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 Engle Road Low Water Crossing Replacement Project, Greasy Creek

   Landowner Name Dallas County Commission

2) County Dallas MDC region Southwest

3) Project objectives: We are proposing this project because we believe it will fulfill the following objectives. One objective of the project is to remove the existing low water crossing and replace with a newly designed, clear-span low water crossing to facilitate fish passage and allow for improved sediment transport increasing stream stability. A second objective is to use the newly designed crossing as a demonstration project for neighboring county road services working on streams within the Niangua darter range. A third objective is for Missouri Department of Conservation (MDC) personnel to monitor and evaluate changes in Niangua darter populations and their subsequent distribution. These objectives will all address specific areas of concern discussed in the Compensation Planning framework for the Ozark/Osage EDU including aquatic resource problems, water quality problems, and aquatic resource conditions. The portions of the

Niangua River near Benton Branch (Williams Ford) will be used as a reference reach to help establish achievement of the defined objectives.

4) The project submitted for consideration is in the Niangua River 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). Greasy Creek, a major tributary to the Niangua River, contains 12.9 miles of Niangua darter known range. The Niangua River watershed contains a total of 62.6 miles of Niangua darter known range, of which 31 miles are federally designated critical habitat. Removing the existing low water crossing with a clear-span structure will not only facilitate fish passage, but will also improve sediment transport thereby restoring a critical component of the natural stream process and enhancing stream habitat stability within this reach of habitat. An inventory and assessment of low water crossings, including a priority ranking report, has been completed for the entire range of the Niangua darter. The inventory data has been entered into the National Fish Passage Decision Support System and can be found with the on-line GeoFIN application (http://ecos.fws.gov/geofin/). There were five crossings originally identified as fish passage barriers in the Niangua River watershed (three on the Niangua River and two on Greasy Creek). Two of those, both on the Niangua River, have been replaced with passage friendly structures. A third, also on the Niangua River, is currently in the process of being replaced.

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): This project will be completed under a 30-year term cooperative agreement between Dallas County the Missouri Conservation Heritage Foundation and the Missouri Department of Conservation; a standard agreement used to implement projects within the Niangua Darter Habitat Enhancement Low Water Crossing Assistance Program.

7) Baseline information
   a. Describe the ecological characteristics of the proposed project site: The project site is located on Greasy Creek less than 0.3 miles upstream from its confluence with the Niangua River. Greasy Creek is a 4th order stream with a 46,228 acre watershed. This site is also located near the mouth of Greasy Creek and the beginning of the 12.9 miles of Niangua Darter known range within Greasy Creek, severely limiting (if not prohibiting) movement of fish into the Greasy Creek watershed from the Niangua River.
   b. Historic and existing plant communities, hydrology and soils of the proposed project site: Land cover in the Greasy Creek watershed before settlement was a mosaic of prairie, savanna, and forest. The undissected uplands were dominated by patches of prairie and savanna with high grasses and large post oaks. Areas of greater relief and narrow ridgetops were dominated by oak-hickory forest with occasional patches of prairie in the bottomland. Currently much of the land within the watershed has been converted from forest, savanna and prairie to cattle pasture and hay-land. Overall, the Niangua River Watershed lies in the Salem Plateau subdivision of the Ozark Plateau physiographic region. The watershed is underlain with several hundred feet of Ordovician and

Cambrian rock, largely dolomite. The edges of the watershed lie in Jefferson City-Cotter dolomite, while streams cut into progressively older Roubidoux, Gasconade, and Eminence formations. There is considerable subsurface movement of water in the watershed through solution dissolved channels in the fractured and jointed dolomite. As a result, karst features such as caves, sinkholes, losing streams, and springs are abundant. Streams which incise into the middle or lower Gasconade have well sustained base flows even during dry periods, due to ample groundwater supplies. Streams which incise into the Roubidoux formation are frequently losing streams and sinkholes are common. Soils in the watershed are classified as residual, alluvial, colluvial, and loess. Residual soils consist primarily of material weathered from cherty dolomite, dolomite, and sandstone, and occur on the surface of steep slopes. When they develop in uplands from Roubidoux formations, and Jefferson City - Cotter dolomites, an impervious fragipan usually occurs 18 to 24 inches below the surface. Colluvial soils, which are soils deposited on lower valley slopes by erosion from more elevated sites, are limited in abundance. Alluvial soils are those transported by streams and deposited on level or gently sloping areas in flood plains. They range in size from silt to gravel. Loess soils are silty, windblown material which commonly occur on ridgetops.

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:
The project site is located on Greasy Creek less than 0.3 miles upstream from its confluence with the Niangua River. This site is also located near the mouth of Greasy Creek and the beginning of the 12.9 miles of Niangua Darter known range within Greasy Creek, severely limiting (if not prohibiting) movement of fish into the Greasy Creek watershed from the Niangua River. Greasy Creek enters the Niangua River within the 31.0 miles stretch of federally designated critical habitat; 12.5 miles upstream from the downstream boundary. In addition to federally designated critical habitat, the Niangua River contains 47.1 miles of known range. A total of approximately 12.6 miles of known range within Greasy Creek will be opened above this project site. When modeling this site with the GeoFIN web-based application, a total of 188.6 miles (303.2 km) of streams within the Greasy Creek watershed upstream from this barrier are opened.

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 15,198.4

b. Number of riparian credits N/A

c. Stream type (circle): Ephemeral Intermittent (Perennial)

This Project generates 15,198.4 credits of which we believe the Foundation should receive the full amount. The removal of the existing low water crossing is the portion of the project

that provides the primary ecological lift, however, the design, construction and ancillary work associated with stabilization and planting required after the project is complete are all critical to ensure that the replacement structure meets aquatic organism passage requirements and ecologically sound restoration. Without SSTF investment in the full project, the county would be unable to complete such a project . U.S. Fish and Wildlife Service and County funds are being leveraged for the project but will be concentrated on the bridge replacement, not the barrier removal.

9) Mitigation work plan
   a. Specifications of the project (geographic boundaries, construction methods, timing, sequence): The current low water crossing is a typical vented ford with four concrete box culverts. Aquatic organism passage barriers exist (particularly to benthic fishes) at low flows due to the culverts being perched above the stream bed, as well as a biological barrier due to the concrete floor and walls. At moderate to high flows, the structure creates velocity, exhaustion, and jump barriers. The boundaries of the project will be confined to the foot-print of the existing low water crossing. The project will entail demolition of the existing low water crossing by chipping/breaking up the structure, then loading and hauling the refuge off site. Once removed, the new low water bridge (clear-span design) will be constructed on the same foot-print and tie into the existing road approaches. Design will be similar to recently completed single clear-span crossings used in numerous other low water crossing replacement projects throughout Niangua Darter range as part of this recovery effort to address AOP concerns.
   b. Methods for establishing desired plant community (species composition and type, control of undesirable species, size of plants used, control of wildlife damage): This project does not include establishing any plant communities. Any areas disturbed during construction will be planted to pre-existing cover.
   c. Grading plan and elevations of constructed features (describe or attach engineering design plans): The elevation of the new low water bridge will not be significantly higher than the existing low water crossing. Since the existing road approaches will be used, the grade of the new structure will closely match that of the existing structure. However, the new structure will be a clear-span type of structure without a floor and will utilize the natural stream bed to facilitate AOP and natural sediment transport.
   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: No alterations to the existing stream channel and/or banks are planned for this project. A low water bridge, clear-span type of structure will be constructed in place of the existing vented ford low water crossing. Some rip-rap will be placed around the bridge abutments to protect from scour. The new low water bridge will have a clear-span approximately 45 feet long with an elevation similar to the existing low water crossing.

10) Maintenance plan:
   a. Description and schedule of maintenance following initial construction: As outlined in the cooperative agreement, the county agrees to: 1) remove gravel and flood debris from the deck of the crossing as needed; 2) remove snags and obstructions from the stream channel, in the immediate vicinity of the crossing, if flow under the crossing is obstructed; 3) examine the crossing immediately following high flow events for scour or undercutting that may impact the structural integrity of the crossing; and 4) provide maintenance as needed to the crossing and roadway approaches.

b. Mowing frequency and timing: Not applicable.
c. Herbicide applications (chemical used, method, timing, frequency): Not applicable.
d. Irrigation plan (include source of water): Not applicable.
e. Passive water control and instream structure description and required maintenance (type and frequency): See item (a) for maintenance information.

11) Performance standards

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

Riparian: Not applicable.

Stream Channel: The three main standards that will be met by this project are: 1) the existing crossing that has been identified as a barrier to AOP and sediment transport will be removed; 2) the newly designed clear-span low water bridge will not have a floor and use the natural stream bed; and 3) the length of the clear-span low water bridge will be greater than 75% of the bank-full channel width.

Reference stream(s) used (if any): These performance standards have been documented in being successful in facilitating AOP and sediment transport in the connecting Niangua River and nearby Little Niangua River consistent with this recovery effort throughout Niangua Darter range.

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): Removing the existing low water crossing with a clear-span structure will not only facilitate fish passage, but will also improve sediment transport thereby restoring a critical component of the natural stream process and enhancing stream habitat stability within this reach of habitat. The portions of the Niangua River near Benton Branch (Williams Ford) will be used as a reference reach to help establish achievement of defined objectives.

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: Numerous low water crossings on streams within the range of the Niangua Darter *Etheostoma nianguae* are barriers to the passage of aquatic organisms, materials, and degrade habitat for small, benthic fishes. Ongoing cooperative efforts between the Missouri Department of Conservation and several partners (US Fish & Wildlife Service, Missouri Conservation Heritage Foundation, Missouri Department of Transportation, Federal Emergency Management Agency, county governments) have allowed for prioritization and subsequent replacement of many poorly-designed crossings with clear-span bridges. Goals of the projects include improving fish passage and restoring habitat while at the same time reducing the need for maintenance and increasing the availability and safety of the crossing for use by road traffic. We provide monitoring to evaluate the response of Niangua Darter populations and habitat associated with low water crossing improvement projects.

13) Long-term management plan:

a. Describe how the project site will be managed after performance standards have been met: Through the 30-year term cooperative agreement the county has agreed to provide standard maintenance as outlined above. Additionally, through the cooperative agreement the county has agreed to incorporate fish passage and sediment transport considerations into subsequent design and construction whenever the crossing must be repaired or replaced.

b. Annual cost estimate for management: Responsibility of Dallas County

c. Funding mechanisms will be used to finance long term management (including responsible party: Dallas County road and bridge department will manage and perform maintenance as needed. Funding will be provided through the counties annual budget for road/bridge maintenance.

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): Long term management responsibilities are transferred to Dallas County Commission. A long term management plan and stewardship commitment are included in the above referenced cooperative agreement.

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 there is an inability to construct the project in accordance with approved plans, no further action will be taken and the existing structure will be left in place. If the structure fails due to an act of God, the County has agreed to replace the structure with a new structure that facilitates fish passage and sediment transport. Design changes will only occur after consultation and approval by MDC, USFWS, USACOE, and County.

b. Party (ies) responsible for implementing adaptive management: If failure in the project is due to an act of God, the agencies will assist with adaptive management implementation. If project failure is due to County negligence, the County will be responsible for implementing adaptive management plans and remedial measures with oversight from agencies.

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 $ 225,000. SSTF Resources are requested in the amount of $ 100,000.

17) Partner funds in the amount of $ 125,000 are being contributed by: (if applicable): US Fish and Wildlife Service ($100,000); Dallas County Commission ($25,000);

18) Total stream length of the project NA Total Riparian corridor acreage NA

19) Total cost per credit (including all costs) estimated at $ 14.80 .

20) If the project is leveraged with contributions from others, SSTF Resources are requested to fund which practices/products/costs activities? Demolition, hauling and disposal of existing low water crossing; Project engineering/design; partial construction costs. Post construction stabilization and planting as needed.

21) Schedule for project completion and/or installation: Planning, engineering, environmental review and permit acquisition Winter 2015 and Spring 2016. Demolition, removal of existing crossing and construction of new crossing summer 2016.

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.

MDC Region: Southwest Region Date: June 26, 2015

Name of project leader, and Division: Craig Fuller, Fisheries

Lead Division Administrator Approval: Actg Date: 7/7/15

MDC Director Approval: Date: July 28 2015

TAD

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

MCHF Approval: **Date:** 8-18-15

1008 Eagle Road
Swansea etc.

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	

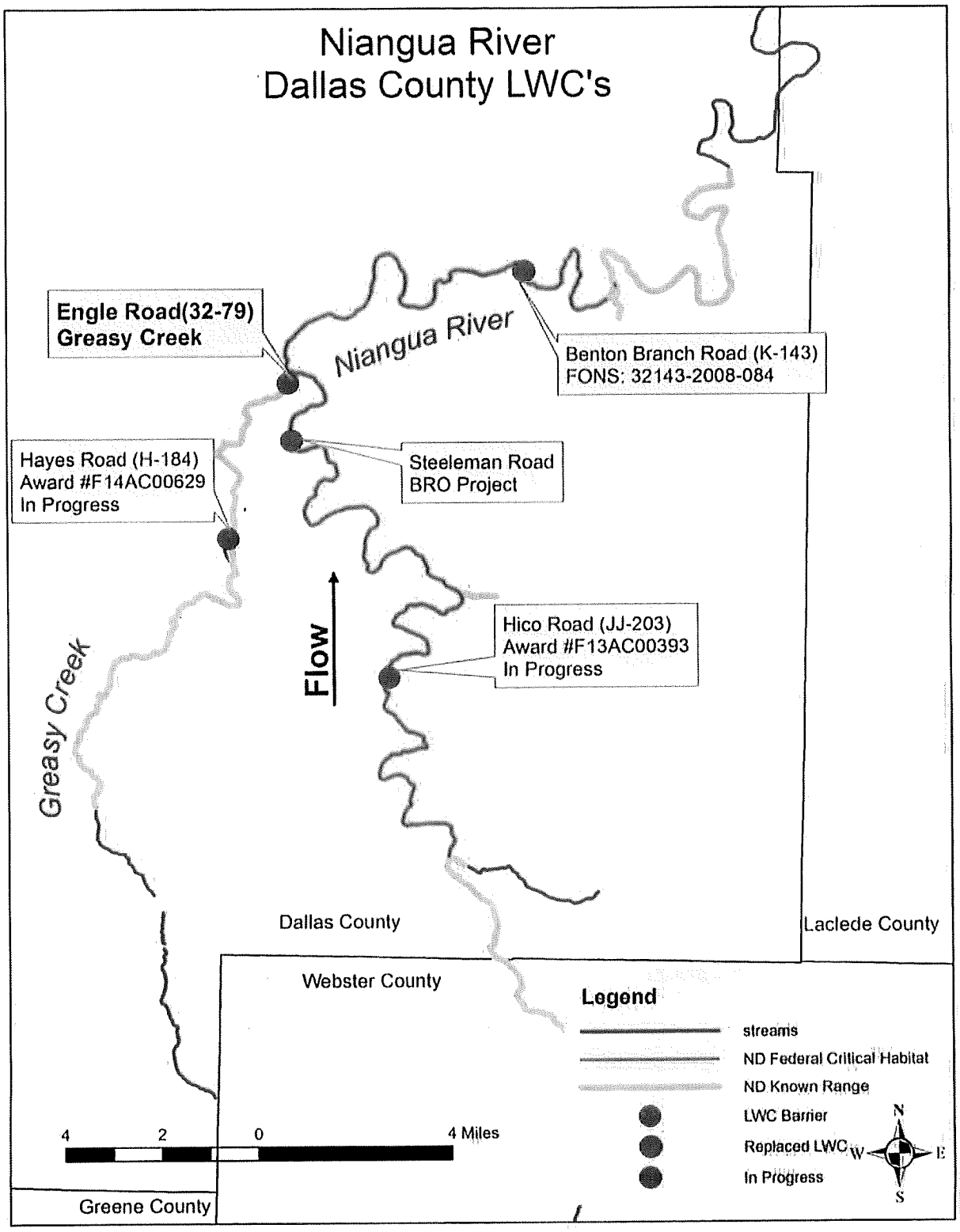
Factors	Net Benefit 1	Net Benefit 2	Net Benefit 3	Net Benefit 4	Net Benefit 5	Net Benefit 6
Stream Type	0.4					
Priority Waters	0.4					
Net Benefit	3.5					
Site Protection	0					
Credit Schedule	0.3					
Sum Factors (M)=	4.6					
Stream Length Benefited (do not count each bank separately or count same channel reach twice) (LF)=	3304					
Credits (C) = M X LF	15,198.4					
Total Instream Credits Generated C X LK Factor* =						

Total Instream Credits Generated from all Columns = 15,198.4

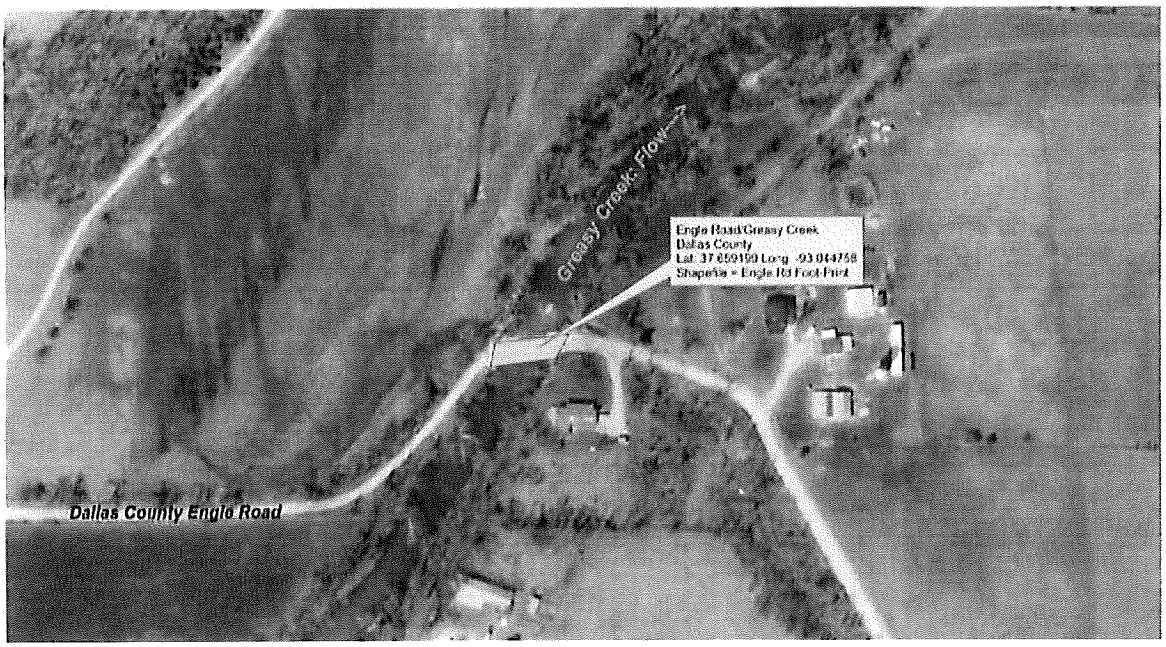
* Location and Kind (LK) Factor only applies to permittee-responsible mitigation projects (see page 18 of document).

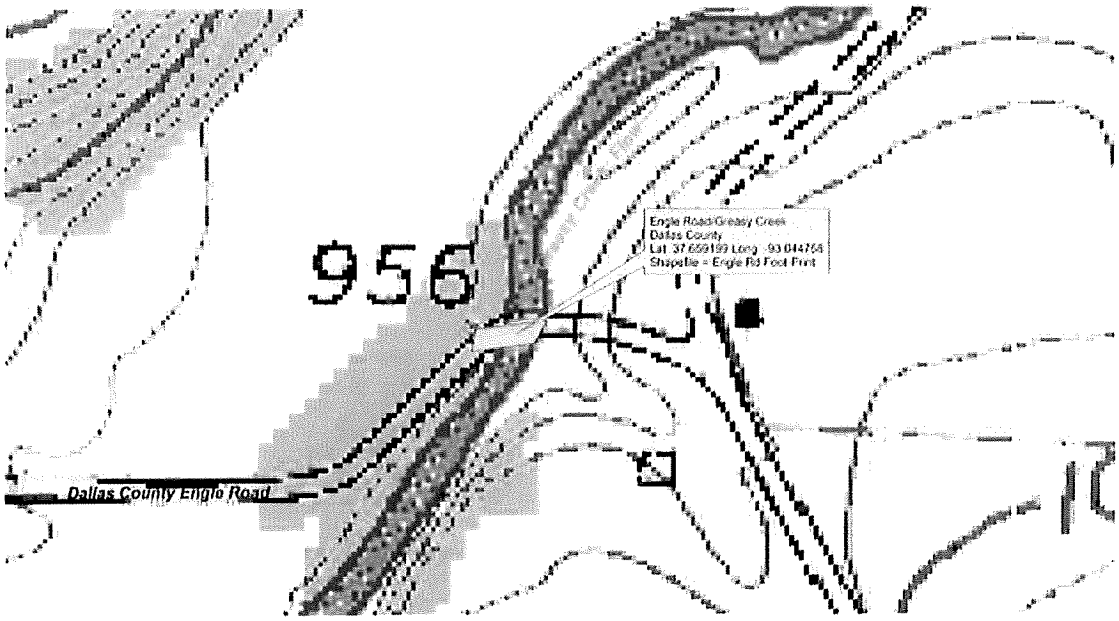
Attachment- Map of the State, Highlighting Location of the Watershed

Attachment- Watershed Map with location of project site in relation to other project sites, Niangua Darter federally designated critical habitat and Niangua Darter known range.

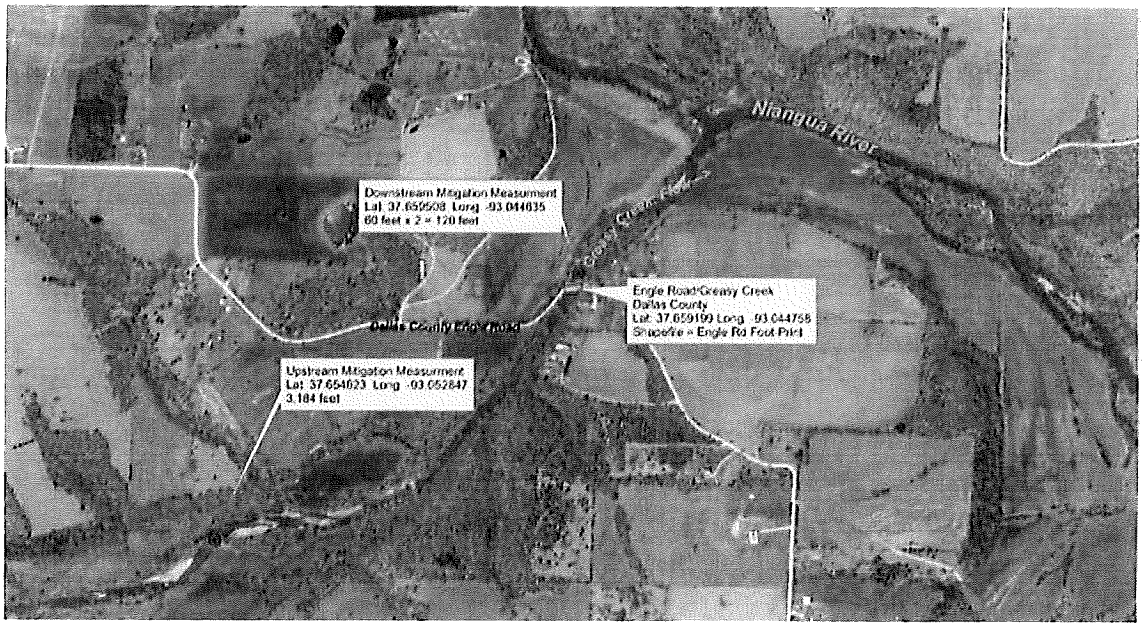


Attachment- Aerial photo and topographic map of Dallas County Engle Road/Greasy Creek project site with GPS coordinates and associated shapefile name.





Attachment- Site map and Missouri Stream Mitigation Worksheet



Attachment- Pictures of the Project Site

Crossing ID: 3899

Rank: 31

Greasy Creek/CR 32-79

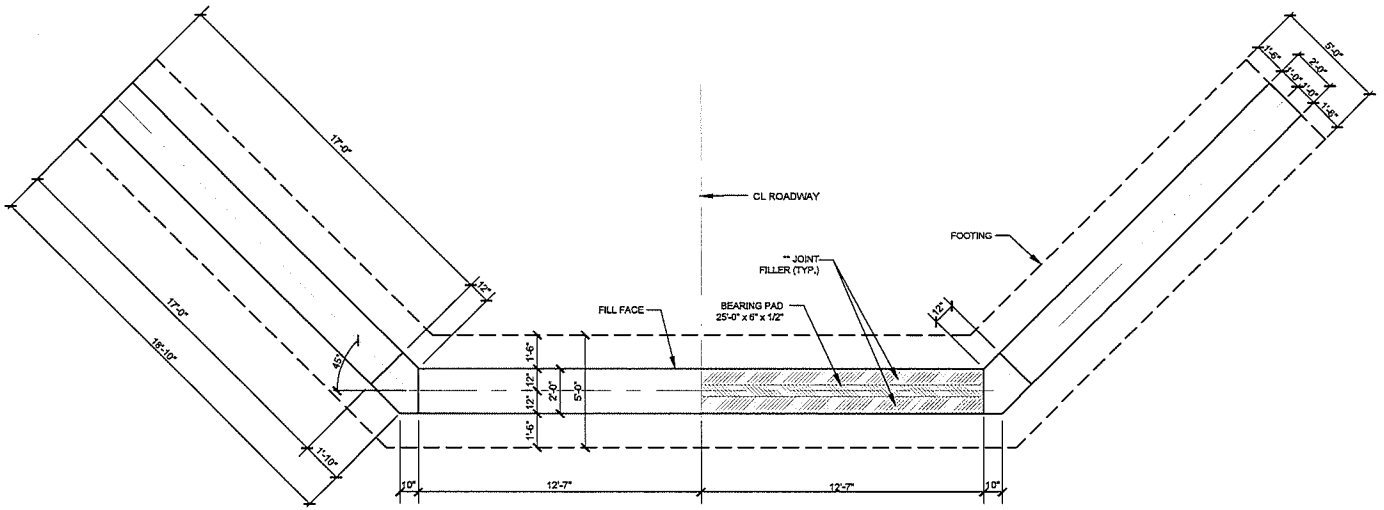
(Engle Road)

Looking Upstream

Looking Downstream

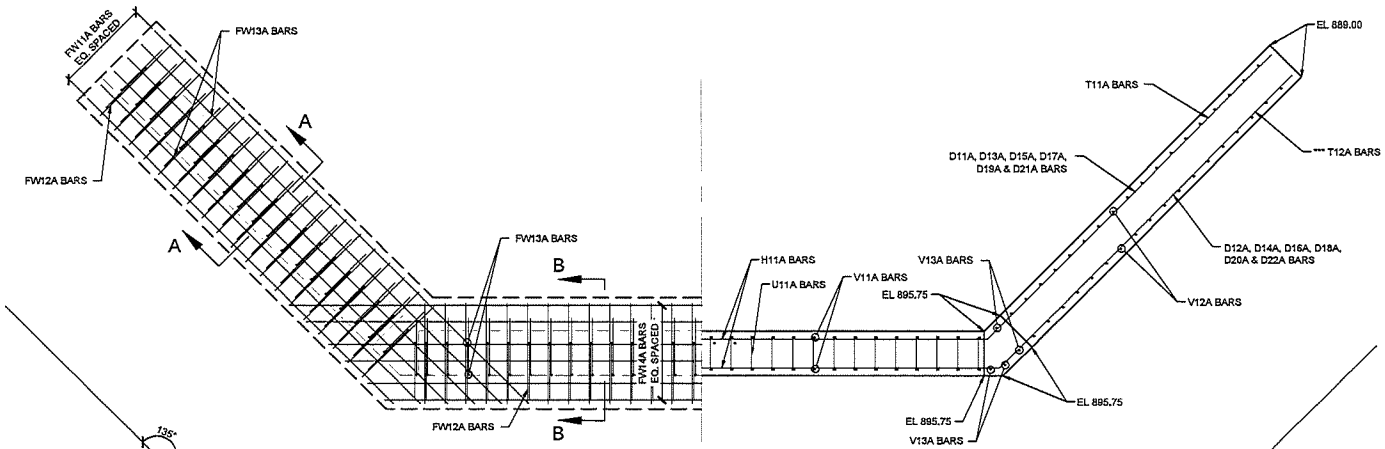
Attachment- Example of the proposed clear-span (45-foot) low water bridge design to be used on Dallas County Engle Road over Greasy Creek.

Photo of the completed 45-foot clear-span low water bridge located on Dallas County School Road over the Little Niangua River as part of the Niangua Darter (AOP) recovery efforts.



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.



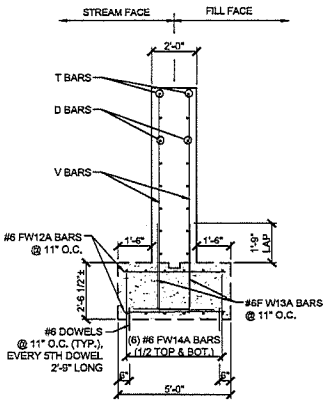
PLAN VIEW OF REBAR

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

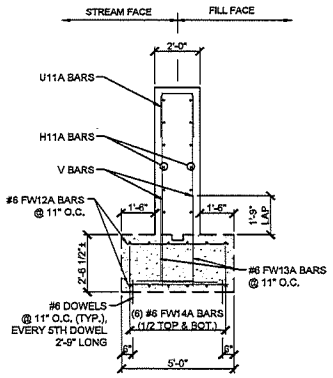
T12A BENDING DIAGRAM

T12A BENDING DIAGRAM

NOTE:
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.



SECTION A-A
WING WALL REINFORCEMENT



SECTION B-B
ABUTMENT REINFORCEMENT

DALLAS COUNTY, MISSOURI

END BENT #1 DETAILS

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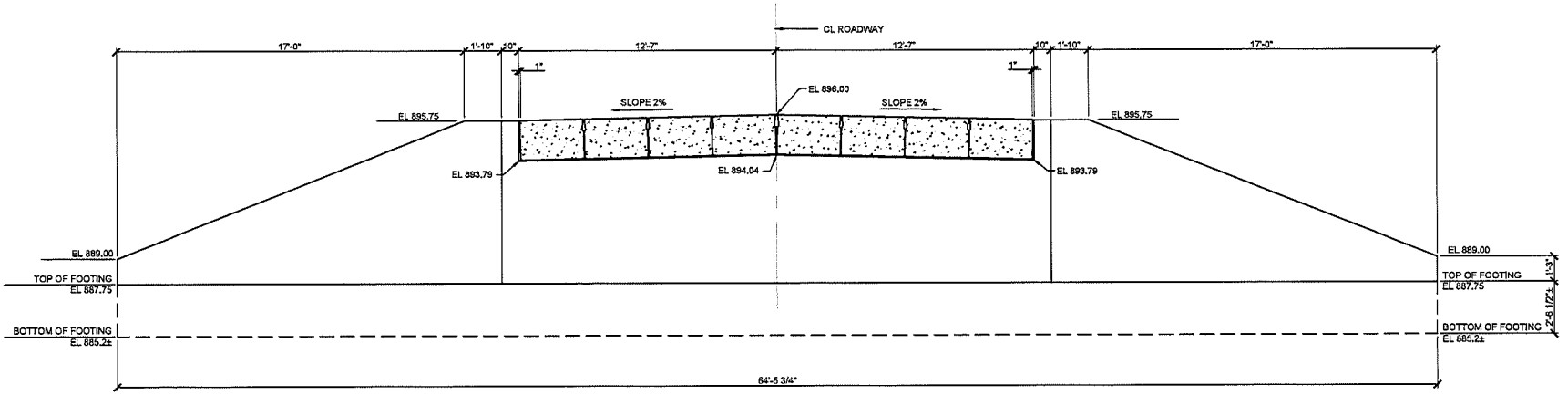
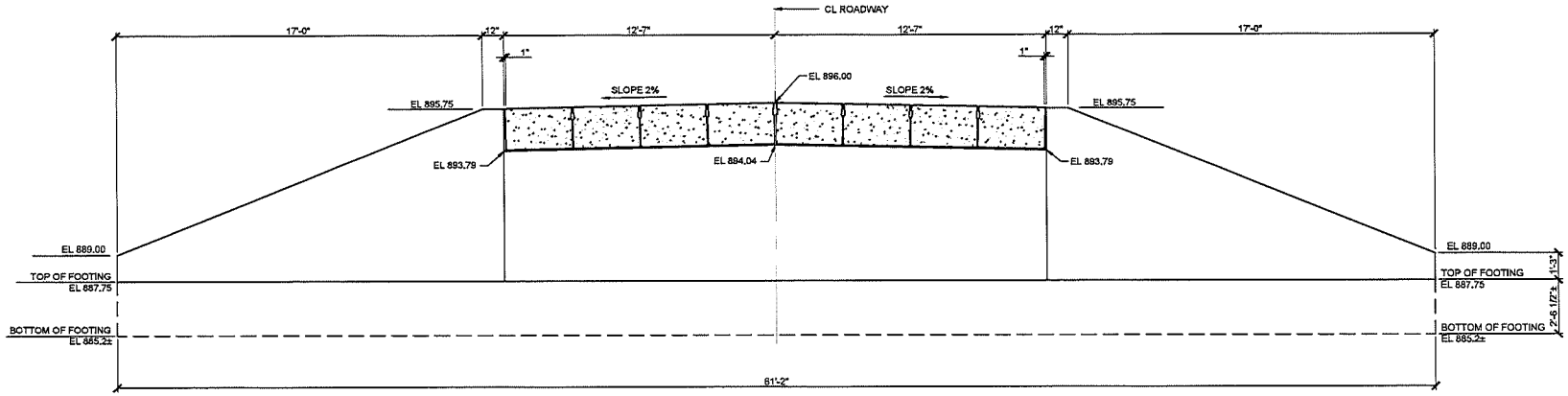
01.22.2013

S1



ELEVATION OF STREAM FACE GEOMETRY

(WINGWALLS SHOWN STRAIGHT FOR CLARITY)



ELEVATION OF FILL FACE GEOMETRY

(WINGWALLS SHOWN STRAIGHT FOR CLARITY)

NOTE:
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DALLAS COUNTY, MISSOURI

END BENT #1 DETAILS

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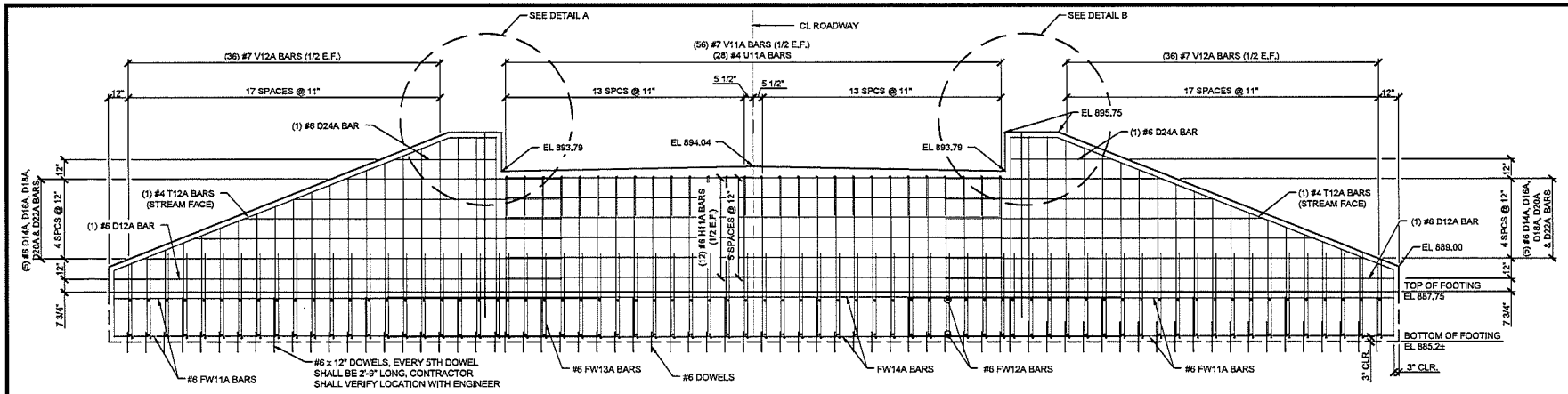
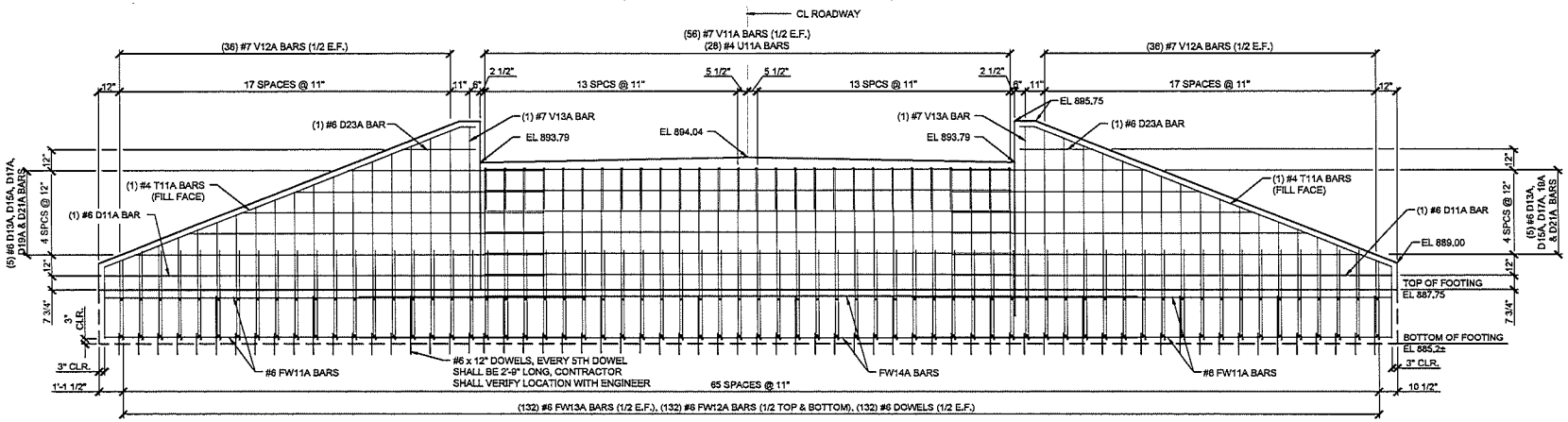


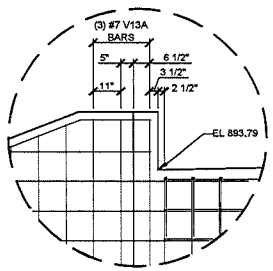
STREAM FACE ELEVATION

(WINGWALLS SHOWN STRAIGHT FOR CLARITY)

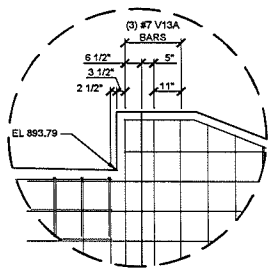


FILL FACE ELEVATION

(WINGWALLS SHOWN STRAIGHT FOR CLARITY)



DETAIL "A"



DETAIL "B"

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DALLAS COUNTY, MISSOURI

END BENT #1 DETAILS

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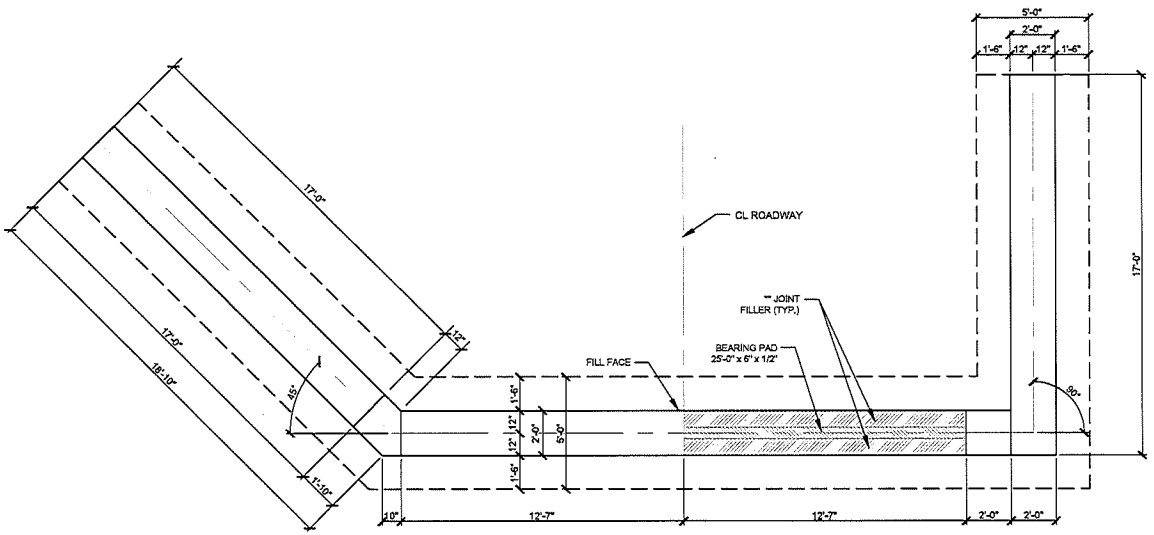

PLAN VIEW OF GEOMETRY

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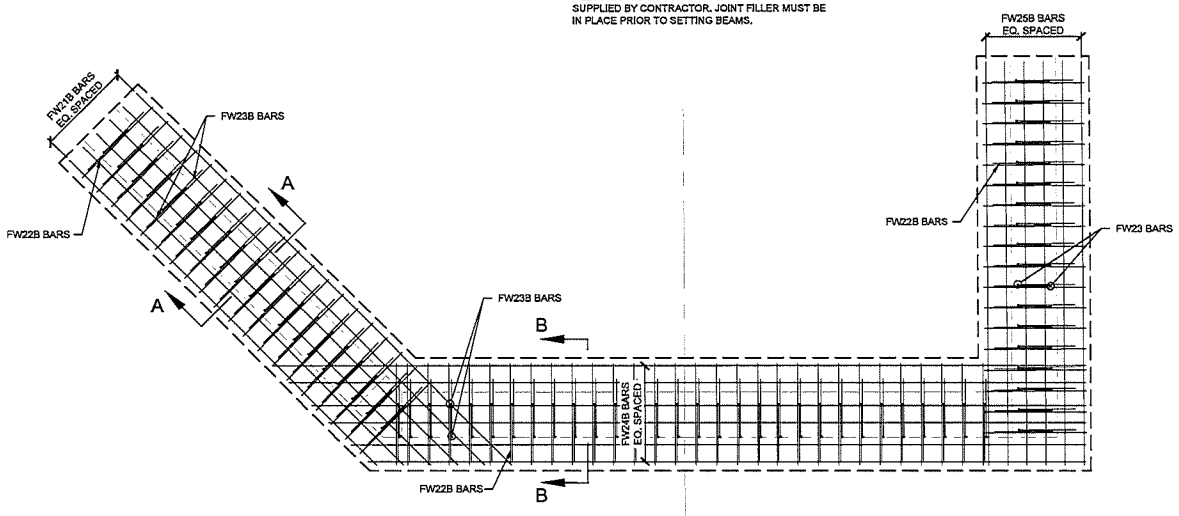
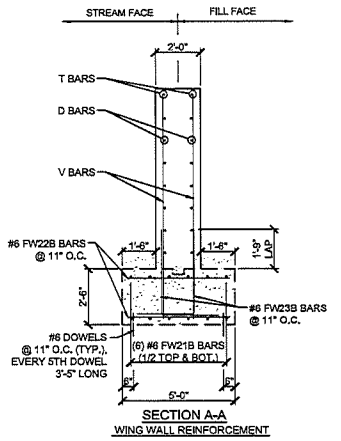
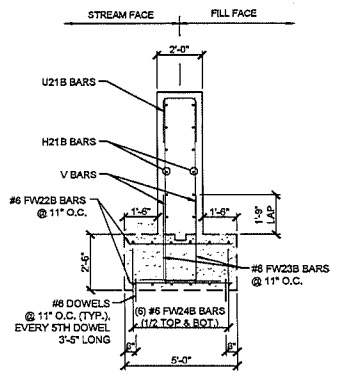


PLAN VIEW OF FOOTING REBAR



SECTION A-A
WING WALL REINFORCEMENT



SECTION B-B
ABUTMENT REINFORCEMENT

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DALLAS COUNTY, MISSOURI
END BENT #2 DETAILS

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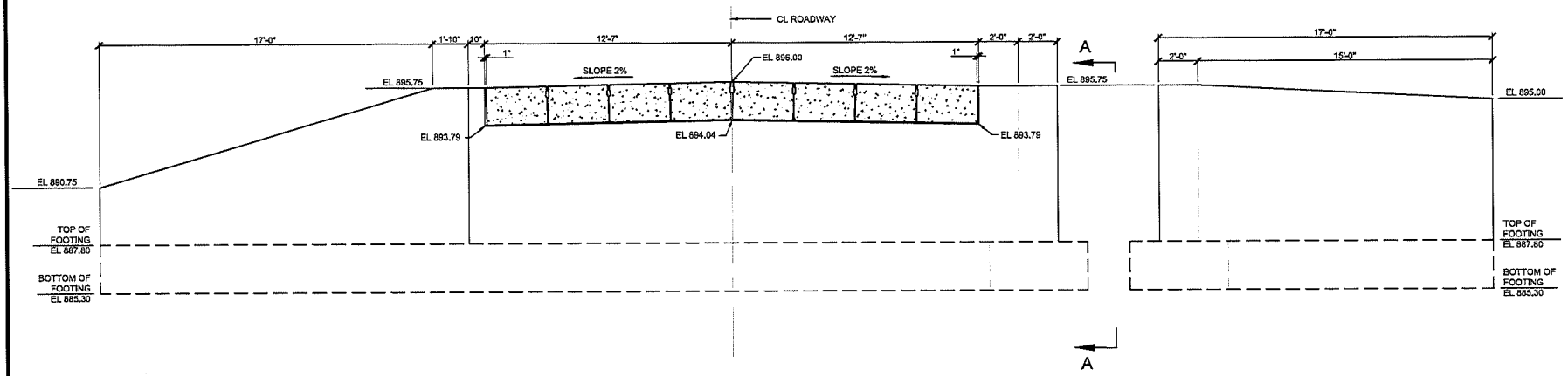
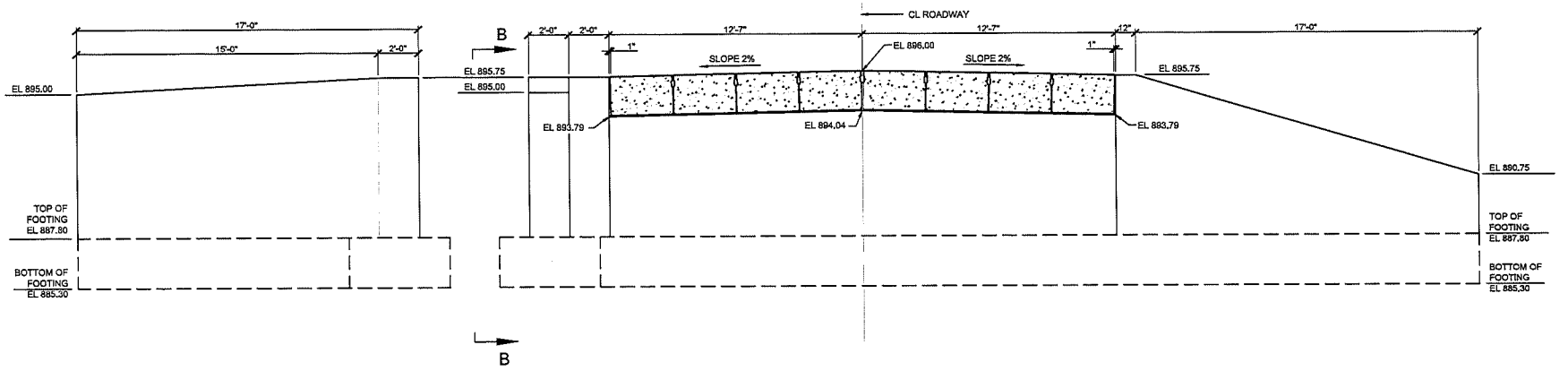


ELEVATION OF STREAM FACE GEOMETRY
(ONE WINGWALL SHOWN STRAIGHT FOR CLARITY)

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)

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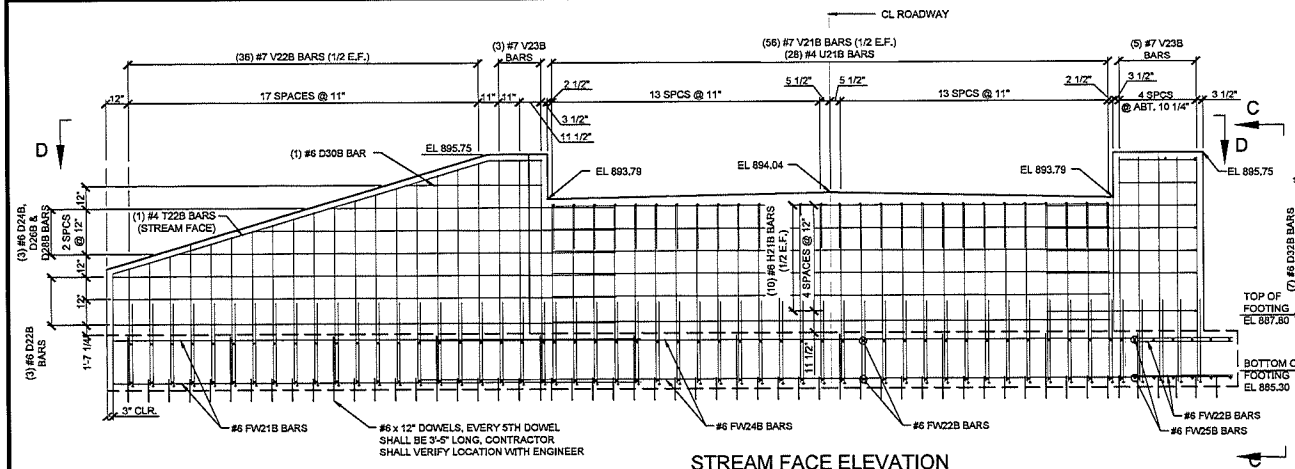
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DALLAS COUNTY, MISSOURI
END BENT #2 DETAILS

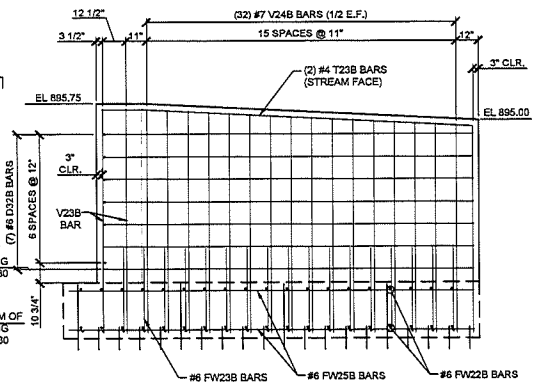
S1-97_DE
NTS
01.22.2013

S5



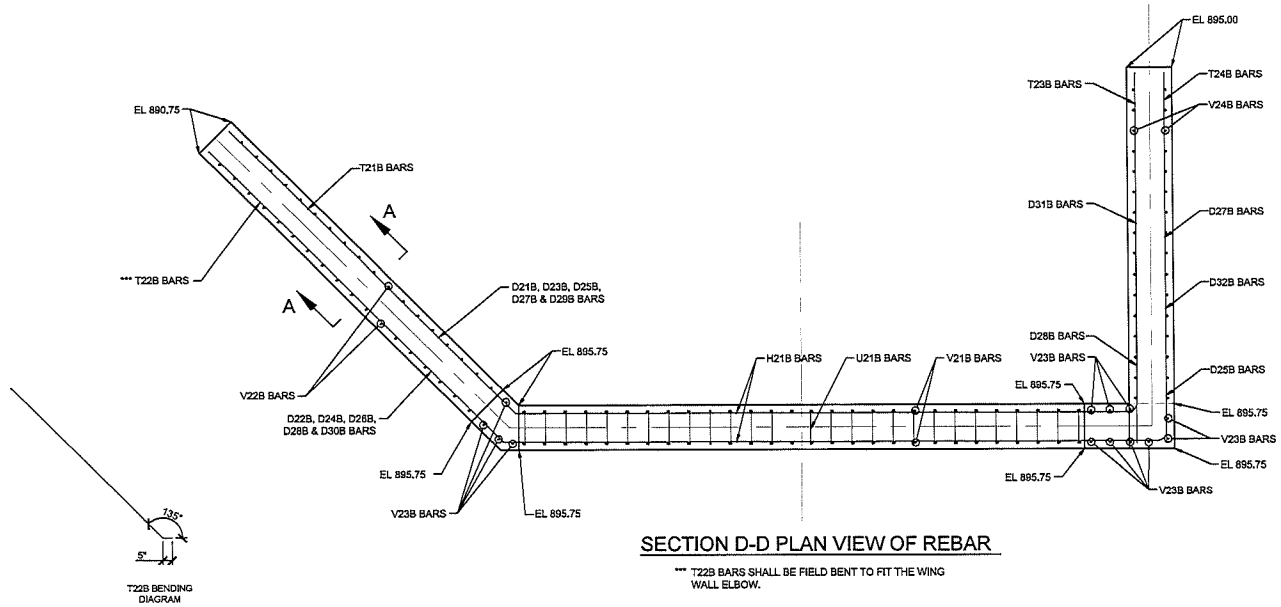
STREAM FACE ELEVATION

(ONE WINGWALL SHOWN STRAIGHT FOR CLARITY)



ELEVATION C-C

ELEVATION OF WINGWALL STREAM FACE



T22B BENDING DIAGRAM

SECTION D-D PLAN VIEW OF REBAR

*** T22B BARS SHALL BE FIELD BENT TO FIT THE WING WALL ELBOW.

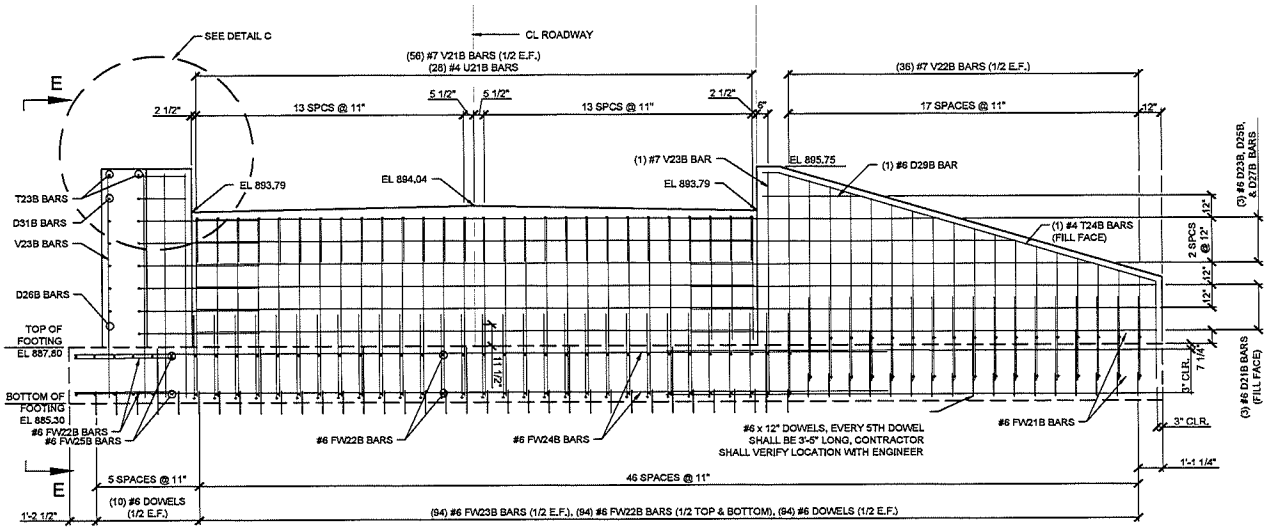
NOTE:
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DALLAS COUNTY, MISSOURI

END BENT #2 DETAILS

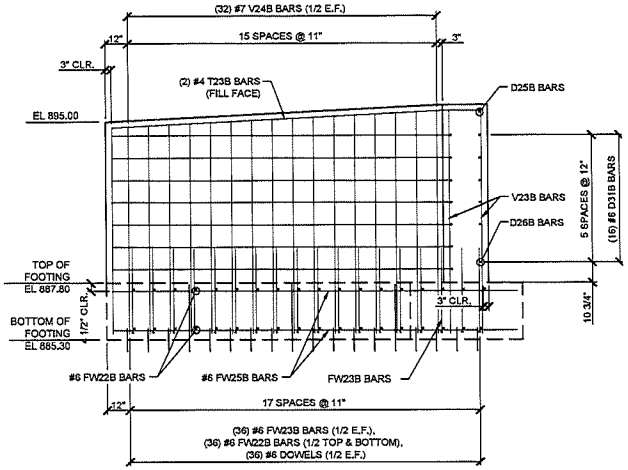
51-57_DE
NTS
01.22.2013

S6

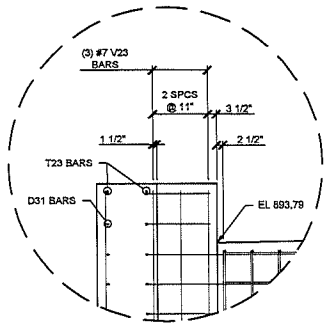


FILL FACE ELEVATION

(ONE WINGWALL SHOWN STRAIGHT FOR CLARITY)



ELEVATION E-E
ELEVATION OF WINGWALL FILL FACE



DETAIL "C"

NOTE:
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

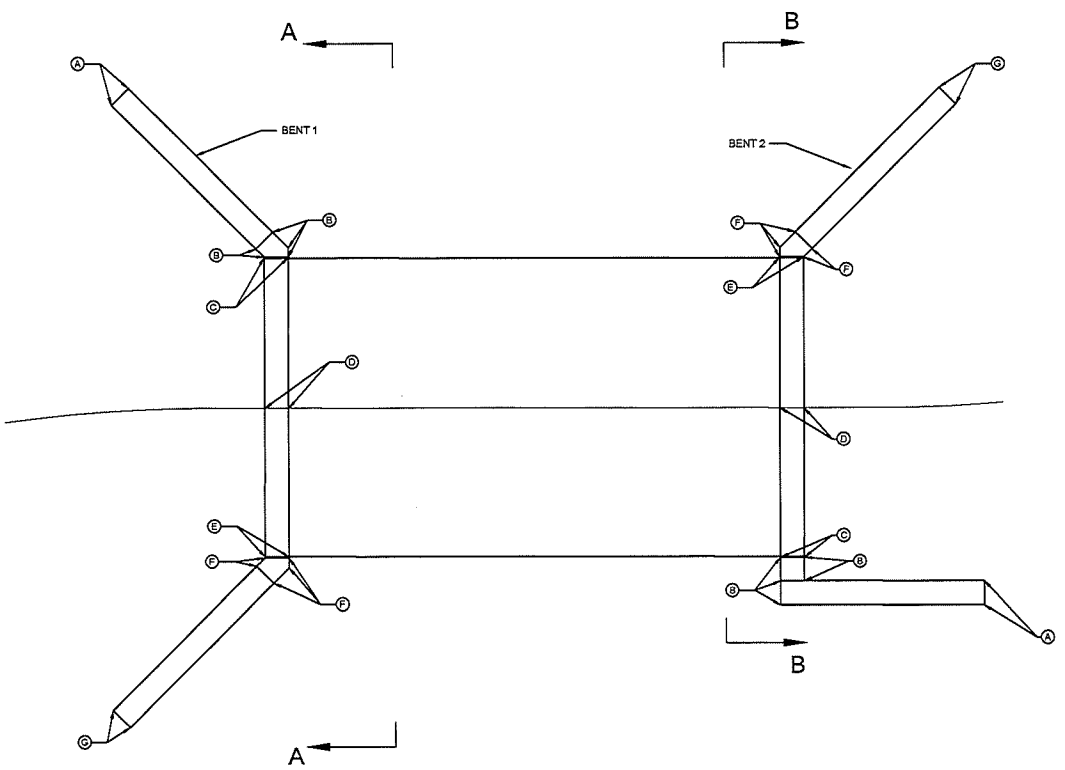
DALLAS COUNTY, MISSOURI

END BENT #2 DETAILS

31-07_DE
NTS
01.22.2013

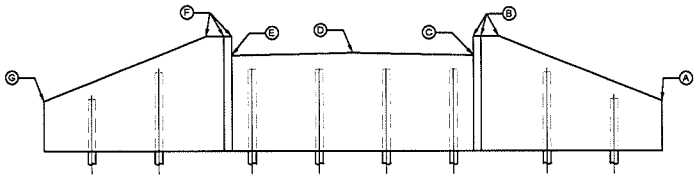
S7

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

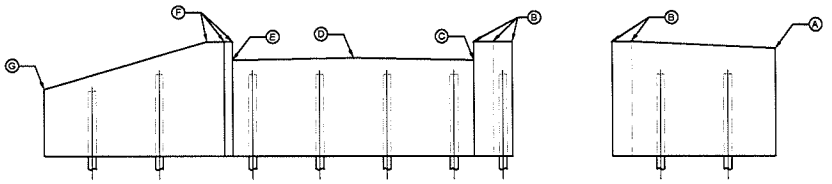


BENT 2 ELEVATIONS	
LOCATION	ELEVATION
A	895.00
B	895.75
C	893.79
D	894.04
E	893.79
F	895.75
G	890.75

PLAN - END BENT AND WINGWALL ELEVATIONS



ELEVATION "A-A"



ELEVATION "B-B"

NOTE:
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DALLAS COUNTY, MISSOURI

ABUTMENT ELEVATIONS

SB_DC
NTS
01.22.2013

S8

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.

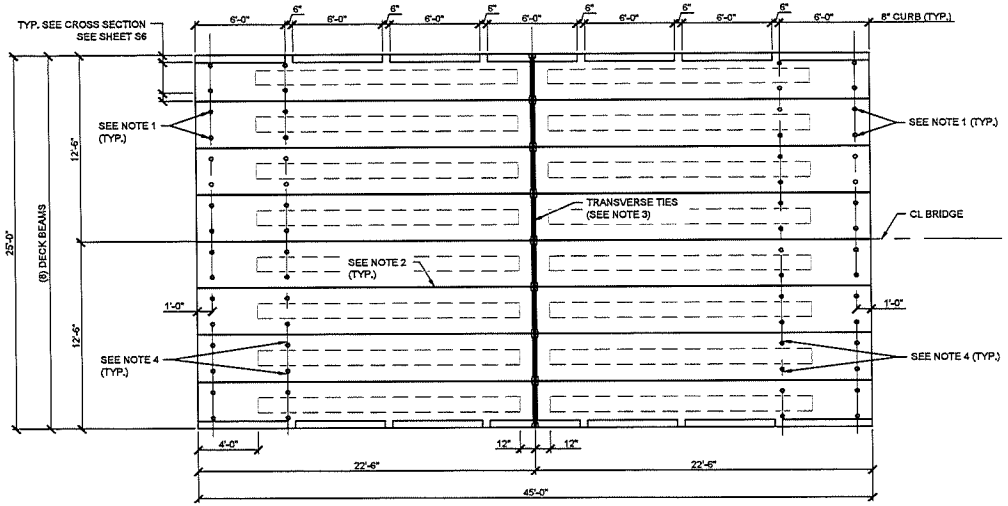
DESIGN LOADING: HS20-44
SEISMIC PERFORMANCE CATEGORY 'A'
EARTH — 120 PSF
EQUIVALENT FLUID PRESSURE — 45 POUNDS/CU. FT.
35 POUND/SQUARE FOOT FUTURE WEAR SURFACE SUPERSTRUCTURE:
SIMPLY SUPPORTED NON-COMPOSITE FOR DEAD AND LIVE LOADS.

DESIGN UNIT STRESSES

CONCRETE	f'c = 6,000 psi
REINFORCING STEEL STRUCTURAL	fy = 60,000 psi
CARBON STEEL	fy = 50,000 psi

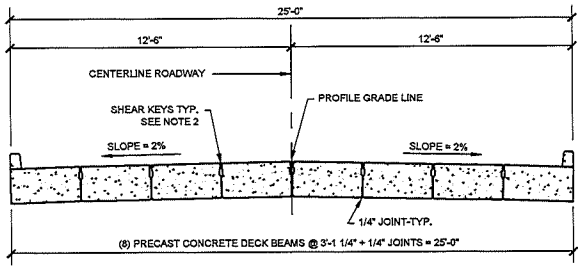
NOTES:

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.



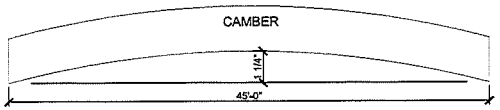
SLAB BEAM LAYOUT PLAN

NOTE:
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.



TYPICAL CROSS SECTION OF ROADWAY

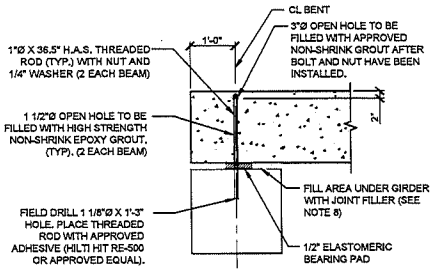
(NEAR CL OF STRUCTURE)



SLAB SHALL BE CAMBERED FOR DEAD LOAD DEFLECTIONS.

TYPICAL SLAB CAMBER

NOT TO SCALE



SECTION AT ABUTMENTS

(ALONG CL BEAMS)

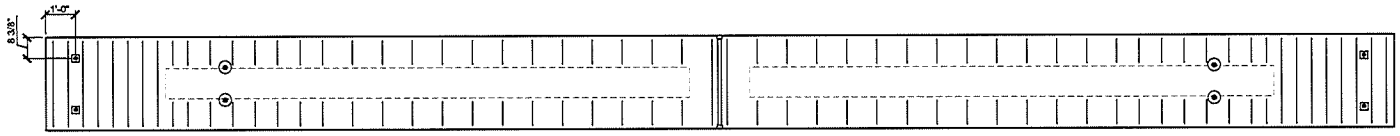
DALLAS COUNTY, MISSOURI

SLAB BEAM DETAILS

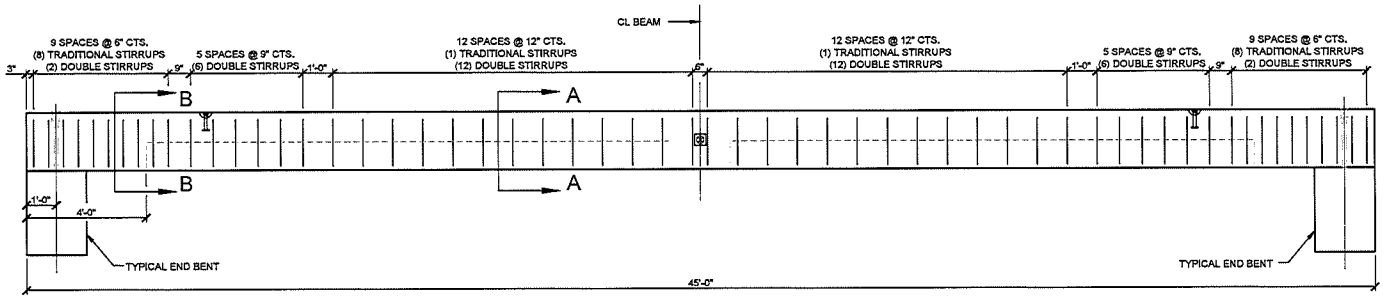
89-911_DE
NTS
01.22.2013

S9

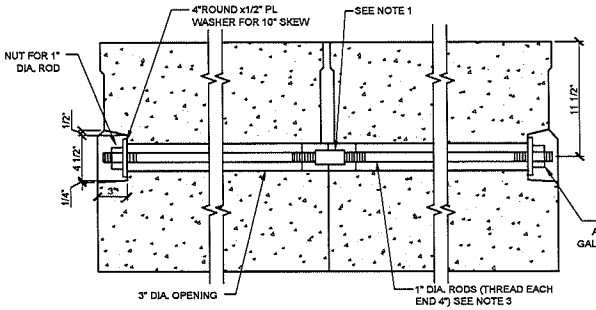
NOTE:
1. USE DAYTON/RICHMOND D-4 HEX COUPLING NUT FOR CONNECTING 1"Ø THREADED RODS. ALTERNATE APPROVED TRANSVERSE TIE RODS OF INCREASED SEGMENTAL LENGTH ARE ACCEPTABLE, INCLUDING 1 CONTINUOUS TIE ROD THROUGH ALL DECK BEAMS.



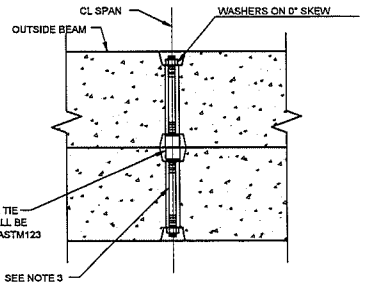
PLAN OF STIRRUP SPACING DETAIL



ELEVATION OF STIRRUP SPACING DETAIL



SECTION ALONG TRANSVERSE TIE ASSEMBLY



PARTIAL PLAN
TRANSVERSE TIE ASSEMBLY
('D'=0")

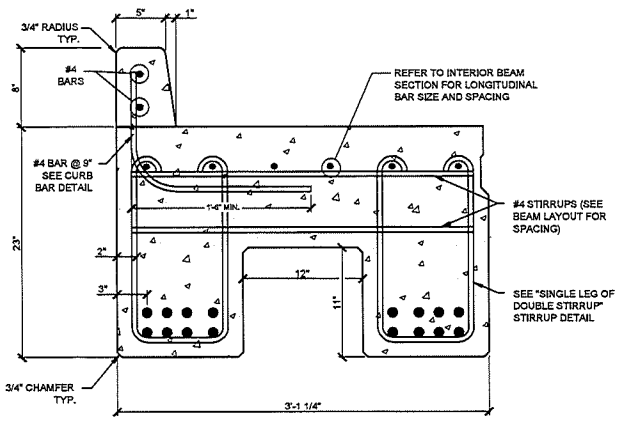
NOTE:
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DALLAS COUNTY, MISSOURI

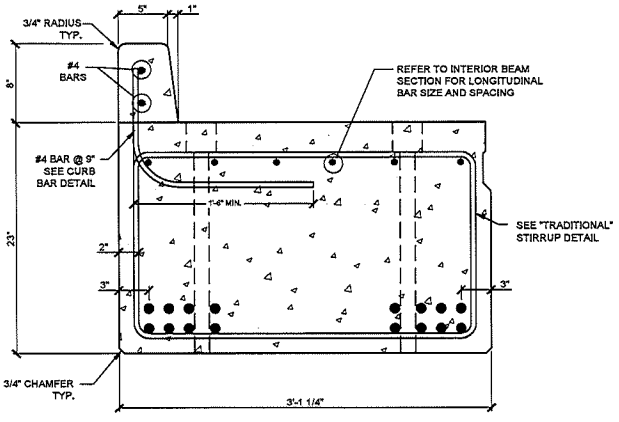
SLAB BEAM DETAILS

S9-511_DE
NTS
01.22.2013

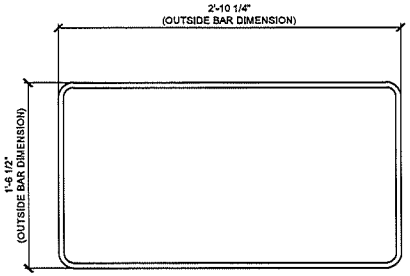
S10



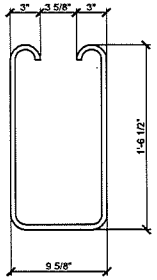
TYPICAL CROSS SECTION A-A
(EXTERIOR BEAM)
NOT TO SCALE



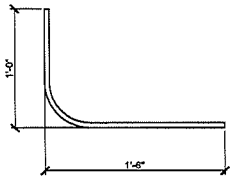
TYPICAL CROSS SECTION B-B
(EXTERIOR BEAM)
NOT TO SCALE



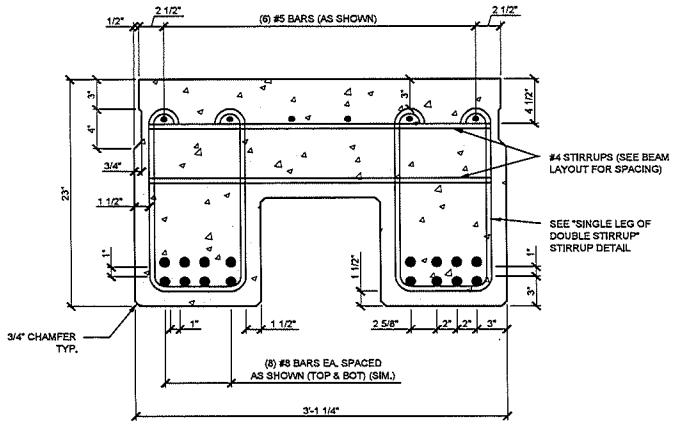
"TRADITIONAL" STIRRUP DETAIL



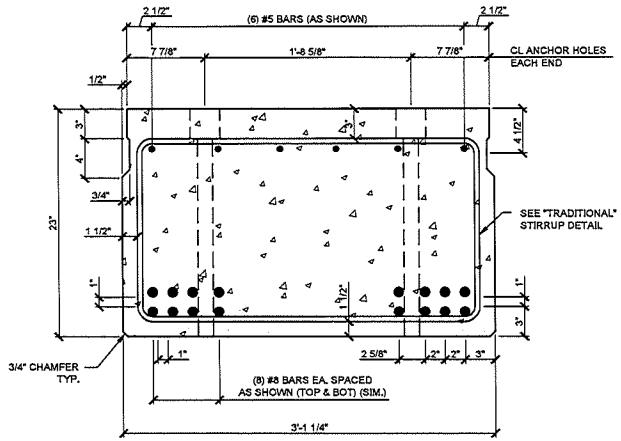
"DOUBLE" STIRRUP DETAIL
(SINGLE LEG OF DOUBLE STIRRUP)



CURB STIRRUP DETAIL



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



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

NOTE:
THIS DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DALLAS COUNTY, MISSOURI
SLAB BEAM DETAILS

SB-811_DE
NTS
01.22.2013

S11

COMPLETE BILL OF REINFORCING STEEL

	NO. REQ'D.	MARK NO. SIZE	MARK NO. MARK	LOCATION	EPOXY (E)	SHAPE NO.	STIRRUP (S)	SUBSTR. (X)	VARIES (V)	NO. EACH	B FT.	B IN.	C FT.	C IN.	D FT.	D IN.	E FT.	E IN.	F FT.	F IN.	H FT.	H IN.	K FT.	K IN.	LENGTH FT.	LENGTH IN.	WEIGHT LBS.
ABUTMENT #1	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
ABUTMENT #2	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

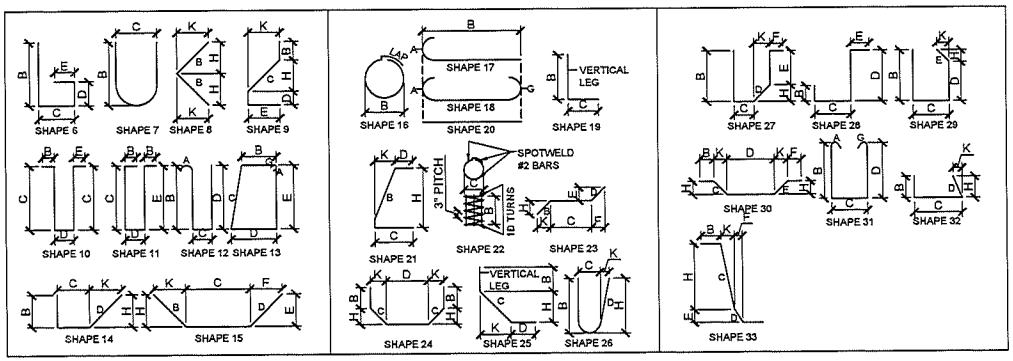
TOTAL WEIGHT: 8,673

DALLAS COUNTY, MISSOURI

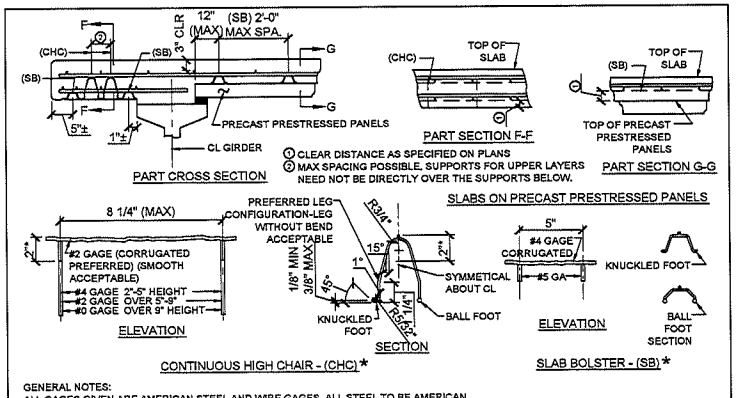
BILL OF REINFORCING

S13-S13_DE
NTS
01.22.2013

S12



BENDING DIAGRAM

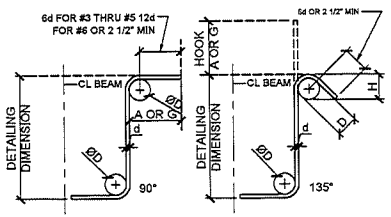


GENERAL NOTES:
ALL GAGES GIVEN ARE AMERICAN STEEL AND WIRE GAGES. ALL STEEL TO BE AMERICAN.
ALL CONTACT POINTS TO BE SECURELY WELDED. USE A BALL OR KNUCKLED FOOT ON ALL BAR SUPPORTS BEARING ON FORMS. WHERE BAR SUPPORTS ARE USED ON EARTH OR AGGREGATE SUBGRADES SUITABLE PLATES OR CONTINUOUS BARS SHALL 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 HOOK A OR G	135° HOOKS HOOK A OR G	135° HOOKS 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.



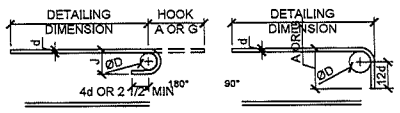
ALL REINFORCING IN END BENTS INCLUDED WITH SUPERSTRUCTURE QUANTITIES.

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

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

D = 6d FOR #3 THRU #6
D = 8d FOR #9, #10 AND #11
D = 10d FOR #14 AND #18

END HOOK DIMENSIONS				
		180° HOOKS ALL GRADES		90° HOOKS ALL GRADES
BAR SIZE	D (IN.)	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.

DALLAS COUNTY, MISSOURI
BILL OF REINFORCING

813-813_DE
NTS
01.22.2013

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