sup>rd</sup> order stream, enters Crane Creek approximately 1.1 miles below the project site. There are no known wetlands connecting to this area.**
- 8) Determination of credits as determined by the Missouri Mitigation Method (attach credit calculation worksheet or other detailed information to demonstrate the specific approach for credit calculation for this project):
- a. Number of stream channel credits **3,861**
  - b. Number of riparian credits **0**
  - c. Stream type (circle): Ephemeral                      Intermittent                      **Perennial**

Credit release schedule:

20%        Upon project approval by the COE and IRT

20%        Upon completion of the project and signing of long term maintenance agreement.

60%        After two bank-full flow events or a maximum of two years, whichever occurs first. Our experience and observations suggest that the stability of the structure and its effects on the stream channel and related habitat could easily be observed after two high flow events and those events would be likely to occur, on average, within or prior to a two year time frame.

9) Mitigation work plan

- a. Specifications of the project (geographic boundaries, construction methods, timing, sequence): **Replace the existing structure with a new bridge constructed on the same alignment as the existing bridge and remove the remnants of the old low water crossing beneath the bridge. The new bridge will be a single structure with an overall length of approximately 45 feet. The new bridge will be designed to carry an HS 20 vehicle and be wide enough to permit passage of some of the larger farm equipment. The roadway will be 24 feet wide allowing for two-lane traffic.**

- b. Methods for establishing desired plant community (species composition and type, control of undesirable species, size of plants used, control of wildlife damage): N/A

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- c. Grading plan and elevations of constructed features (describe or attach engineering design plans) **The preliminary design report is attached. Actual design will take place after project approval.**
- d. Describe or attach drawings showing existing stream channel cross sections, proposed alterations to the stream channel and/or banks, a description of in-stream structures including materials used for improvements, dimensions and elevations, and riparian plantings: **See attached report and figures.**

10) Maintenance plan:

- a. Description and schedule of maintenance following initial construction: N/A

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- b. Mowing frequency and timing: N/A

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- c. Herbicide applications (chemical used, method, timing, frequency): N/A

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- d. Irrigation plan (include source of water): N/A

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- e. Passive water control and instream structure description and required maintenance (type and frequency): N/A

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11) Performance standards

- a. Description of the performance standards used (include metrics for determining project success):

Riparian: N/A

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Stream Channel: **MDC will conduct periodic monitoring of the new bridge to ensure that aquatic organism passage is being maintained. This will be accomplished through both photo documentation as well as Rainbow Trout snorkeling observation surveys conducted at three year intervals.**

Reference stream(s) used (if any): **Crane Creek on upper Wire Road Conservation Area.**

- b. Describe how the performance standards relate to the objectives of the mitigation site (include description of the desired resource type, expected functions or services being

measured, or any other applicable metrics): **The new bridge will be inspected periodically by MDC staff to ensure it is serving its function of maintaining a navigable roadway as well as preventing any aquatic organism passage barriers.**

12) Describe the method and frequency of project monitoring to determine when performance standards are being met (project site must be monitored for an appropriate period not less than 5 years after initial construction/planting), who will be conducting the monitoring, and the frequency monitoring reports will be submitted: **The project site will be monitored annually for aquatic organism passage and photo documentation of the structure.**

13) Long-term management plan:

a. Describe how the project site will be managed after performance standards have been met: **Stone County will be responsible for future maintenance of the bridge as will be specified in a Memorandum of Agreement.**

b. Annual cost estimate for management: \$ **Responsibility of Stone County.**

c. Funding mechanisms will be used to finance long term management (including responsible party): **Responsibility of Stone County.**

d. Long term management responsibilities transferred to (include description of their long term management plan and a written stewardship commitment that includes a financing plan): **Responsibility of Stone County.**

14) Adaptive management plan (due to inability to construct project in accordance with approved plans, monitoring revealing that the project is not meeting performance standards, remedial measures resulting in project modifications, design changes, revisions to maintenance requirements, revised monitoring, etc):

a. Description of strategy to address unforeseen changes in the project: **If the project fails MDC will reevaluate and conveyance for the stream channel will be maintained.**

b. Party (ies) responsible for implementing adaptive management: **If failure in the project is due to an act of God then the agencies will assist with adaptive management, reevaluate, and conveyance will be maintained.**

15) Financial Assurances:

The MCHF has previously demonstrated its ability to fund good stream projects and is committed to the installation, monitoring, and long term management of its compensatory mitigation projects. Since an important basis for project selection is a project's fit into MDC's statewide stream management plan, a commitment of the biological, engineering, and legal resources of MDC also accompanies each project. In addition to MDC's support, the MCHF has incorporated financial assurances into its cost-per-credit and will retain financial assurances not to exceed 10% of each project's estimated completion cost to establish a continuous contingency fund balance of \$250,000.00.

16) Total cost of the project is estimated at \$ **136,500.** SSTF Resources are requested in the amount of **\$111,500.**

17) Partner funds in the amount of \$25,000 are being contributed by: Stone County Road & Bridge

18) Total stream length of the project N/A Total Riparian corridor acreage N/A

19) Total cost per credit (including all costs) estimated at \$ 34.31.

20) If the project is leveraged with contributions from others, SSTF Resources are requested to fund which practices/products/costs activities? Engineering and construction of new bridge.

21) Schedule for project completion and/or installation: Project Approval: September 2014, Project Design: December 2014, Project Bidding: January 2015, Project Construction: March 2015, Project Completion: May 2015.

Note: Proposal must include appropriate on-site photographs, county maps locating the proposed project, related topographic, soils, or other maps, drawings and materials necessary to describe planned activities. In order to reproduce color photographs and maps, a complete electronic file is requested with project proposals.

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MDC Region: Southwest Date: May 1, 2014

Name of project leader, and Division: Shane Bush, Fisheries

Lead Division <sup>Unit Chief</sup> Regional Supervisor Approval: [Signature] Date 6-20-14

Lead Division Administrator Approval: [Signature] Date: June 20, 2014

MDC Director Approval: [Signature] Date: June 25, 2014

Please return to the Executive Director of the Missouri Conservation Heritage Foundation.

MCHF Approval: [Signature] Date: 9-10-2014

**IN-STREAM WORKSHEET**

Stream Type	Ephemeral 0.15	Intermittent 0.2	Perennial Stream 0.4		
Priority Waters	Tertiary 0.05		Secondary 0.2	Primary 0.4	
Net Benefit	Stream Relocation to Accommodate Authorized Project 0.5		Moderate 1.2	Good 2.4	Excellent 3.5
Site Protection	Corps approved site protection without third party grantee 0.1		Corps approved site protection recorded with third party grantee, or transfer of title to a conservancy 0.4		
Credit Schedule	Schedule 1 0.3		Schedule 2 0.1	Schedule 3 0	

Factors	Net Benefit 1	Net Benefit 2	Net Benefit 3	Net Benefit 4	Net Benefit 5	Net Benefit 6
Stream Type	.4					
Priority Waters	.2					
Net Benefit	2.4					
Site Protection	0					
Credit Schedule	.3					
Sum Factors (M)=	3.3					
Stream Length Benefited (do not count each bank separately or count same channel reach twice) (LF)=	1170					
Credits (C) = M X LF	3861					
<b>Total Instream Credits Generated C X LK Factor* =</b>						

**Total Instream Credits Generated from all Columns = 3861**

\* Location and Kind (LK) Factor only applies to permittee-responsible mitigation projects  
(see page 18 of document) .

**THE MISSOURI CONSERVATION HERITAGE FOUNDATION  
STREAM STEWARDSHIP TRUST FUND - GRANT PROGRAM  
COMPENSATORY MITIGATION PROJECT AGREEMENT**

Stone County Road and Bridge  
Name(s) (Last, First, Middle I.)

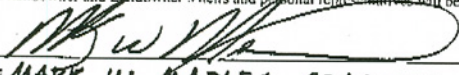
2955 Shiloh Church Road Hurley, MO 65675  
Address(es)

The above-named landowner(s) ("Landowner") hereby agree(s) to cooperate with the Missouri Conservation Heritage Foundation ("MCHF") to implement a compensatory mitigation project ("the Project") funded by the Stream Stewardship Trust Fund ("SSTF") for the area(s) or property adjoining Crane Creek, a stream in Stone County, Missouri, and located in Section 30, Twp. 26 N., Range 24 W. and/or described by field(s) \_\_\_\_\_ as shown in my conservation plan as approved by the Soil and Water Conservation District and Natural Resources Conservation Service.

**A DESCRIPTION OF THE PROJECT, TOGETHER WITH MAPS, PHOTOS, PERMITS, ETC., IS ATTACHED.**

Upon project approval by the Missouri Department of Conservation ("MDC"), the Corps of Engineers ("COE"), and the COE's Interagency Review Team ("IRT"), and approval of this Agreement by MCHF, the Landowner and MCHF acknowledge that this instrument shall be a legally binding Agreement and agree as follows:

- MCHF will provide grant funds not to exceed \$ 111,500 that have been approved for the Project, to be paid \_\_\_\_\_
- Once the Project practices are installed, Landowner will maintain the Project practices according to standards and schedules specified by the MDC, acting as technical advisors for the MCHF, which Landowner has read, understands, and which are attached hereto and made part of this Agreement.
- Upon prior notification, Landowner will allow access to MCHF, Corps of Engineers, or MDC personnel, or their representatives or designees, to inspect, monitor and evaluate the Project's status, implementation, and maintenance for as long as the Project continues as a compensatory mitigation project.
- Landowner and Landowner's heirs and personal representatives will refund to MCHF a pro-rated amount of grant funds that were expended for implementation of the practices called for by the Project if the practices are not properly maintained, are destroyed, or are altered to such extent that, in the sole opinion of the MCHF President or his designee, the practices as altered no longer provide viable stream protection per the standards specified by MDC, unless the alterations were made with the written approval and consent of MDC. Landowner further understands and agrees that MCHF may modify this Agreement by adding or substituting certain practices when the installed practices have deteriorated because of conditions beyond Landowner's control.
- This Agreement is binding upon Landowner and Landowner's heirs and personal representatives and Landowner agrees to place a protective easement protecting the Project in perpetuity to the deed of the land named above. Landowner further understands and agrees that Landowner and Landowner's heirs and personal representatives will be responsible for Project maintenance compliance named herein.

 5-1-14  
Signature MARK W. MAPLES, COMMISSIONER Date

Signature \_\_\_\_\_ Date \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

Project Approved by MDC:

Application Approved by MCHF:

Authorizing Signature \_\_\_\_\_

Authorizing Signature \_\_\_\_\_

Date \_\_\_\_\_

Date \_\_\_\_\_



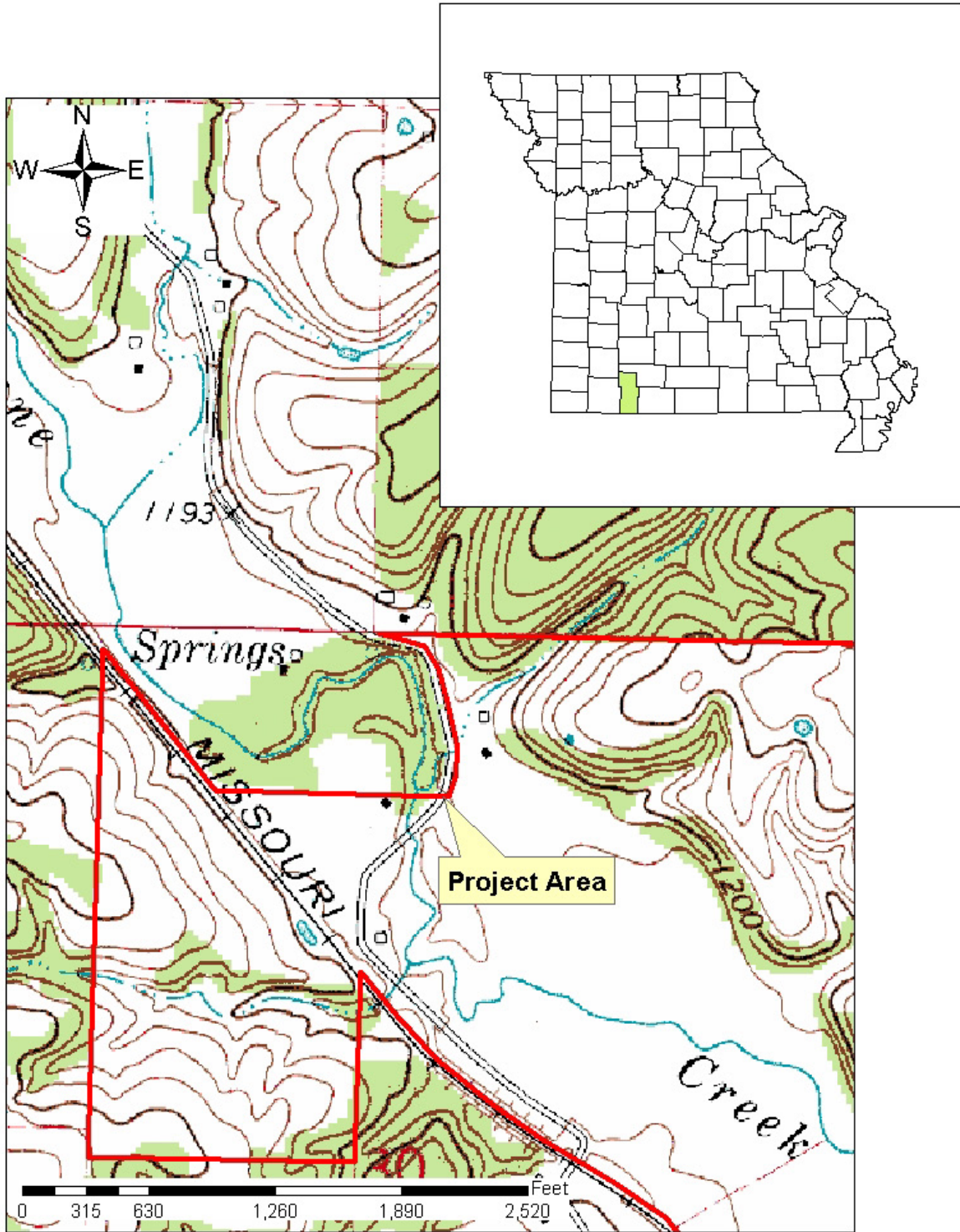


Figure 1. Map of location of project site with county and MDC property boundary illustrated.

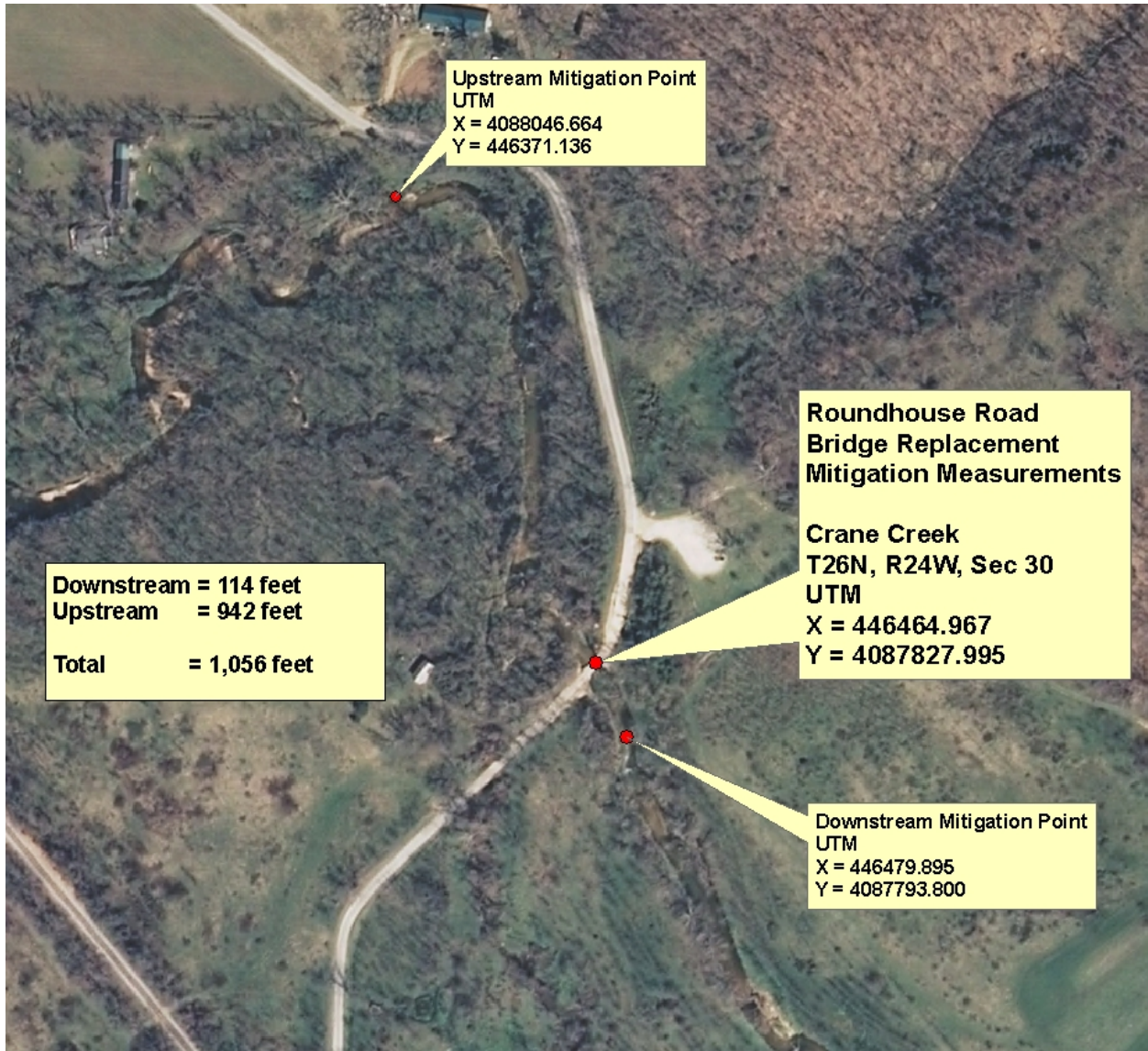


Figure 2. Aerial Map of Roundhouse Road bridge replacement site with mitigation measurements and UTM coordinates listed.



**STONE COUNTY**  
**BRIDGE**  
**REPLACEMENT**  
***ON ROUNDHOUSE ROAD***

**PRELIMINARY  
ENGINEERING REPORT**

**for  
Stone County  
Commission**



2826 S. Ingram Mill, Springfield, MO 65804  
(417) 886-7171 fax (417) 886-7591

**STONE COUNTY BRIDGE  
ON ROUNDHOUSE ROAD  
OVER  
CRANE CREEK**

**PRELIMINARY ENGINEERING REPORT**

**TABLE OF CONTENTS**

- A. Existing Structure
- B. Description of Need
- C. Alternatives Considered
- D. Recommended Alternative for Project
- E. Reason for Selection of the Recommended Alternative
- F. Total Project Cost of Proposed Project
- G. Environmental Review
- H. Conclusion

**EXHIBITS**

- 1. Location Map
- 2. Site Photographs

## A. EXISTING STRUCTURE

The existing bridge is located in Section 30, Township 26 North, Range 24 West in Stone County, Missouri. A project location map is attached as Exhibit 1. This bridge crosses Crane Creek. The bridge is a single span reinforced concrete structure approximately 29-foot long and 13'-6" wide. The width of the roadway only permits one-lane traffic. The supports for the structure are reinforced concrete abutments.

The existing bridge is also located next to the Missouri Department of Conservation's (MDC) Wire Road Conservation Area, an 818-acre tract of land that encompasses 3.7 miles of Crane Creek. Crane Creek is one of five streams MDC has designated as a wild trout management area. Photographs of the existing structure and surrounding area are presented in Exhibit 2.

## B. DESCRIPTION OF NEED

The need for a new structure is critical as this roadway serves as a vital connection for people who live in the area and is used by emergency responders, school buses, and the postal service. The existing structure continues to deteriorate and is experiencing excessive deflections due to heavy loads.

## C. ALTERNATIVES CONSIDERED

### Alternate No. 1

The first alternative that was considered was to replace the structure with a series of corrugated metal pipe culverts. The culverts could be designed to carry the legal load limits permitted by the state and allow for two-lanes of traffic and permit wider loads to cross on the stream.

### Alternate No. 2

The second alternative that was considered was to replace the existing structure with a new span bridge. The new bridge could be designed to carry the legal load limits permitted by the state and allow for two-lanes of traffic and permit wider loads to cross on the bridge. The new bridge would be designed to allow sedimentation transport and lower water velocities for the trout that reside in Crane Creek.

### Alternate No. 3

The third alternative that was considered was to leave the structure as is. This option would ultimately lead to the bridge being closed with substantial impact to the people traveling in the area.

#### D. RECOMMENDED ALTERNATIVE FOR PROJECT

The recommended alternative is to replace the existing structure with a new bridge. The new bridge will be constructed on the same alignment as the existing bridge. It is anticipated that the new bridge will be a single structure with an overall length of approximately 45-feet. The new bridge will be designed to carry an HS 20 vehicle and be wide enough to permit passage of some of the larger farm equipment. The roadway will be 24-foot wide allowing for two-lane traffic.

#### F. REASON FOR SELECTION OF THE RECOMMENDED ALTERNATIVE

This alternative was selected because, in comparison to the other alternatives, it will provide a long-term solution to maintaining a safe and functional crossing which is capable of carrying the loads and volume of traffic into the future, as well as providing a passage for the indigenous trout.

The existing structure has approximately 19.58 square mile drainage. In Table 1 the estimate flow for a specific yearly storm events are provided.

Yearly Storm Event	Flow (c.f.s)
2-Year	1799
5-Year	3483
10-Year	4886
25-Year	6886
50-Year	8350
100-Year	9921

Table 1: Flows for Yearly Storm Events

For the multiple culverts option, four 5-foot diameter corrugated metal pipe culverts would fit between the existing abutments but wouldn't allow a sufficient amount of water to flow through to pass a 2-year storm event. Also, using culverts would increase the water velocity at the culvert making it difficult for the trout to pass through the structure as well as potentially causing a buildup of sediment upstream.

**G. TOTAL PROJECT COST OF PROPOSED PROJECT**

The anticipated cost of the project for a Alternative 2 (New Bridge) is as follows:

<b>Item</b>	<b>Total Cost</b>
Engineering Design Services	<b>\$12,250</b>
Roadway Construction	<b>\$39,950</b>
Bridge Construction	<b>\$75,450</b>
Construction Inspection	<b>\$8,850</b>
<b>TOTAL</b>	<b>\$136,500</b>

The anticipated cost of the project for Alternative 1(New Culverts) is as follows:

<b>Item</b>	<b>Total Cost</b>
Engineering Design Services	<b>\$4,000</b>
Roadway Construction	<b>\$9,000</b>
Culvert Construction	<b>\$14,020</b>
Construction Inspection	<b>\$3,000</b>
<b>TOTAL</b>	<b>\$30,020</b>

## H. ENVIRONMENTAL REVIEW

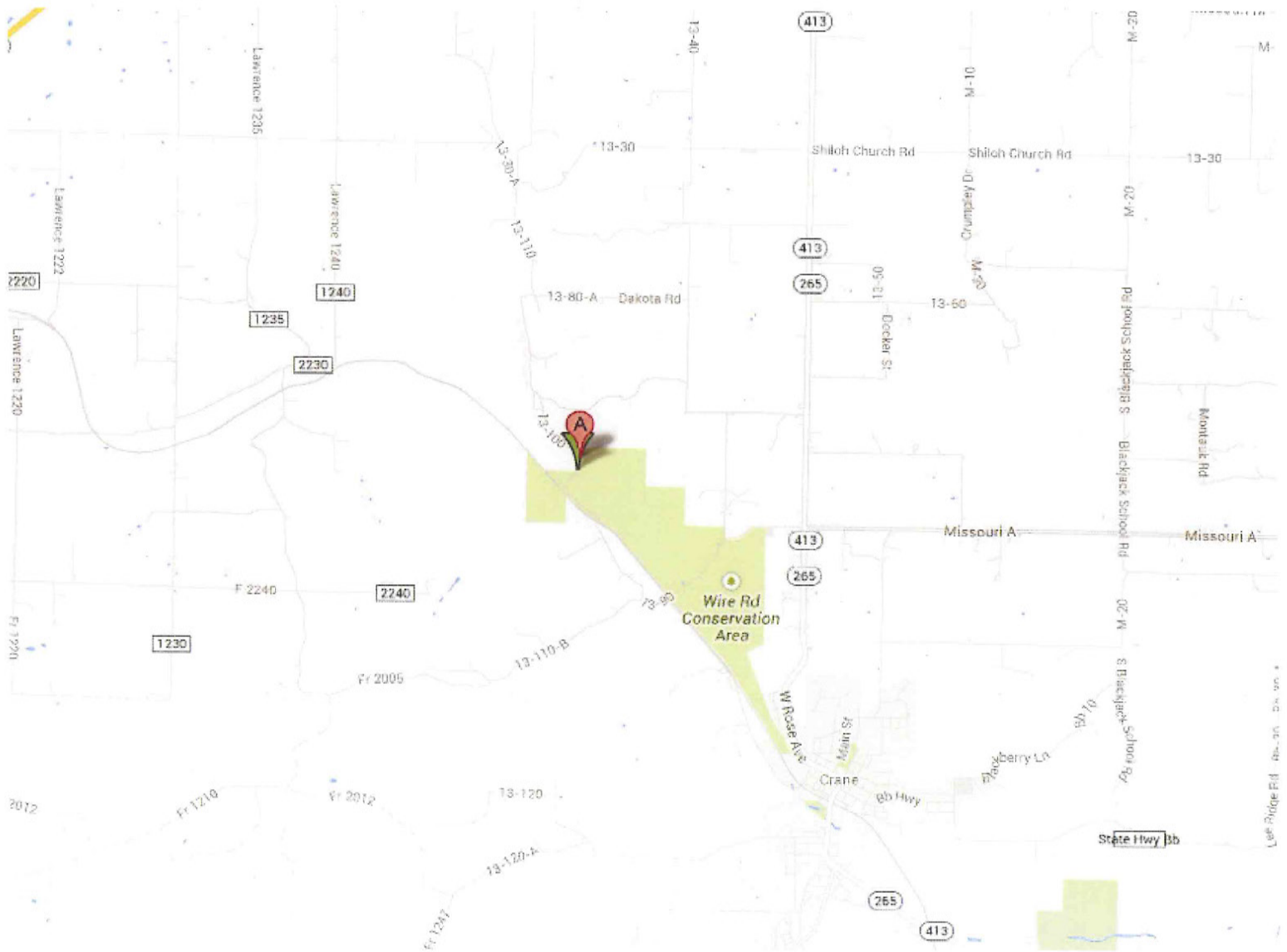
The construction of this new bridge should have little impact on the environment. During the design phase of the project, the engineer will contact the following agencies:

- *Missouri Department of Conservation* in regards to Endangered Species.
- *National Resources Conservation Services* for farmland impact evaluation.
- *Missouri Department of Natural Resources* for possible effects the project may have on historical and archaeological sites.
- *U.S. Army Corps of Engineers* for a 404 permit.
- *Missouri Department of Natural Resources* for a Section 401 Water Quality Certification.

## I. CONCLUSION

The existing bridge is in poor condition and will need to be addressed in the very near future. If funding can be established, the recommended solution is to replace the existing structure with a new 45-foot bridge that can allow for heavier loads, two-lanes of traffic and allow a greater amount of water to flow beneath without impacting the trout population.





**BRIDGE LOCATION**

**EXHIBIT NO. 1**



**VIEW OF BRIDGE  
FROM OLD  
WIRE  
CONSERVATION  
PARKING LOT**



**VIEW OF NORTHEAST SIDE OF  
BRIDGE**

**EXHIBIT NO. 2**

STONE COUNTY ESTIMATED COST

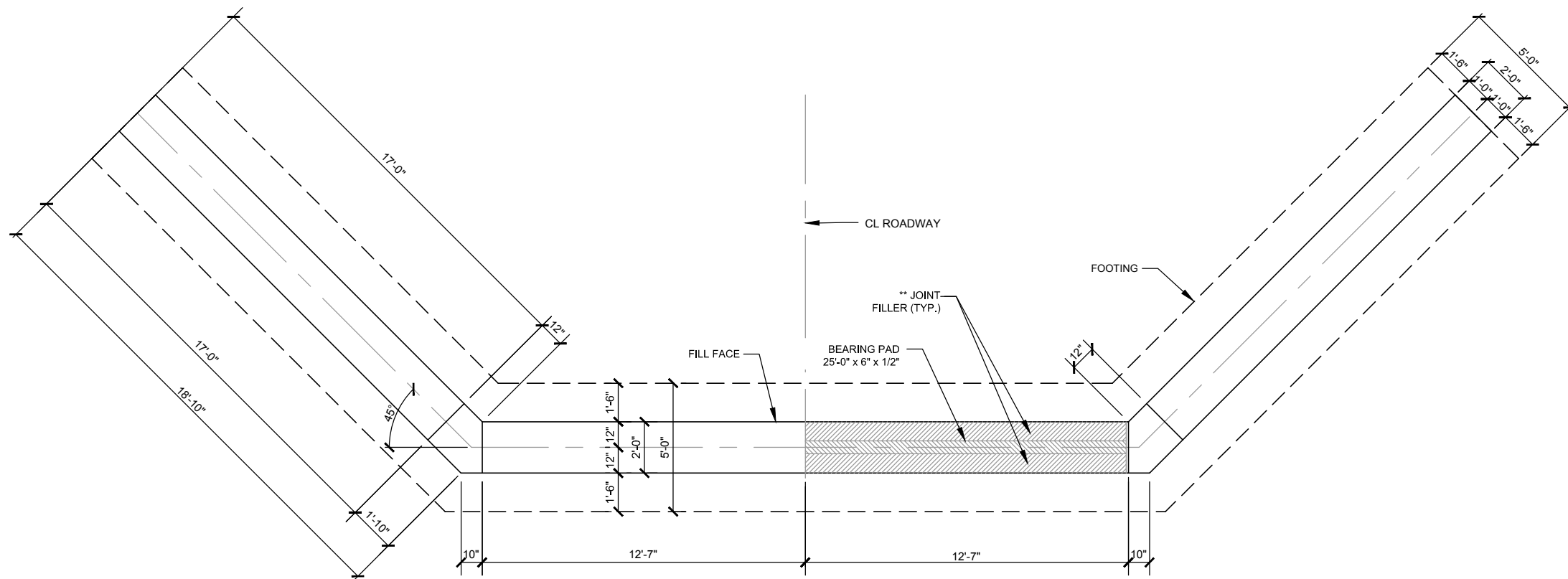
OPINION OF PROBABLE COST

LINE	ITEM	DESCRIPTION	UNITS	QUANTITY	Engineer's Estimate	
					UNIT PRICE	AMOUNT
ROADWAY ITEMS						
1	201	CLEARING & GRUBBING	L.S.	1	\$4,000.00	\$4,000.00
2	203	EMBANKMENT IN PLACE W/ COMPACTION	C.Y.	500	\$15.00	\$7,500.00
3	203	EXCAVATION FOR ROADWAY - UNCLASSIFIED	C.Y.	500	\$12.00	\$6,000.00
4	611	TYPE 2 ROCK BLANKET	C.Y.	150	\$40.00	\$6,000.00
5	801/805	FINAL SEEDING, FERTILIZER, AND MULCHING	AC.	0.5	\$4,500.00	\$2,250.00
6	616	TRAFFIC CONTROL, CONSTRUCTION SIGNS AND BARRICADES	L.S.	1	\$2,000.00	\$2,000.00
7	807	SILT SOXX	L.F.	300	\$4.00	\$1,200.00
8	618	MOBILIZATION	L.S.	1	\$8,000.00	\$8,000.00
SUBTOTAL ROADWAY ITEMS						\$36,950.00
45' Slab Beam Bridge						
9	216	REMOVAL OF EXISTING BRIDGE	L.S.	1	\$6,000.00	\$6,000.00
10	206	EXCAVATION FOR STRUCTURE	L.S.	1	\$2,000.00	\$2,000.00
11	702	STRUCTURAL STEEL PILING	L.F.	160	\$60.00	\$9,600.00
12	705	PRECAST SLAB BEAM	EA.	4	\$10,000.00	\$40,000.00
13	716	PLAIN NEOPRENE BEARING PADS	L.F.	6	\$125.00	\$750.00
14	706	REINFORCING STEEL (Substructure)	Lbs.	500	\$1.20	\$600.00
15	703	CLASS B1 CONC.	C.Y.	30	\$550.00	\$16,500.00
BRIDGE						\$75,450.00
<b>TOTAL COST ESTIMATE</b>						<b>\$112,400.00</b>

STONE COUNTY ESTIMATED COST

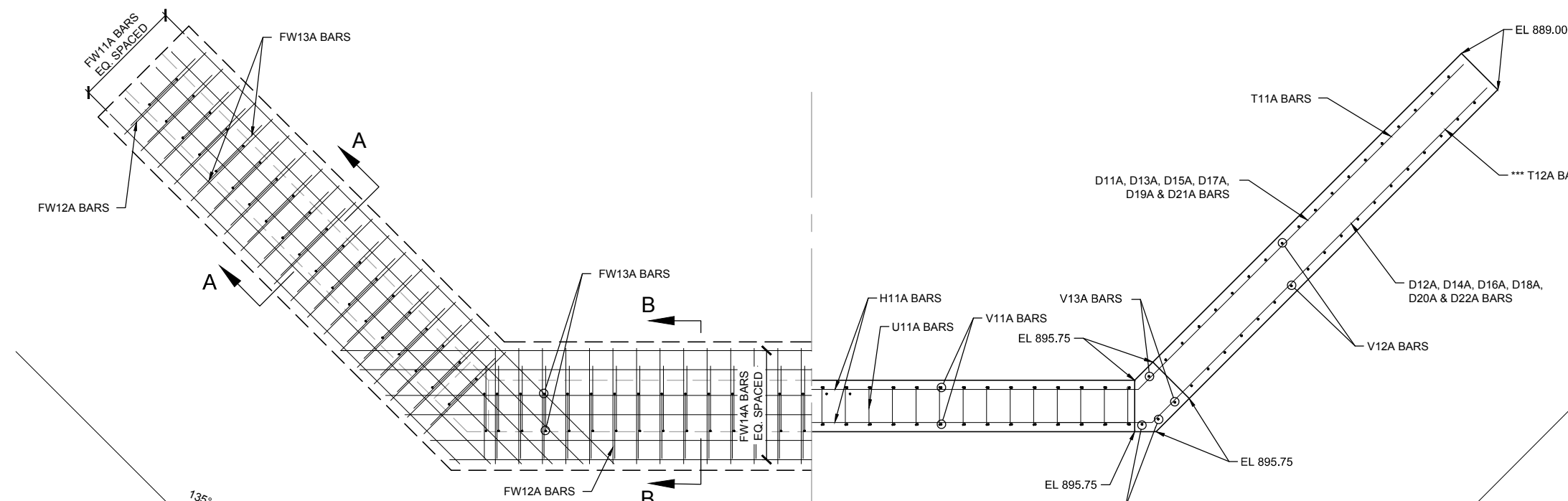
OPINION OF PROBABLE COST

LINE	ITEM	DESCRIPTION	UNITS	QUANTITY	Engineer's Estimate	
					UNIT PRICE	AMOUNT
ROADWAY ITEMS						
1	201	CLEARING & GRUBBING	L.S.	1	\$1,000.00	\$1,000.00
2	616	TRAFFIC CONTROL , CONSTRUCTION SIGNS AND BARRICADES	L.S.	1	\$1,000.00	\$1,000.00
3	618	MOBILIZATION	L.S.	1	\$1,000.00	\$1,000.00
4	611	ROCK BLANKET	CYD	150	\$40.00	\$6,000.00
SUBTOTAL ROADWAY ITEMS						\$9,000.00
45' Slab Beam Bridge						
5	216	REMOVAL OF EXISTING BRIDGE	L.S.	1	\$2,000.00	\$2,000.00
6	206	EXCAVATION FOR STRUCTURE	L.S.	1	\$500.00	\$500.00
7	724	5' DIAMETER CORRUGATED METAL PIPE	EA.	4	\$2,880.00	\$11,520.00
BRIDGE						\$14,020.00
TOTAL COST ESTIMATE						\$23,020.00



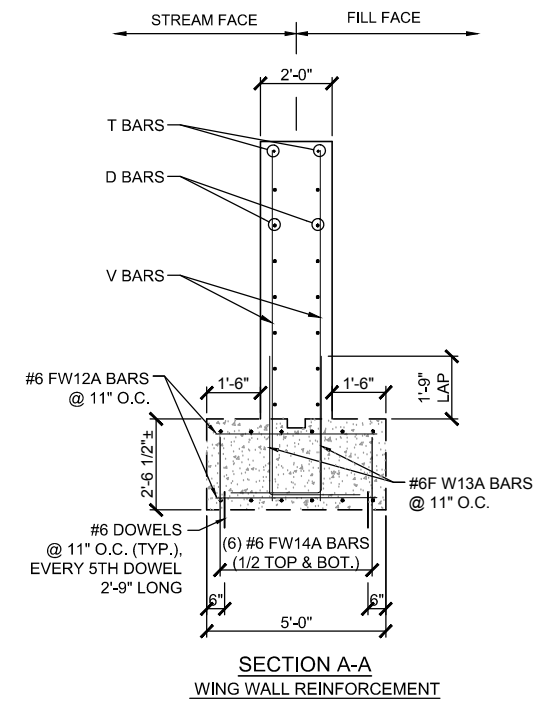
**PLAN VIEW OF GEOMETRY**

\*\* FILL AREA UNDER GIRDER WITH JOINT FILLER TO BE SUPPLIED BY CONTRACTOR. JOINT FILLER MUST BE IN PLACE PRIOR TO SETTING BEAMS.

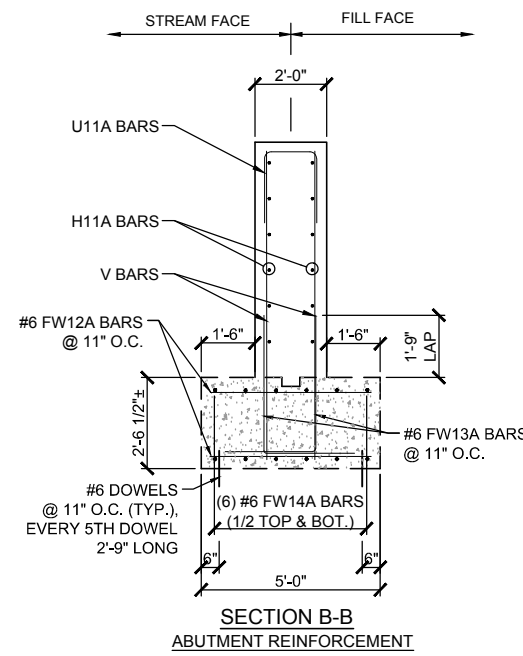


**PLAN VIEW OF REBAR**

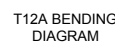
\*\*\* T12A BARS SHALL BE FIELD BENT TO FIT THE WING WALL ELBOW.



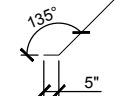
**SECTION A-A  
WING WALL REINFORCEMENT**



**SECTION B-B  
ABUTMENT REINFORCEMENT**

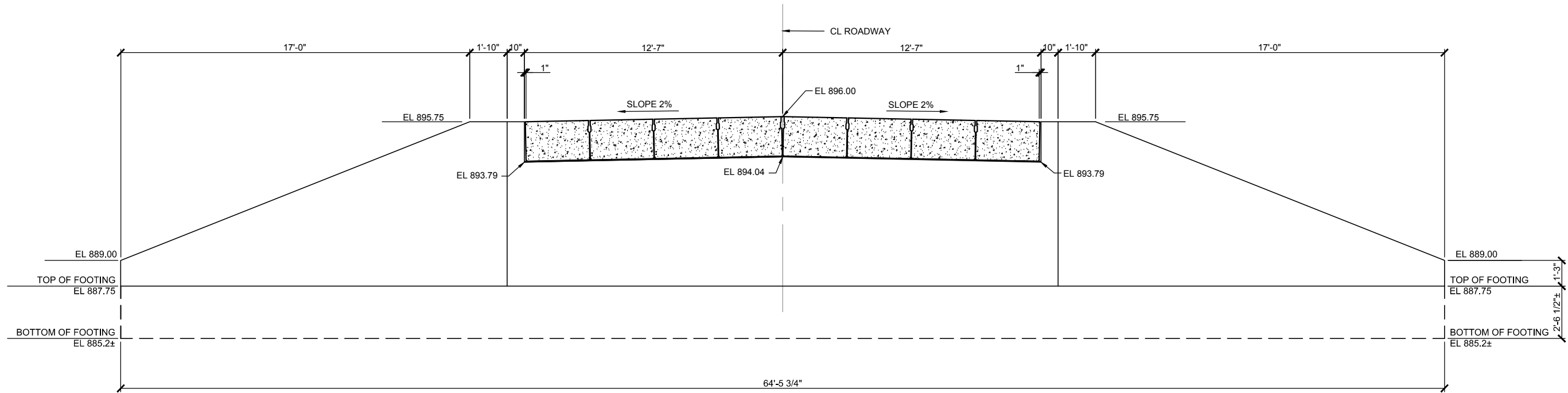


T12A BENDING DIAGRAM

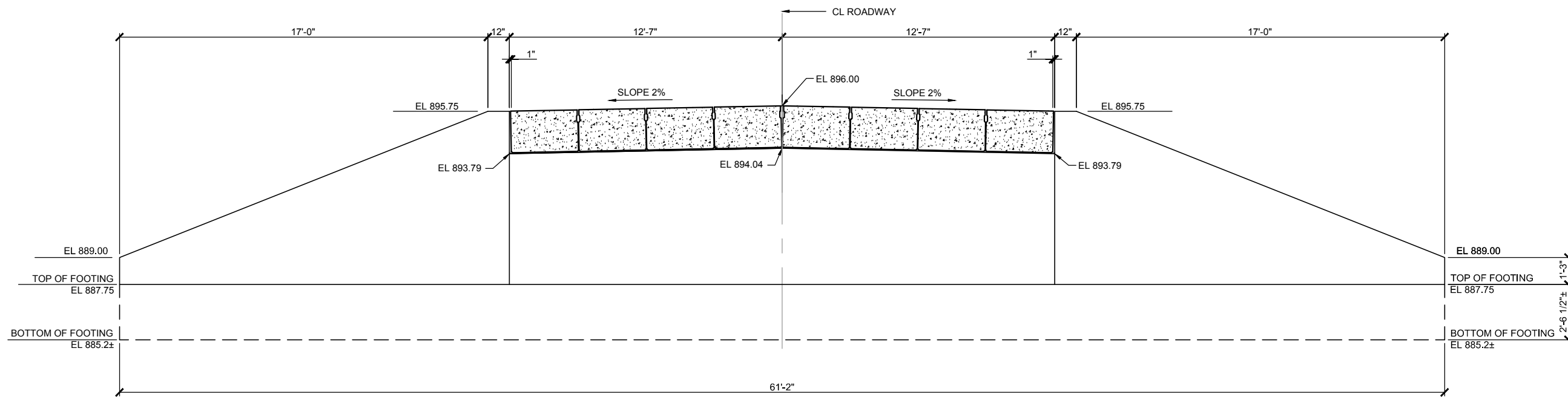


T12A BENDING DIAGRAM

NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

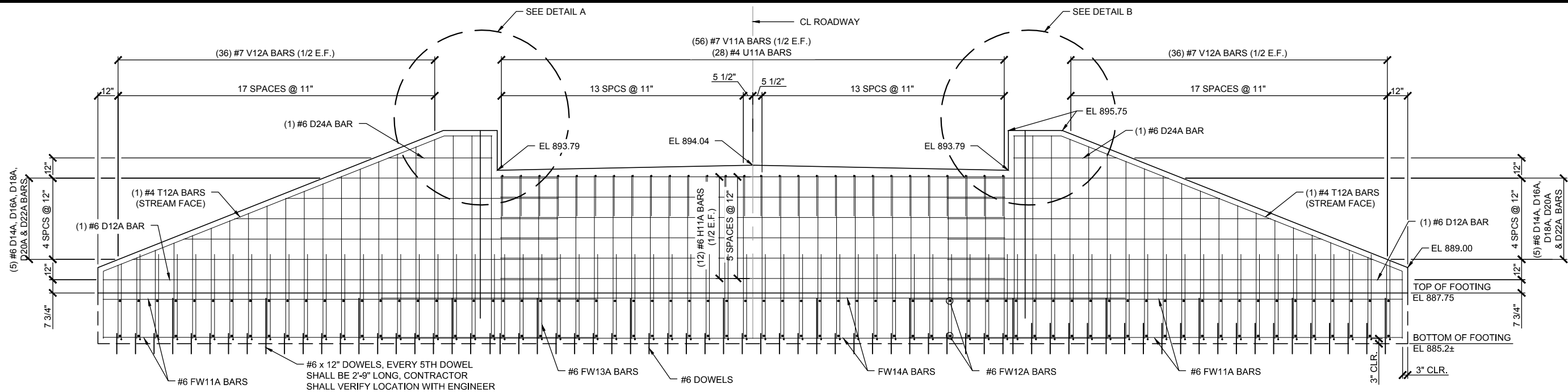


**ELEVATION OF STREAM FACE GEOMETRY**  
(WINGWALLS SHOWN STRAIGHT FOR CLARITY)

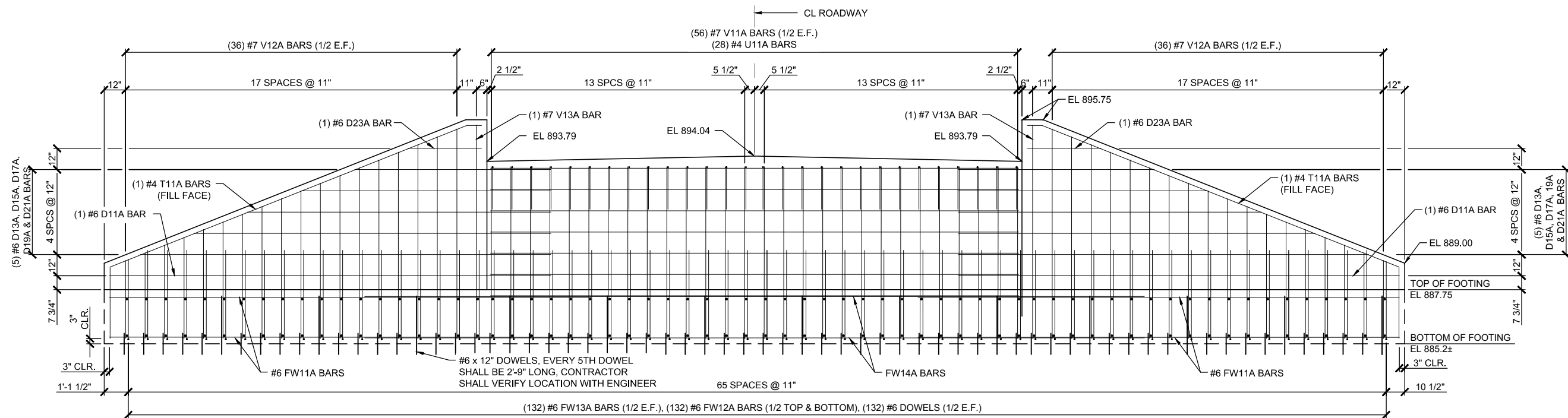


**ELEVATION OF FILL FACE GEOMETRY**  
(WINGWALLS SHOWN STRAIGHT FOR CLARITY)

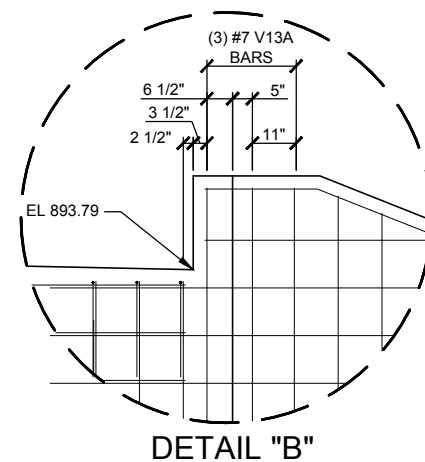
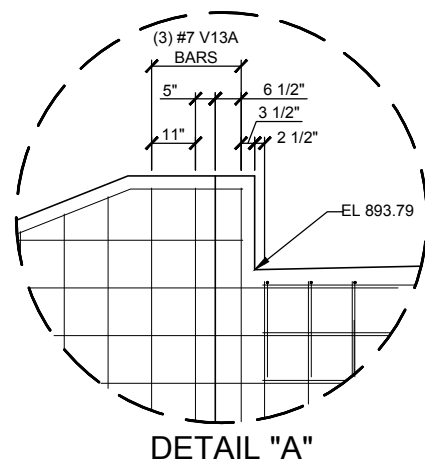
NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.



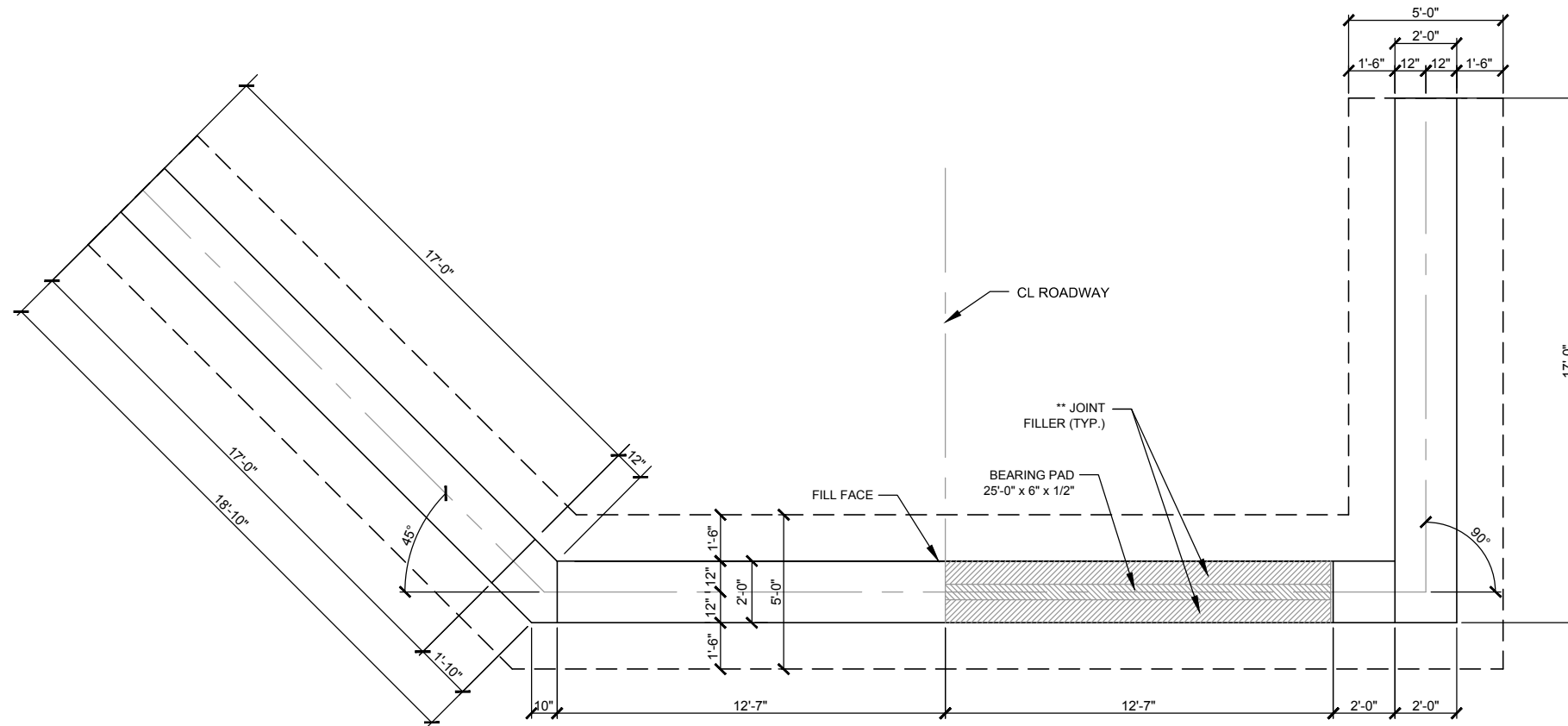
**STREAM FACE ELEVATION**  
(WINGWALLS SHOWN STRAIGHT FOR CLARITY)



**FILL FACE ELEVATION**  
(WINGWALLS SHOWN STRAIGHT FOR CLARITY)

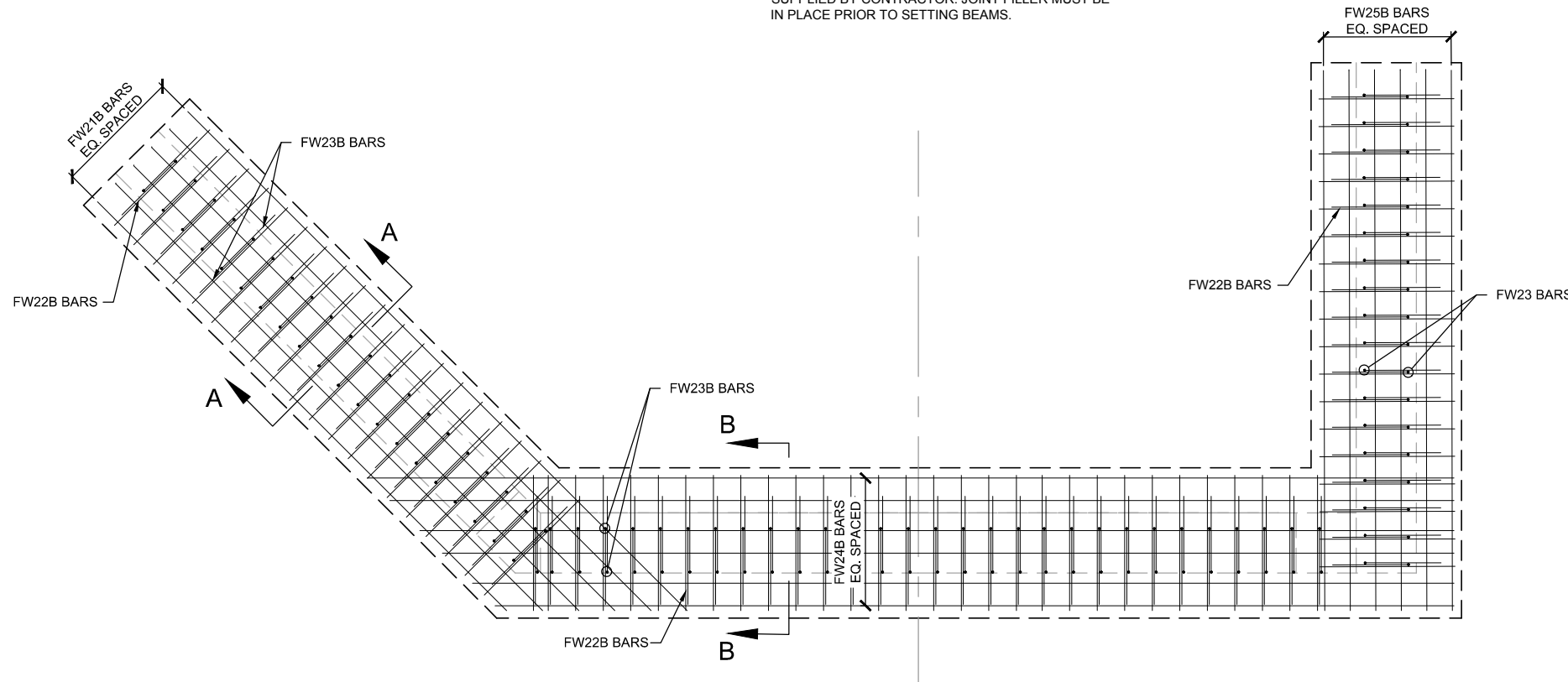


NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

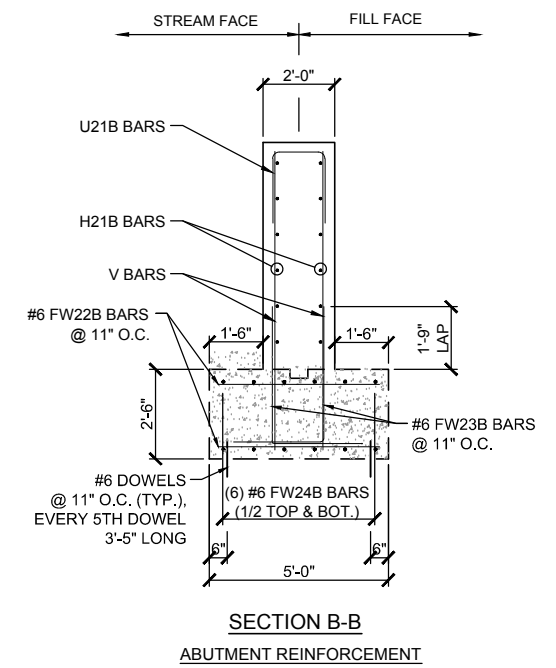
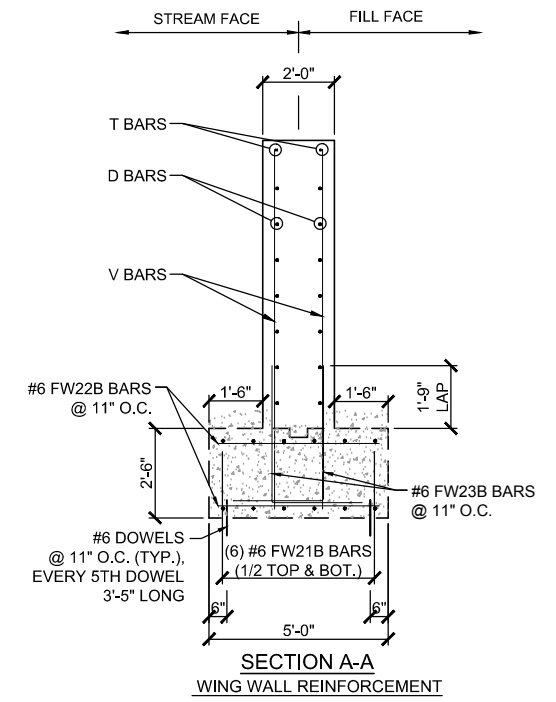


**PLAN VIEW OF GEOMETRY**

\*\* FILL AREA UNDER GIRDER WITH JOINT FILLER TO BE SUPPLIED BY CONTRACTOR. JOINT FILLER MUST BE IN PLACE PRIOR TO SETTING BEAMS.

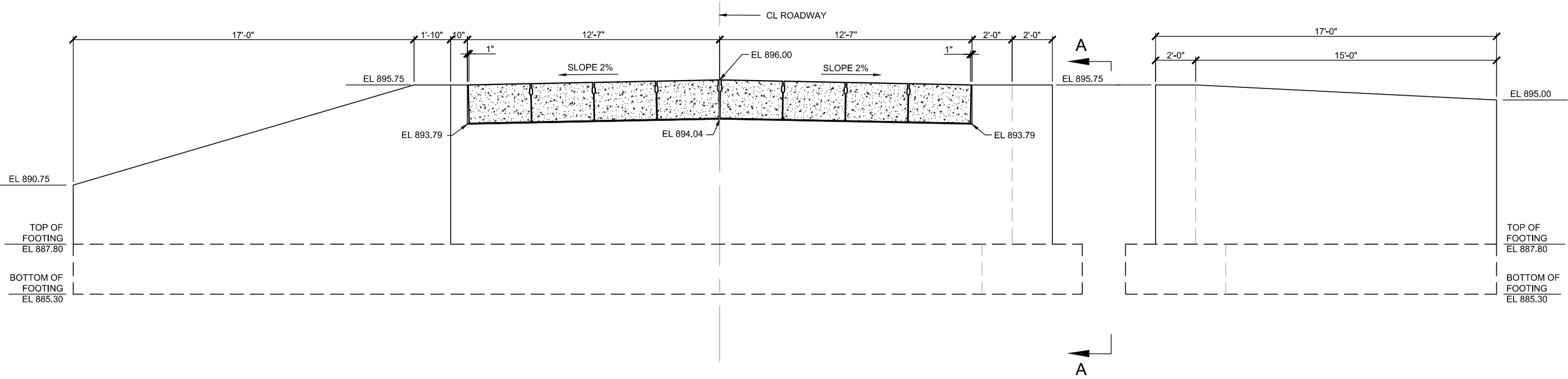


**PLAN VIEW OF FOOTING REBAR**



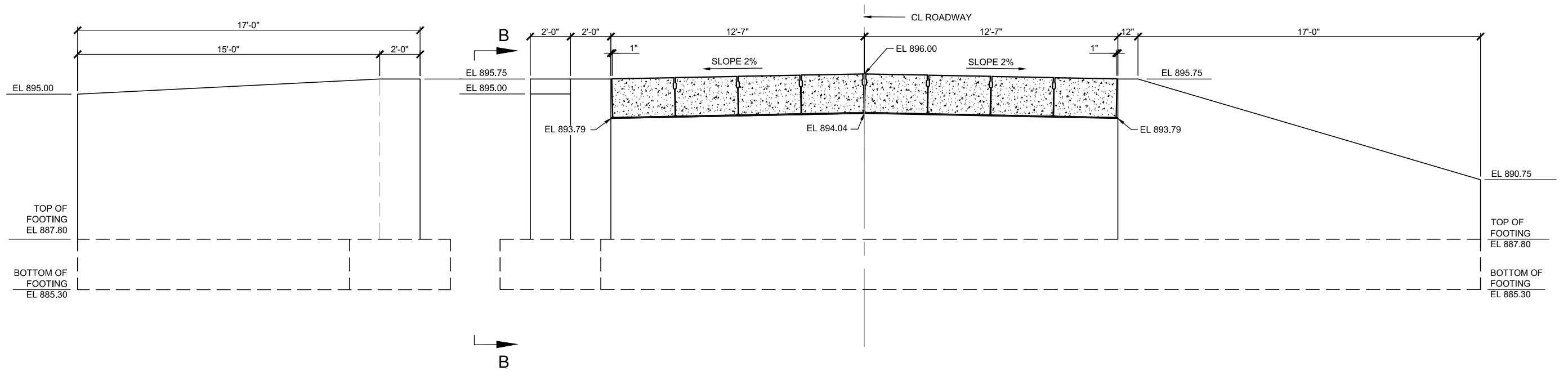
NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.





**ELEVATION OF STREAM FACE GEOMETRY**  
(ONE WINGWALL SHOWN STRAIGHT FOR CLARITY)

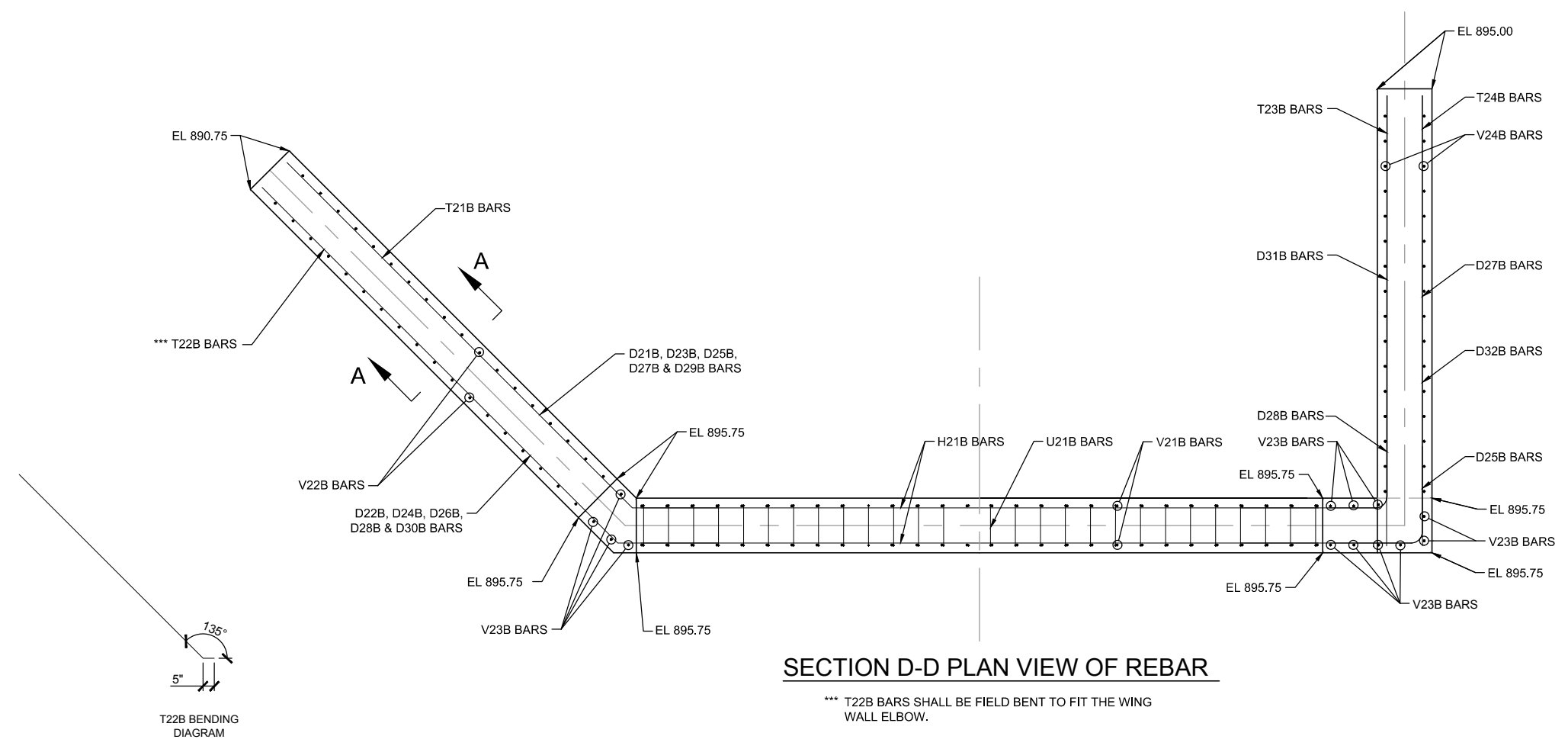
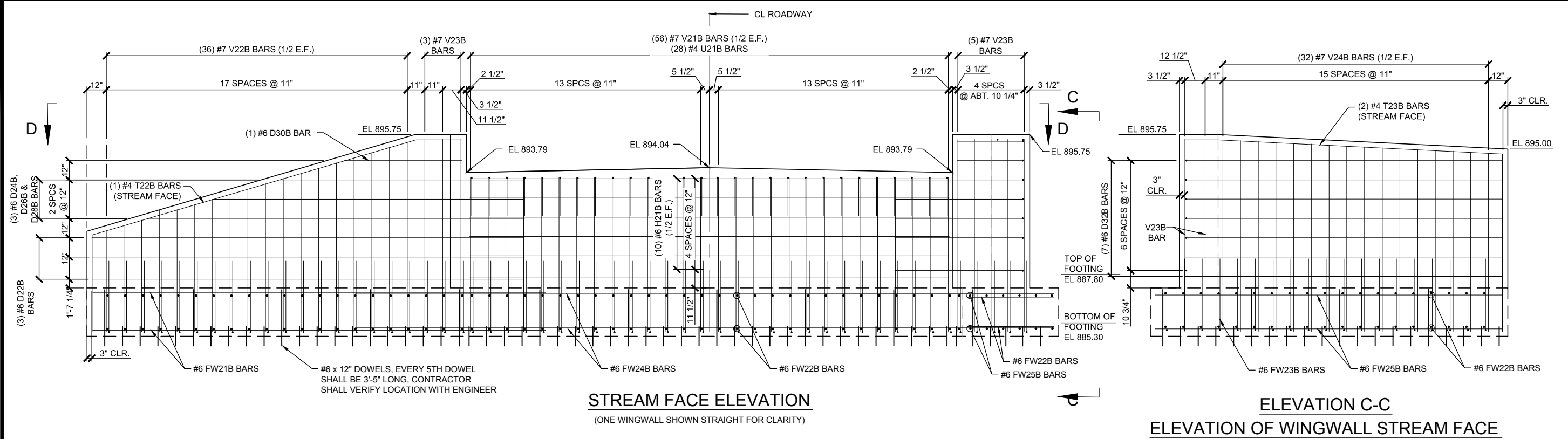
**ELEVATION A-A**  
**ELEVATION OF WINGWALL STREAM FACE GEOMETRY**



**ELEVATION B-B**  
**ELEVATION OF WINGWALL FILL FACE GEOMETRY**

**ELEVATION OF FILL FACE GEOMETRY**  
(ONE WINGWALL SHOWN STRAIGHT FOR CLARITY)

NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

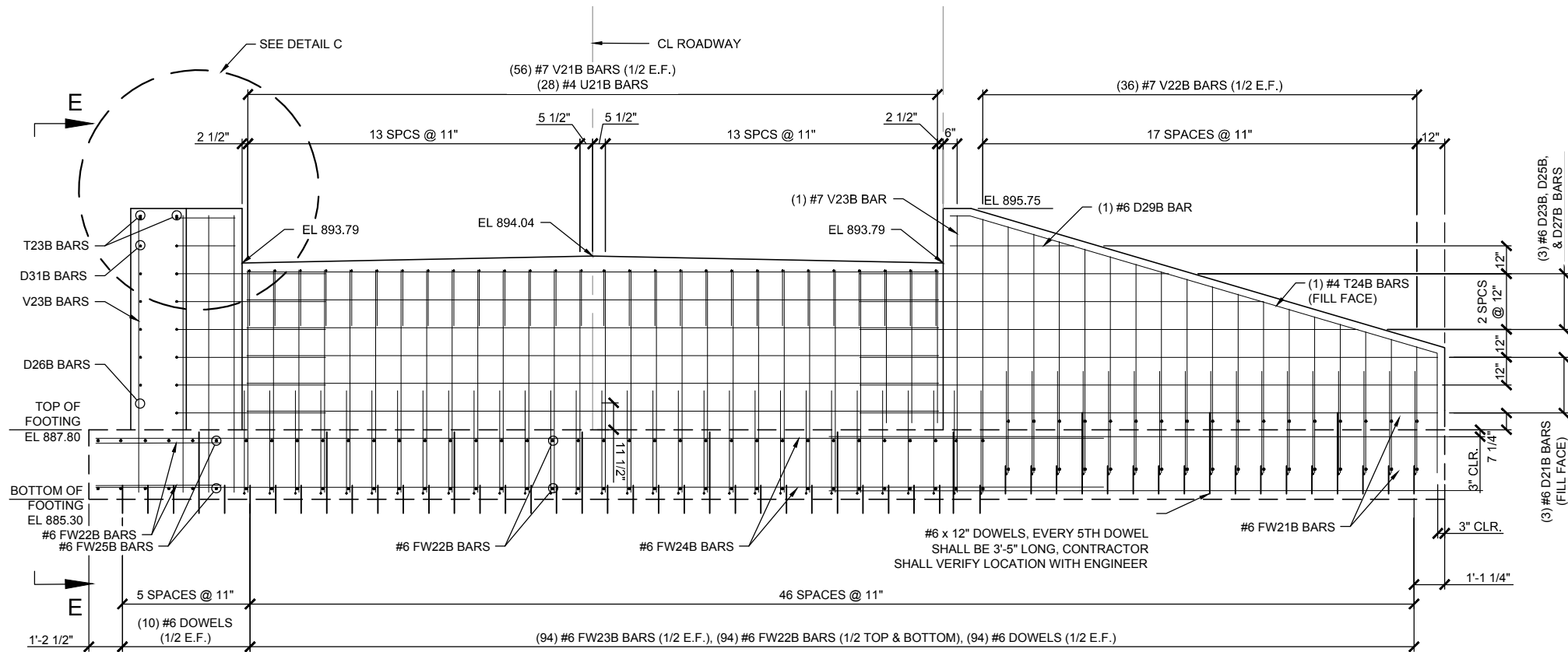


NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DALLAS COUNTY, MISSOURI  
END BENT #2 DETAILS

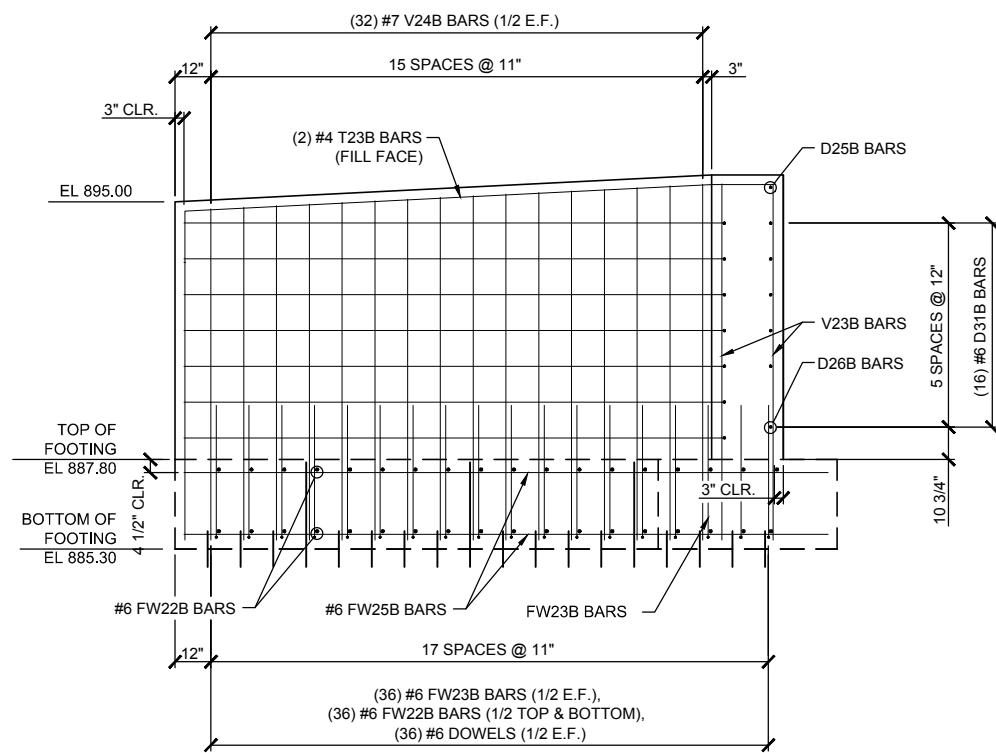
S1-S7\_DE  
NTS  
01.22.2013

S6



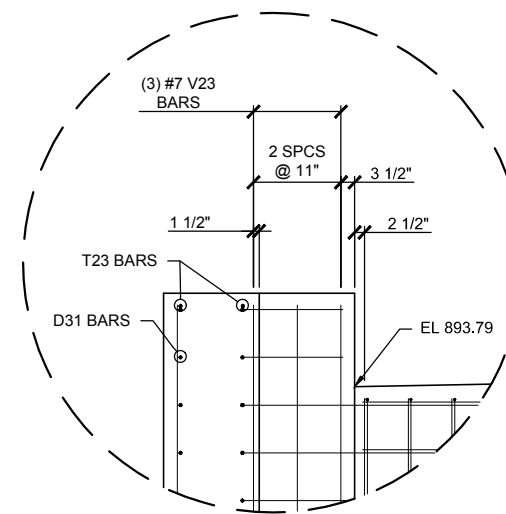
**FILL FACE ELEVATION**

(ONE WINGWALL SHOWN STRAIGHT FOR CLARITY)



**ELEVATION E-E**

**ELEVATION OF WINGWALL FILL FACE**

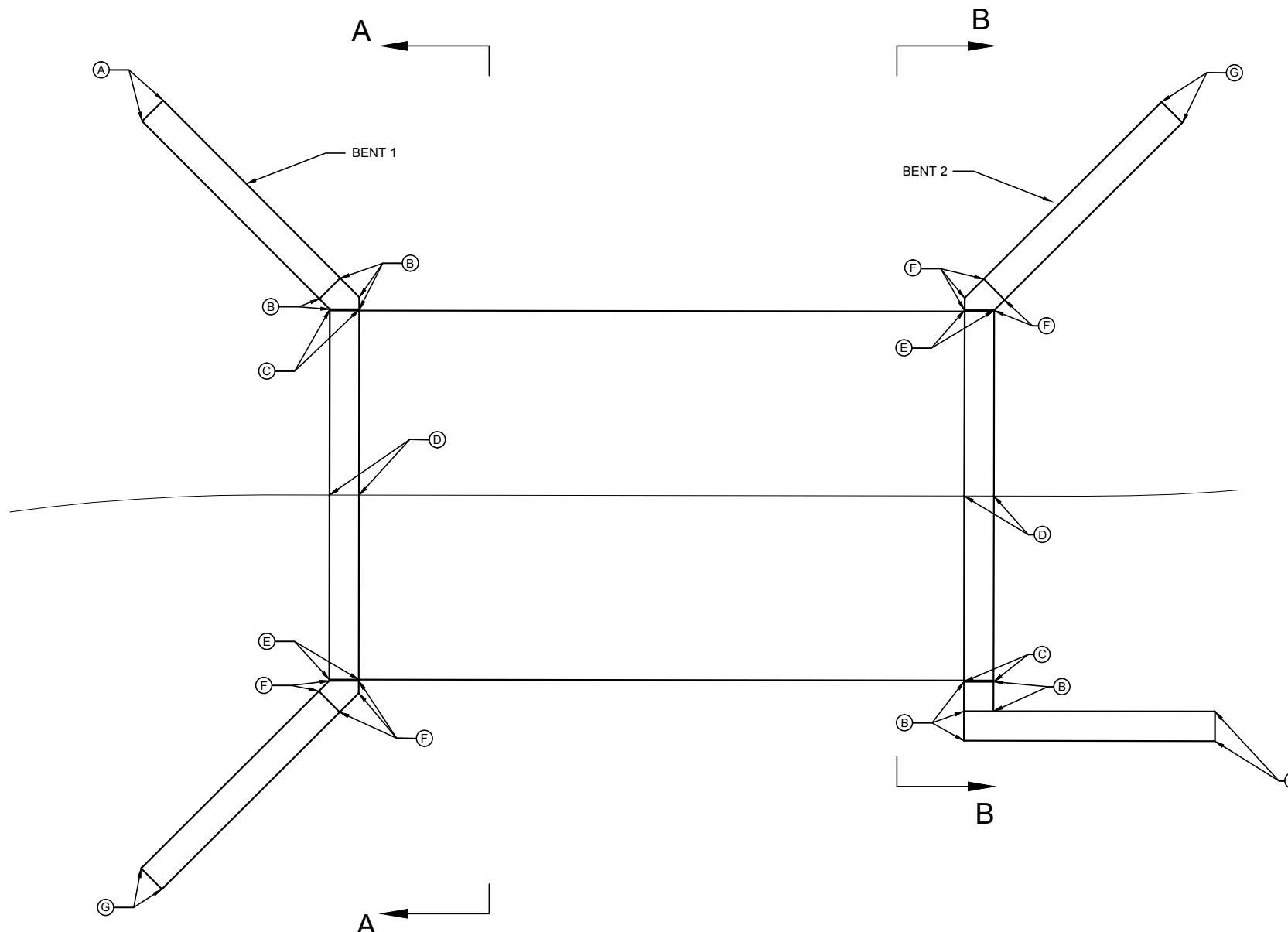


**DETAIL "C"**

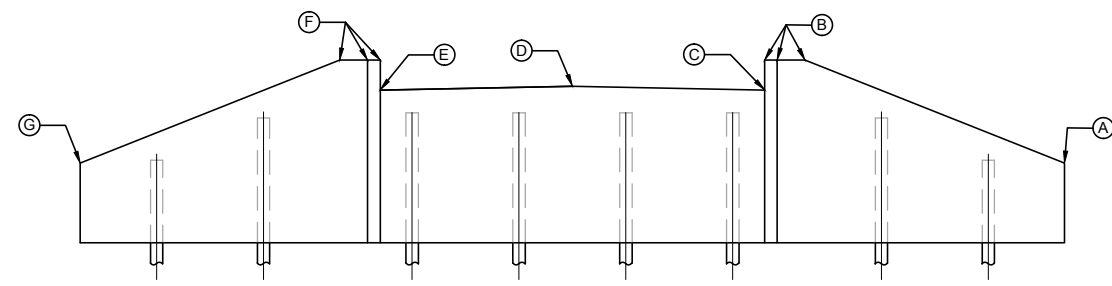
NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

BENT 1 ELEVATIONS	
LOCATION	ELEVATION
A	889.00
B	895.75
C	893.79
D	894.04
E	893.79
F	895.75
G	889.00

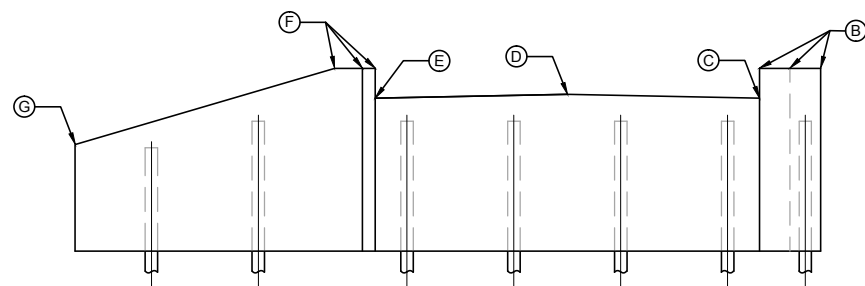
BENT 2 ELEVATIONS	
LOCATION	ELEVATION
A	895.00
B	895.75
C	893.79
D	894.04
E	893.79
F	895.75
G	890.75



PLAN - END BENT AND WINGWALL ELEVATIONS



ELEVATION "A-A"



ELEVATION "B-B"

NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

## GENERAL NOTES

### DESIGN DATA

DESIGN SPECIFICATIONS: 2002 A.A.S.H.T.O. STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 17TH EDITION AND CURRENT INTERIMS

THE CONTRACTOR SHALL FOLLOW THE SPECIFICATIONS AS STATED IN THE "MISSOURI STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION," 2011 AND CURRENT SUPPLEMENTAL SPECIFICATIONS REVISIONS.

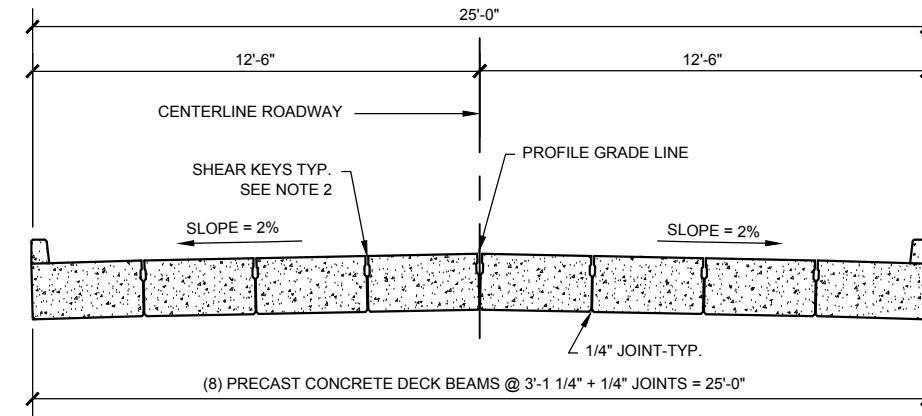
DESIGN LOADING: HS20-44  
SEISMIC PERFORMANCE CATEGORY 'A'  
EARTH — 120 PSF  
EQUIVALENT FLUID PRESSURE — 45 POUNDS/CU. FT.  
35 POUND/SQUARE FOOT FUTURE WEAR SURFACE SUPERSTRUCTURE:  
SIMPLY SUPPORTED NON-COMPOSITE FOR DEAD AND LIVE LOADS.

### DESIGN UNIT STRESSES

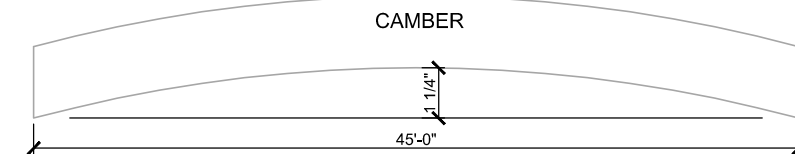
CONCRETE	$f_c = 6,000$ psi
REINFORCING STEEL STRUCTURAL	$f_y = 60,000$ psi
CARBON STEEL	$f_y = 50,000$ psi

### NOTES:

1. AFTER BEAMS HAVE BEEN ERECTED, HOLES SHALL BE DRILLED INTO SUBSTRUCTURE AND ANCHOR BOLTS PLACED. ANCHOR HOLES SHALL BE FILLED WITH NON-SHRINK GROUT TO TOP OF BEAM AND ALLOWED TO CURE MIN. 24 HOURS PRIOR TO GROUTING THE SHEAR KEYS. ANCHOR BOLTS SHALL BE EQUIVALENT TO ASTM A 307.
2. LONGITUDINAL KEYS SHALL BE GROUTED.
3. THE 1" DIAMETER RODS IN THE TRANSVERSE TIE ASSEMBLY SHALL BE TIGHTENED TO A SNUG FIT AND THE THREADS SET. POCKETS THAT RECEIVE TRANSVERSE TIE BAR OUTSIDE SHALL BE FILLED WITH GROUT AFTER TRANSVERSE TIE ASSEMBLY IS IN PLACE. SEE SHEET S6 FOR DETAILS. TIE RODS SHALL BE ASTM A36.
4. USE RECESSED LIFT ANCHORS ON EACH END. FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION.
5. ALL REBAR IN PRECAST DECK BEAMS SHALL BE EPOXY COATED.
6. DO NOT LIFT BEAMS UNTIL CONCRETE STRENGTH IS EQUAL TO 3500 PSI.
7. PROVIDE A TYNE FINISH ON TOP OF BEAMS WITH DEPTH OF TYNES 1/4".
8. JOINT FILLER MUST BE IN PLACE PRIOR TO SETTING SLAB BEAMS.
9. SLAB BEAMS MUST MEET A DEFLECTION CRITERIA OF L/800
10. SUPPLIER NEEDS TO BE PRE APPROVED
11. NOMINAL 1" JOINT AT CENTERLINE PIER SHALL BE FILLED WITH JOINT FILLER. SEAL JOINT WITH SONOLISTIC NFI BY SONNEBORN SEALANT SYSTEMS OR APPROVED EQUAL.
12. SHOP DRAWINGS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL.



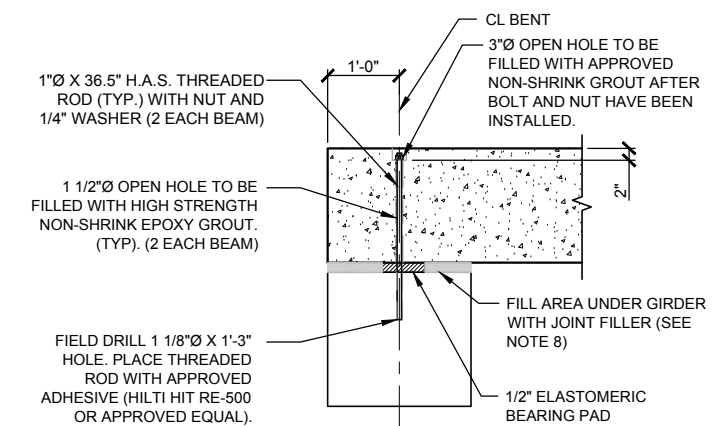
**TYPICAL CROSS SECTION OF ROADWAY**  
(NEAR CL OF STRUCTURE)



SLAB SHALL BE CAMBERED FOR DEAD LOAD DEFLECTIONS.

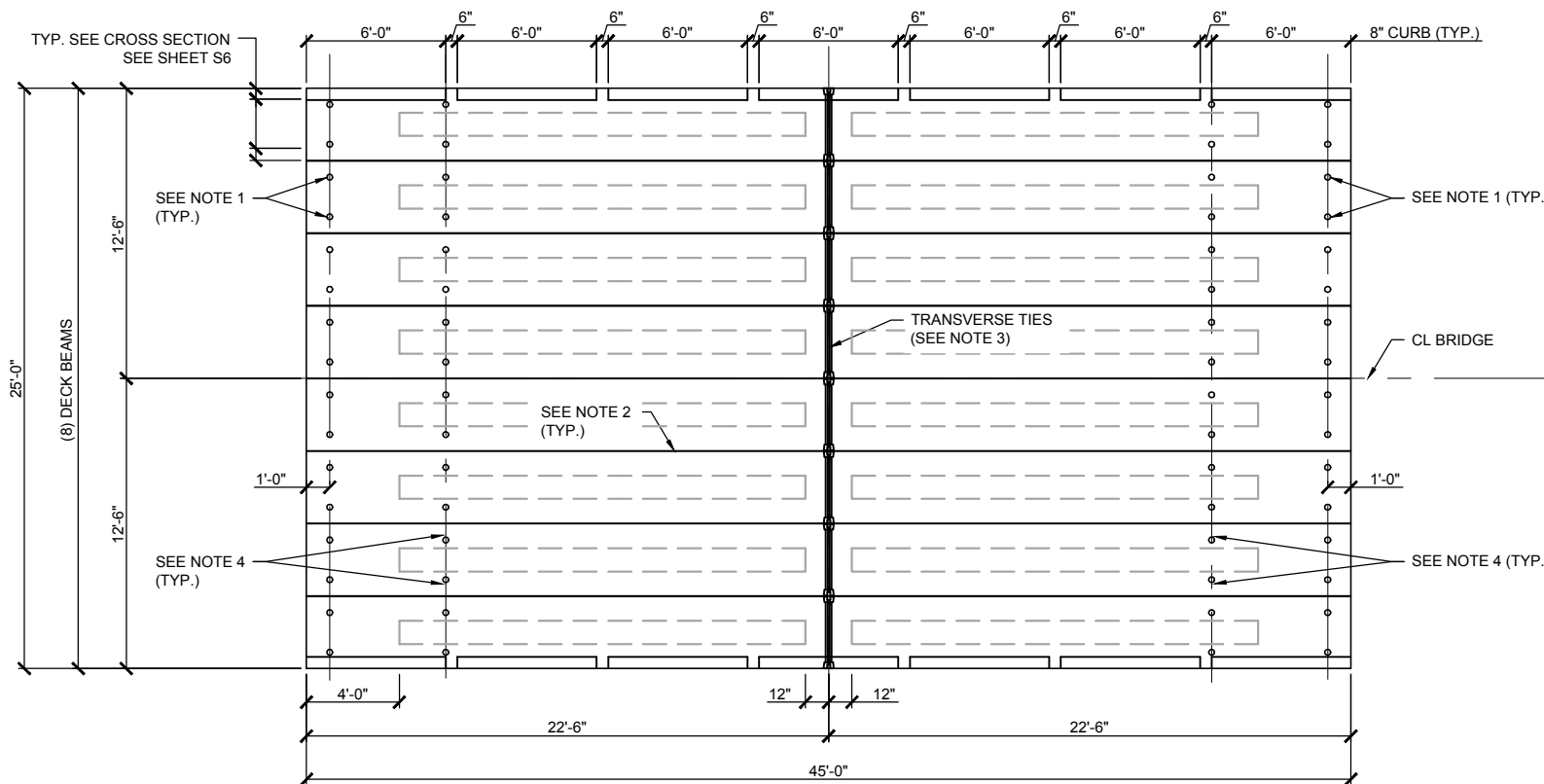
### TYPICAL SLAB CAMBER

NOT TO SCALE



### SECTION AT ABUTMENTS

(ALONG CL BEAMS)

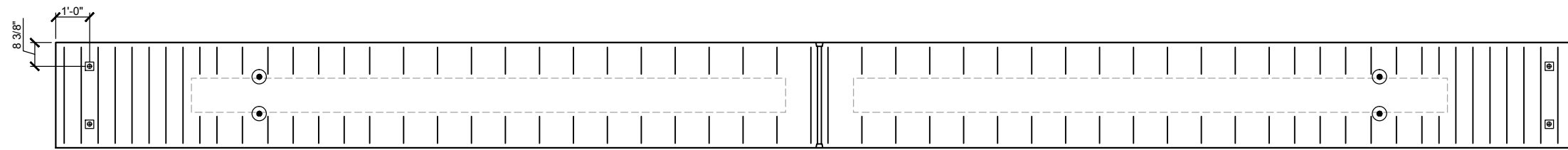


**SLAB BEAM LAYOUT PLAN**

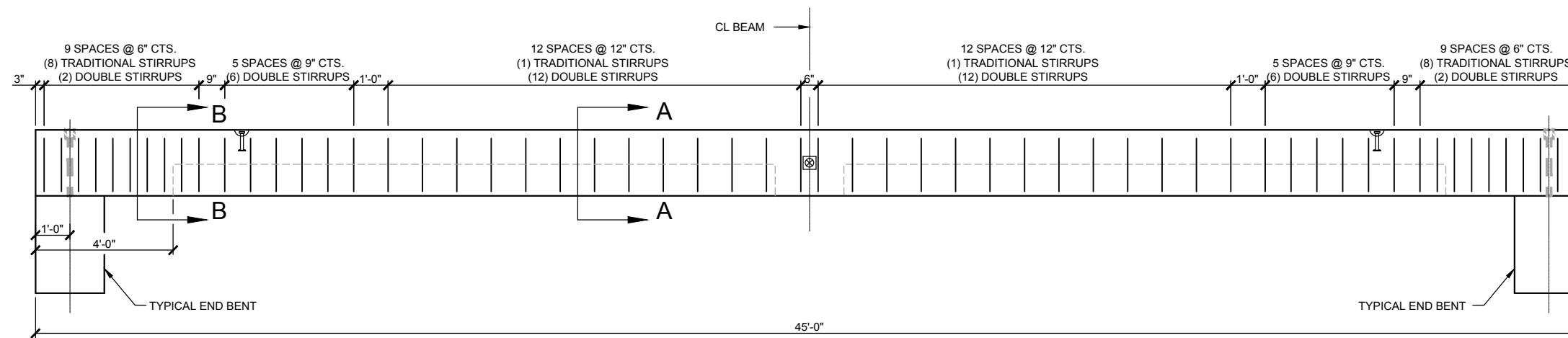
NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

**NOTE:**

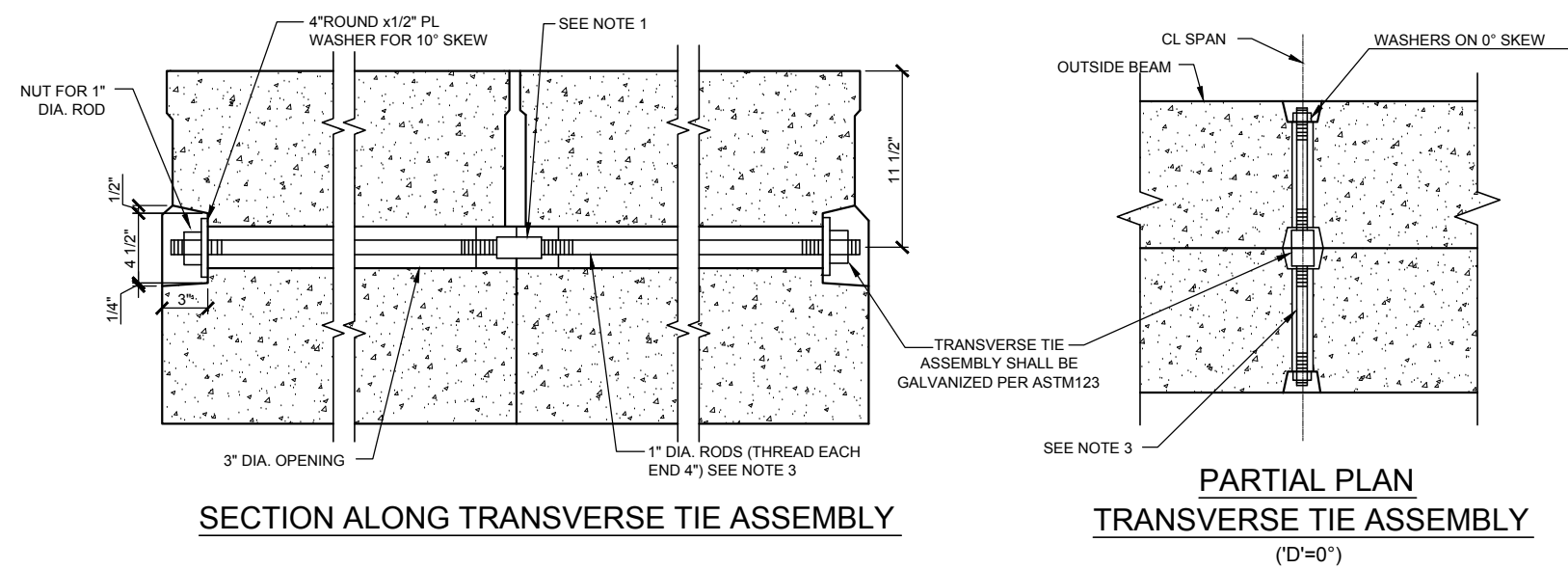
1. USE DAYTON/RICHMOND D-4 HEX COUPLING NUT FOR CONNECTING 1"Ø THREADED RODS. ALTERNATE APPROVED TRANSVERSE TIE RODS OF INCREASED SEGMENTAL LENGTH ARE ACCEPTABLE, INCLUDING 1 CONTINUOUS TIE ROD THROUGH ALL DECK BEAMS.



**PLAN OF STIRRUP SPACING DETAIL**



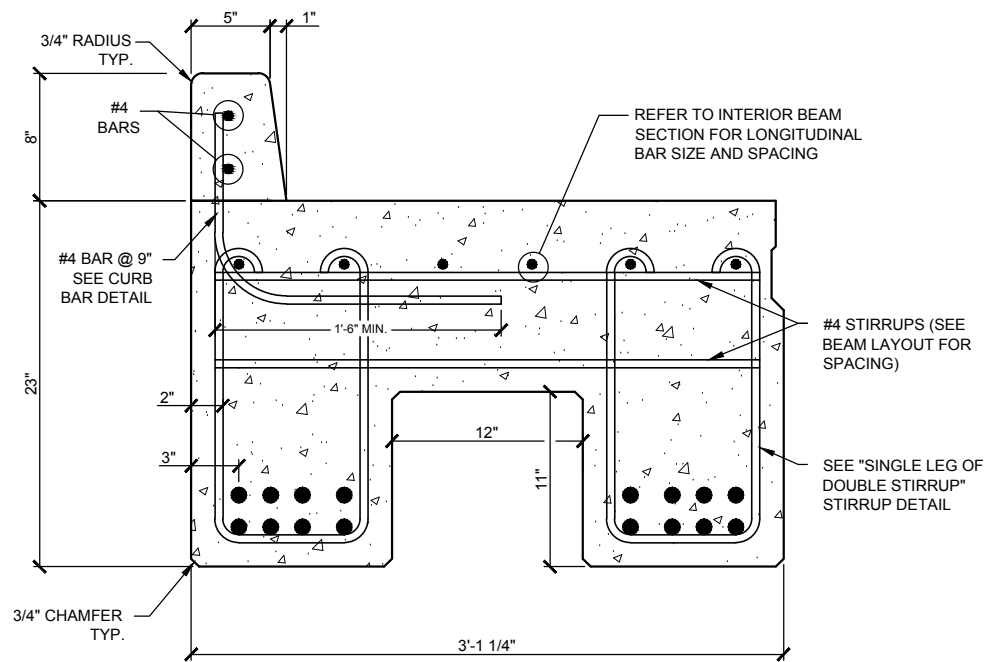
**ELEVATION OF STIRRUP SPACING DETAIL**



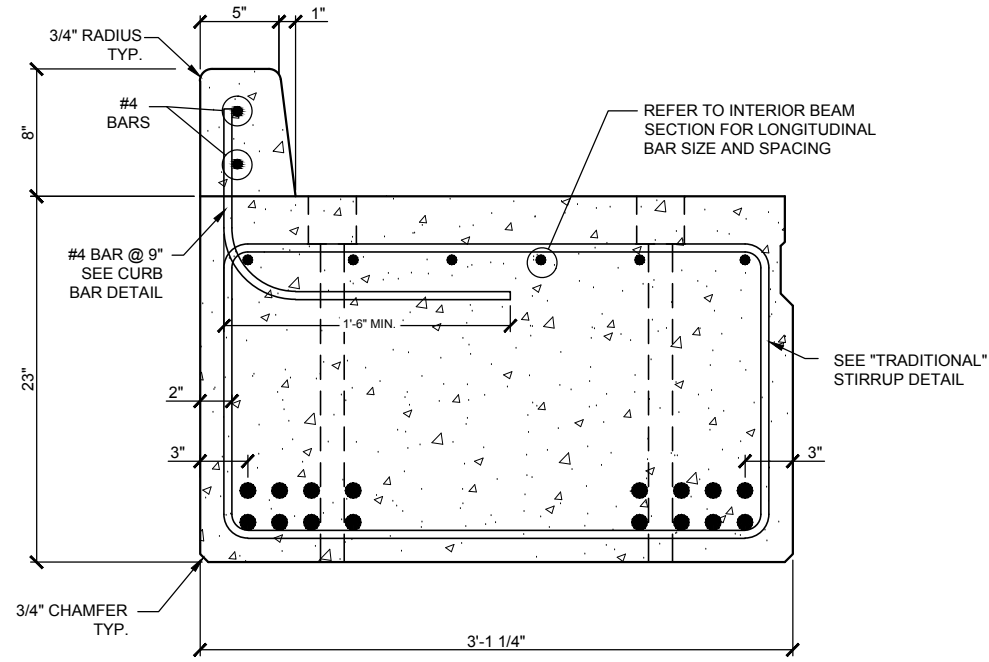
**SECTION ALONG TRANSVERSE TIE ASSEMBLY**

**PARTIAL PLAN TRANSVERSE TIE ASSEMBLY (D'=0°)**

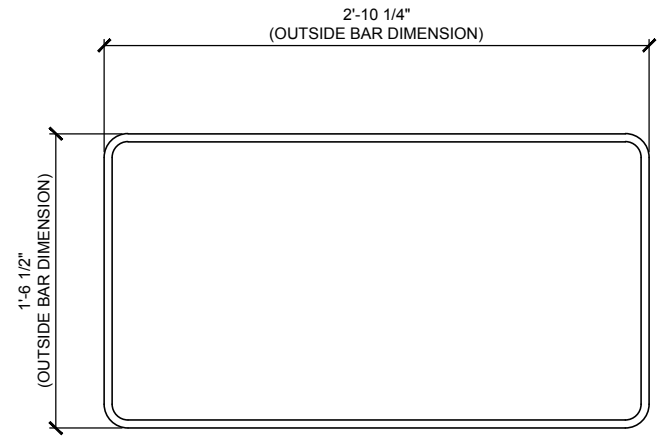
NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.



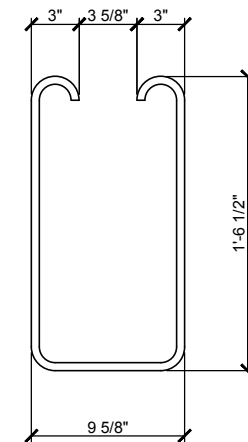
**TYPICAL CROSS SECTION A-A**  
(EXTERIOR BEAM)  
NOT TO SCALE



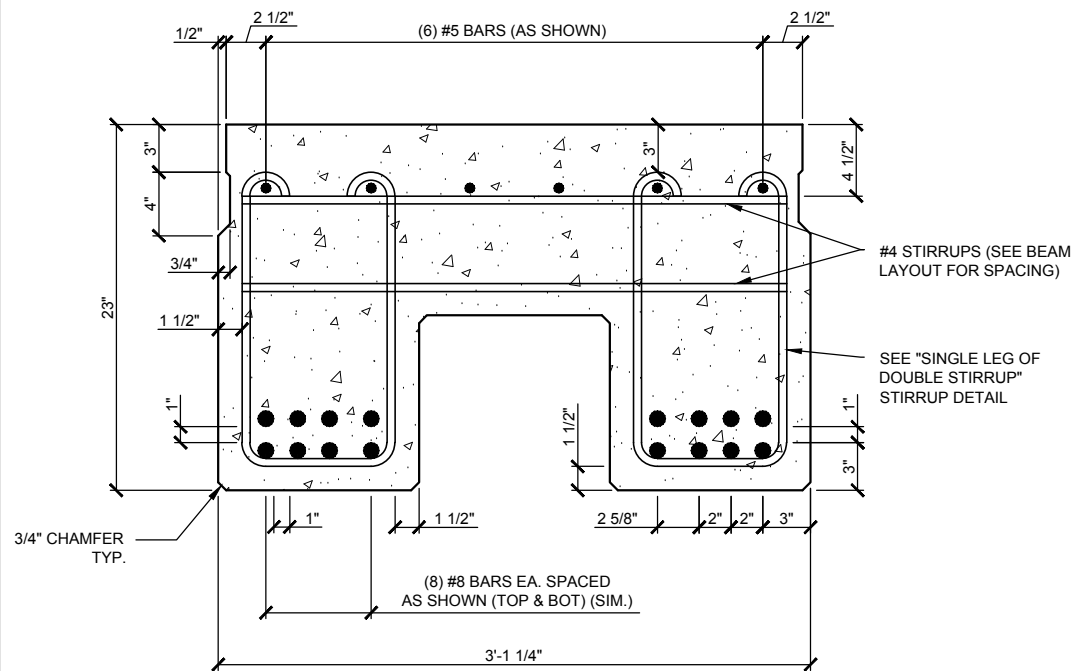
**TYPICAL CROSS SECTION B-B**  
(EXTERIOR BEAM)  
NOT TO SCALE



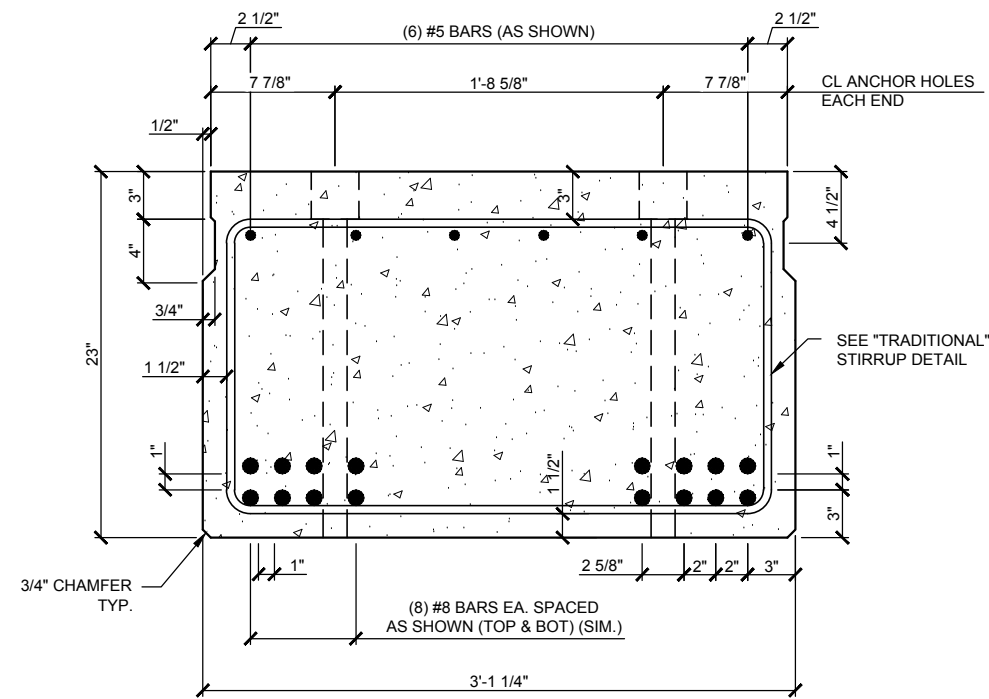
**"TRADITIONAL" STIRRUP DETAIL**



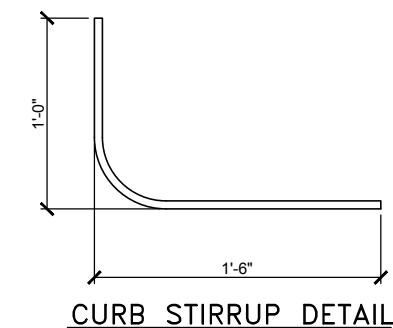
**"DOUBLE" STIRRUP DETAIL**  
(SINGLE LEG OF DOUBLE STIRRUP)



**TYPICAL CROSS SECTION A-A**  
(INTERIOR BEAM)  
NOT TO SCALE



**TYPICAL CROSS SECTION B-B**  
(INTERIOR BEAM)  
NOT TO SCALE



**CURB STIRRUP DETAIL**

NOTE:  
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

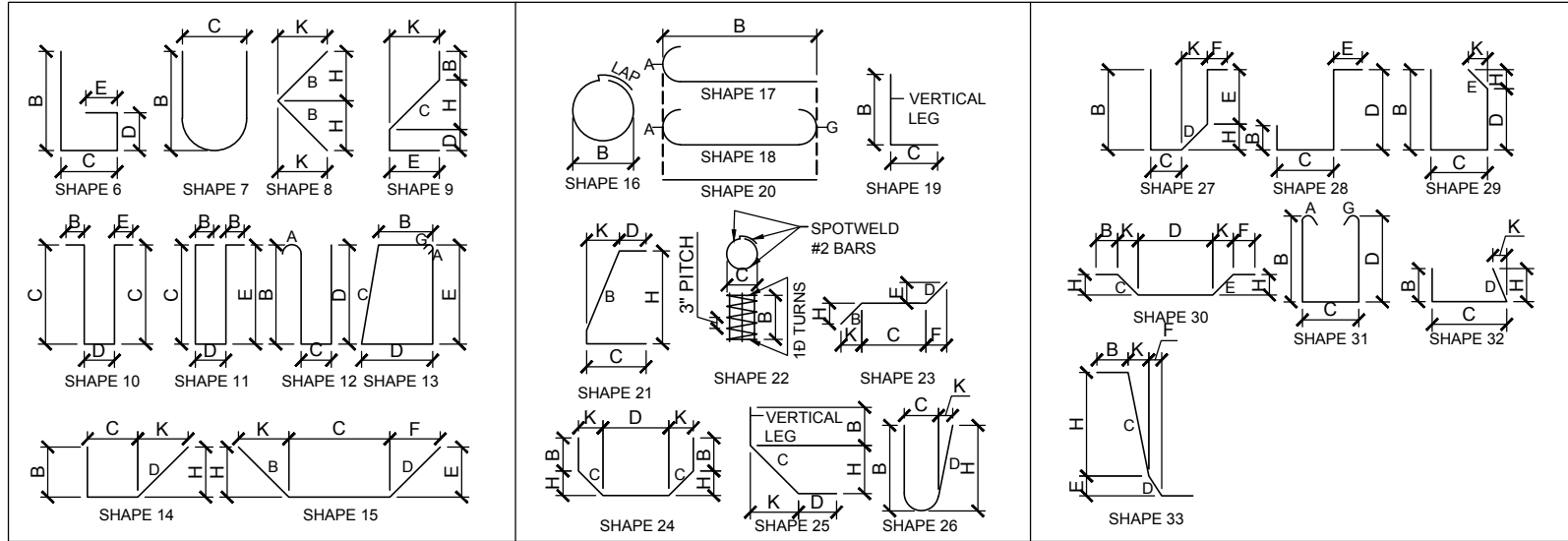
**COMPLETE BILL OF REINFORCING STEEL**

NO. REQ'D.	MARK NO.		LOCATION	EPOXY (E)	SHAPE NO.	STIRRUP (S)	SUBSTR. (X)	VARIES (V)	NO. EACH	DIMENSIONS												LENGTH		WEIGHT		
	SIZE	MARK								B		C		D		E		F		H		K		FT.	IN.	LBS.
										FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.			
2	4	T11	WINGWALL		25		X			4	9.25	18	0.75	0	8.50			6	8.00	16	9.25	23	7	32		
10	6	D11	WINGWALL		14		X			0	0.00	3	2.00	17	10.75			12	7.75	12	7.75	21	1	317		
1	6	D13	WINGWALL		14		X			0	0.00	3	2.00	16	2.00			11	5.00	11	5.00	19	4	30		
1	6	D15	WINGWALL		14		X			0	0.00	3	2.00	13	7.75			9	7.75	9	7.75	16	10	26		
1	6	D17	WINGWALL		14		X			0	0.00	3	2.00	11	1.50			7	10.25	7	10.25	14	4	22		
1	6	D19	WINGWALL		14		X			0	0.00	3	2.00	8	7.25			6	1.00	6	1.00	11	9	18		
1	6	D21	WINGWALL		14		X			0	0.00	3	2.00	6	1.00			4	3.50	4	3.50	9	3	14		
1	6	D23	WINGWALL		20		X			3	5.50											3	6	6		
28	4	U11	WALL		10		X			0	0.00	1	11.75	1	5.50	0	0.00					5	5	102		
20	6	H11	WALL		20		X			24	10.00											24	10	746		
56	7	V11	WALL		20		X			9	6.00											9	6	1088		
72	7	V12	WINGWALL		20		X	VS	4	5	1.00											5	1	0		
			INC=4.35in				X	VL	4	11	3.00											11	3	1202		
8	7	V13	WINGWALL		20		X			11	5.50											11	6	188		
2	4	T12	WINGWALL		25		X			4	9.25	18	0.75	2	4.25			6	8.00	16	9.50	25	2	34		
1	6	D12	WINGWALL		14		X			0	3.00	3	8.50	18	5.25			13	0.50	13	0.50	22	5	34		
1	6	D14	WINGWALL		14		X			0	3.00	3	8.50	17	3.25			12	2.75	12	2.75	21	3	32		
1	6	D16	WINGWALL		14		X			0	3.00	3	8.50	14	9.00			10	5.25	10	5.25	18	9	29		
1	6	D18	WINGWALL		14		X			0	3.00	3	8.50	12	2.75			8	7.75	8	7.75	16	2	25		
1	6	D20	WINGWALL		14		X			0	3.00	3	8.50	9	8.50			6	10.50	6	10.50	13	8	21		
1	6	D22	WINGWALL		14		X			0	3.00	3	8.50	7	2.50			5	1.25	5	1.25	11	2	17		
1	6	D24	WINGWALL		14		X			0	3.00	0	5.50	4	8.25			3	3.75	3	3.75	5	5	9		
1	4	T24	WINGWALL		25		X			6	6.00	17	5.75	0	8.50			4	11.25	16	9.25	24	8	17		
7	6	D21	WINGWALL		14		X			0	0.00	3	2.00	17	10.75			12	7.75	12	7.75	21	1	222		
1	6	D23	WINGWALL		14		X			0	0.00	3	2.00	14	9.00			10	5.00	10	5.00	17	11	27		
1	6	D25	WINGWALL		14		X			0	0.00	3	2.00	11	4.00			8	0.25	8	0.25	14	6	22		
1	6	D27	WINGWALL		14		X			0	0.00	3	2.00	7	11.25			5	7.25	5	7.25	11	1	17		
1	6	D29	WINGWALL		20		X			4	5.00											4	5	7		
28	4	U11	WALL		10		X			0	0.00	1	11.75	1	5.50	0	0.00					5	5	102		
20	6	H11	WALL		20		X			24	10.00											24	10	746		
56	7	V11	WALL		20		X			9	6.00											9	6	1088		
36	7	V22	WINGWALL		20		X	VS	2	6	9.00											6	9	0		
			INC=3.24in				X	VL	2	11	4.00											11	4	666		
13	7	V23	WINGWALL		20		X			11	5.50											11	6	305		
32	7	V24	WINGWALL		20		X	VS	2	10	9.00											10	9	0		
			INC=0.55in				X	VL	2	11	5.25											11	5	726		
1	4	T22	WINGWALL		25		X			6	6.00	17	5.75	2	4.50			4	11.25	16	9.25	26	4	18		
1	4	T23	WINGWALL		25		X			10	8.50	14	9.00	1	9.00			0	8.75	14	8.75	27	3	19		
7	6	D22	WINGWALL		14		X			0	0.00	3	8.50	18	5.25			13	0.50	13	0.50	22	2	233		
11	6	D23	WINGWALL		19		X			16	4.75	6	7.75									23	1	381		
1	6	D24	WINGWALL		14		X			0	0.00	3	8.50	15	10.25			11	2.50	11	2.50	19	7	30		
1	6	D26	WINGWALL		14		X			0	0.00	3	8.50	12	5.50			8	9.75	8	9.75	16	2	25		
1	6	D28	WINGWALL		14		X			0	0.00	3	8.50	9	0.75			6	5.00	6	5.00	12	9	20		
1	6	D30	WINGWALL		14		X			0	0.00	0	5.00	5	8.00			4	0.00	4	0.00	6	1	10		

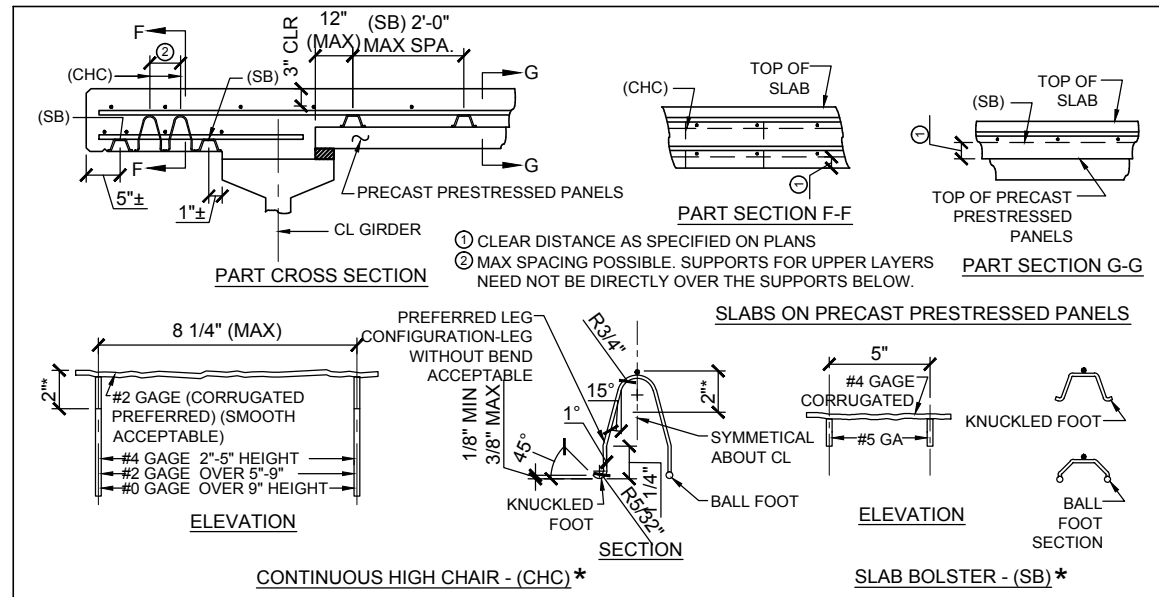
**SUPERSTRUCTURE WEIGHT: 0**  
**SUBSTRUCTURE WEIGHT: 8,673**

**TOTAL WEIGHT: 8,673**





BENDING DIAGRAM

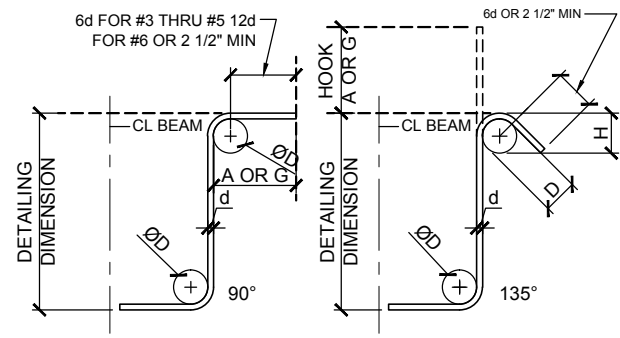


GENERAL NOTES:  
 ALL GAGES GIVEN ARE AMERICAN STEEL AND WIRE GAGES. ALL STEEL TO BE AMERICAN.  
 ALL CONTACT POINTS TO BE SECURELY WELDED. USE A BALL OR KNUCKLED FOOT ON ALL BAR SUPPORTS BEARING ON FORMS. WHERE BAR SUPPORTS ARE USED ON EARTH OR AGGREGATE SUBGRADES SUITABLE PLATES OR CONTINUOUS BARS SHALL BE PROVIDED TO PREVENT DISPLACEMENT OF THE SUPPORT FOOT.  
 ALL DIMENSIONS TO REINFORCING STEEL ARE TO C/L BAR EXCEPT WHERE CLEAR DISTANCE FROM FACE OF CONCRETE IS INDICATED.  
 HEIGHT OF BAR SUPPORTS TO BE THAT REQUIRED TO SUPPORT BARS IN EXACT POSITIONS SHOWN ON PLANS.  
 WHEN BARS OF DIFFERENT SIZES ARE USED IN THE SAME MEMBERS, THE SELECTION OF BAR SUPPORTS SHALL BE BASED ON THE LARGER SIZE.  
 SUPPORTS FOR UPPER LAYERS NEED NOT BE DIRECTLY OVER THE SUPPORTS BELOW. PORTIONS TO BE EPOXY OR PLASTIC \* COATED WHEN USED TO SUPPORT COATED REINFORCEMENT.

BAR SUPPORTS FOR CONCRETE REINFORCEMENT

END HOOK DIMENSIONS				
GRADES 40-50-60 KSI				
BAR SIZE	D (IN.)	90° HOOKS		135° HOOKS
		HOOK A OR G	HOOK A OR G	APPROX. H
#3	1 1/2"	4"	4"	2 1/2"
#4	2"	4 1/2"	4 1/2"	3"
#5	2 1/2"	6"	5 1/2"	3 3/4"
#6	4 1/2"	8"	7"	4 1/2"

NOTE:  
 UNLESS OTHERWISE NOTED DIAMETER "D" IS THE SAME FOR ALL BENDS AND HOOKS ON A BAR.



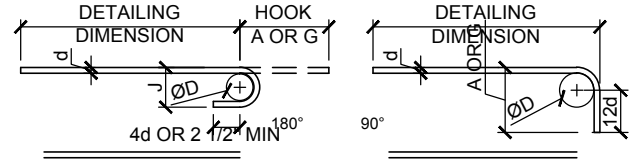
ALL REINFORCING IN END BENTS INCLUDED WITH SUPERSTRUCTURE QUANTITIES.

BENDING DIAGRAMS

NOTES:  
 ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG TO BE BENT WITH SAME PROCEDURE AS FOR 90 DEG. STD. HOOKS

HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE PROCEDURES AS SHOWN ON THIS SHEET

E - EPOXY COATED REINFORCEMENT  
 S - STIRRUP  
 X - BAR IS INCLUDED IN SUBSTRUCTURE QUANTITIES  
 V - BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS



SIZE OF 180° HOOKS GRADE 40 KSI  
 D = 6d FOR #3 THRU #8  
 D = 8d FOR #9, #10 AND #11  
 D = 10d FOR #14 AND #18

SIZE OF 90° HOOKS ALL GRADES AND 180° HOOKS GRADE 60 KSI

BAR SIZE	D (IN.)	END HOOK DIMENSIONS		
		180° HOOKS		90° HOOKS
		ALL GRADES		ALL GRADES
		A OR G	J	A OR G
#3	2 1/4"	5"	3"	6"
#4	3"	6"	4"	8"
#5	3 1/4"	7"	5"	10"
#6	4 1/2"	8"	6"	12"
#7	5 1/4"	10"	7"	14"
#8	6"	11"	8"	16"
#9	9 1/2"	15"	11 1/4"	19"
#10	10 1/4"	17"	12 3/4"	22"

SHOWN ON THIS LINE AND THE FOLLOWING LINE  
 NO. EA. NUMBER OF BARS OF EACH LENGTH  
 NOMINAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE LISTED FOR FABRICATORS USE (NEAREST INCH ACTUAL LENGTHS ARE MEASURED ALONG CENTERLINE BAR TO THE NEAREST INCH PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.

NOTE:  
 THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.