

December 15, 2007

Mr. Jay Bestgen
 1320 Creek Trail Drive
 Jefferson City, Missouri 65109

Re: J5S0862 Route BB – Morgan County
 Practical Design 2008 Awards for Excellence

Dear Judges:

Crawford, Murphy & Tilly, Inc (CMT), along with MoDOT District 5 and MoDOT Bridge, are proud to present the Route BB project for consideration for the 2008 Practical Design Awards for Excellence. MoDOT and CMT initiated design of this project in 2005 and final plans were submitted in late 2006. This project is an excellent example of collaboration between MoDOT and its consultant to provide innovation and non-standard design to produce a functional project. Furthermore, the proposed reconstruction of this bridge and approach roadway not only provide improved safety, but did so at a significant reduction of costs when comparing the final estimated cost to the originally programmed amount. Subsequent to the final PS&E submittal for Bridge No. A7449, the project was moved to the Safe and Sound Improvement Program and therefore, as of this date, the proposed improvements have not commenced.

EXISTING CONDITIONS/ORIGINAL DESIGN:

The existing Route BB Bridge (P-666) over Richland Creek consisted of a three-span concrete girder bridge with vertical abutments. The existing 16 to 20 foot-wide roadway along Route BB was tapered to meet an existing 20-foot-wide bridge deck that was striped for one lane of traffic, resulting in a single lane bridge.

The original design, as scoped, included the complete removal and replacement of Bridge P-666 with a new 26-foot-wide bridge accompanied by 26-foot-wide roadway approaches. This would allow for two 12-foot lanes throughout the project limits. The length of the proposed three-span bridge increased to 150 feet due to the current standard of using spill slopes at abutments. This increase required modifying the vertical alignment. This component of the design, along with the increase in the bridge length, resulted in a project length of 415 feet. An estimated construction cost for these improvements at the time of the STIP budget was \$631,000.

PRACTICAL DESIGN MEASURES:

During the Preliminary Design Phase, a Practical Design Field Check was held at the project site to discuss possible practical design measures in order to reduce construction costs for this low ADT roadway (440 in design year -2028). The following suggested measures were evaluated as possible components to be used in the final design. These innovative cost-saving ideas were formalized by the Design Field Check Team that consisted of members of MoDOT District 5, MoDOT Bridge and CMT:

- **Utilize the existing end bents and intermediate bents and replace the superstructure of the bridge only.**
 In order to utilize the existing substructure components, it was first determined that the bridge width would need to be reduced from 26 feet to 24 feet. In addition, through analysis, it was determined that the existing bents, originally designed for an H10 loading, could be modified to sustain the current loading requirement for an HS20-44 loading. Through visual inspection, it was determined that the existing vertical end bents were in good condition and could be used in place. A review of the intermediate bents determined that they would need to be removed and replaced due to their type and deteriorating condition. As a result of salvaging the existing vertical abutments, the new bridge length was reduced significantly. A reduced 24-foot-wide bridge width also reduced roadway tie-in costs.

- **Reduce tie-in length of the roadway approaches.** Coupled with the reduced bridge length requirement described above, it was determined that the existing vertical alignment could now be utilized, which reduced the limits of full-width reconstruction. The Field Check Team also noted that pavement reconstruction costs could be further reduced by utilizing full-depth tapers that tie-in to the existing pavement width. The final project resulted in a full-width pavement reconstruction length of 65 feet, reduced from the original scope of 290 feet. In conjunction with this change, associated earthwork costs were reduced as well.
- **Other implemented cost saving measures.** To avoid right-of-way takings, a 7-foot-deep, high strength guardrail post was used. This enabled the use of 2: 1 fore slopes directly off the edge of pavement and eliminated right-of-way encroachments near both sides of the proposed bridge. The Field Check Team also noted that rock fill on the 2:1 slopes could be utilized from a nearby quarry at a cost-effective unit price.

To reduce guardrail costs, the Team recommended using a minimum length guardrail section since Route BB had a very low crash rate occurrence and the roadway was low volume (440 ADT - 2028). It was also noted that using the minimum section of guardrail was still an improvement over the existing condition.

SUMMARY OF COST SAVINGS:

The initial STIP budget was \$631,000. The Final PS&E estimate was \$349,000, resulting in a savings of approximately 44 percent. The areas of savings are summarized below:

Item	Original Design	Final Design
Bridge	\$429,000	\$233,000
Pavement & Grading	\$111,000	\$46,000
Miscellaneous	\$91,000	\$80,000
Total	\$631,000	\$349,000

Note: This project was moved to the Safe & Sound Program.

SUMMARY:

The practical design elements incorporated into this project resulted in a project that met all of the original project’s needs regarding improved safety and traffic flow, while not affecting the public’s expectations of the improvements. The elements eliminated any need for right-of-way acquisition and did not affect adjacent utilities. More maintenance may be encountered due to the use of the existing vertical end bents, but a substantial savings was realized due to the implementation of these practical design measures. The overall construction schedule will now require less time for the detour and road closure due to the reduced length of the project and the use of existing substructure components.

Overall this project exemplifies MoDOT’s commitment to providing practical design cost-saving measures to make a “good project”, rather than a “perfect project”, that meets the public’s needs while utilizing innovation and non-standard designs in the process.

Sincerely,
CRAWFORD, MURPHY & TILLY, INC

R. Jay Rakers
CMT Project Manager

**MoDOT PROJECTS
2008 APPLICATION FORM**
(required for each entry)

Job No. _____ **Route** _____ **County** _____

STIP Description (Scoping or Construction, state which STIP) _____

Is the submittal for the entire project or just a portion of the project? Please explain: _____

Project Manager (could have both) **MoDOT** _____ **Consultant** _____

Key core team members as approved by the MoDOT PM (may include consultants) (limit of 9)

Project Contacts: **District** _____ **Consultant** _____

Project Budget:

Conceptual budget \$ _____ **Initial STIP Budget** \$ _____

Final STIP budget \$ _____ **Award amount** \$ _____

Other : _____

Value Engineering study during design? yes no (if yes) **Project Stage** _____

Total VE savings implemented \$ _____ **VE Contact Person** _____

Construction-stage VE (VECP)? yes no (if yes) **Explain** _____

Total VECP savings \$ _____ **VECP Contact Person** _____

What would make this entry stand out from the rest of the entries when considering MoDOT's practical design philosophy? (In layman's terms - 100 words or fewer) _____

Send entries to: MoDOT Design Division, ATTN: Jay Bestgen
1320 Creek Trail Dr., Jefferson City, Missouri 65109

ALL ENTRIES MUST BE RECEIVED NO LATER THAN CLOSE OF BUSINESS ON DECEMBER 15, 2007.



- Utilized existing vertical end bents
- Eliminated spill slopes
- Resulted in reduction of bridge and roadway lengths



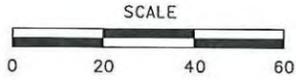
- Existing - 20' one-lane bridge
- Original Design - 26' roadway width
- After Practical Design - 24' roadway width



- Live load on existing bridge - H10
- Existing end bents adequate for HS20-44 live load



ROUTE	STATE	DISTRICT	SHEET NO.
BB	MO	5	4
JOB NO.		J5S0862	
CONTRACT ID.			
PROJECT NO.			
COUNTY	MORGAN		DATE
			4/7/2006



CURVE RTEBB-1	
PI	49+53.19
PC	48+21.73
PT	50+84.55
Δ	03° 45' 52" (RT)
D	01° 25' 57"
L	262.82'
T	131.45'
R	4,000.00'
SE	NC

SE 1/4 SEC 9
T63N, R18W

KENNETH AND CARLENE NOLTING
NO TAKINGS

SW 1/4 SEC 10
T63N, R18W

NE 1/4 SEC 16
T63N, R18W

SEAN AND KENDA BAUER
NO TAKINGS

ROBERT F. BYE
NO TAKINGS

MATCHLINE STA 48+75.00

MATCHLINE STA 54+25.00

BEGIN PROJECT
STA. 50+00.24

END PROJECT
STA. 54+15.24

APPROX. SECTION LINE
SEC. 9
SEC. 10

APPROX. SECTION LINE
SEC. 15
SEC. 16

RICHLAND CREEK

EXIST. BRIDGE NO. P-666 (R)

NEW BRIDGE #A7449

END BRIDGE
STA. 52+16.09

BEGIN BRIDGE
STA. 50+80.51

PT STA 50+84.55

ROUTE BB

EXIST. R/W

EXIST. R/W

EXIST. R/W

EXIST. R/W

EXIST. DITCH (UIP)
TYPE A C.E.T.

EXIST. DITCH (R)
RELOCATE DITCH

EXIST. DITCH (UIP)

TYPE A C.E.T.
EXIST. DITCH (UIP)

TYPE A C.E.T.

EXIST. DITCH (R)
RELOCATE DITCH

EXIST. OVERHEAD POWER

SEC. 9
SEC. 16

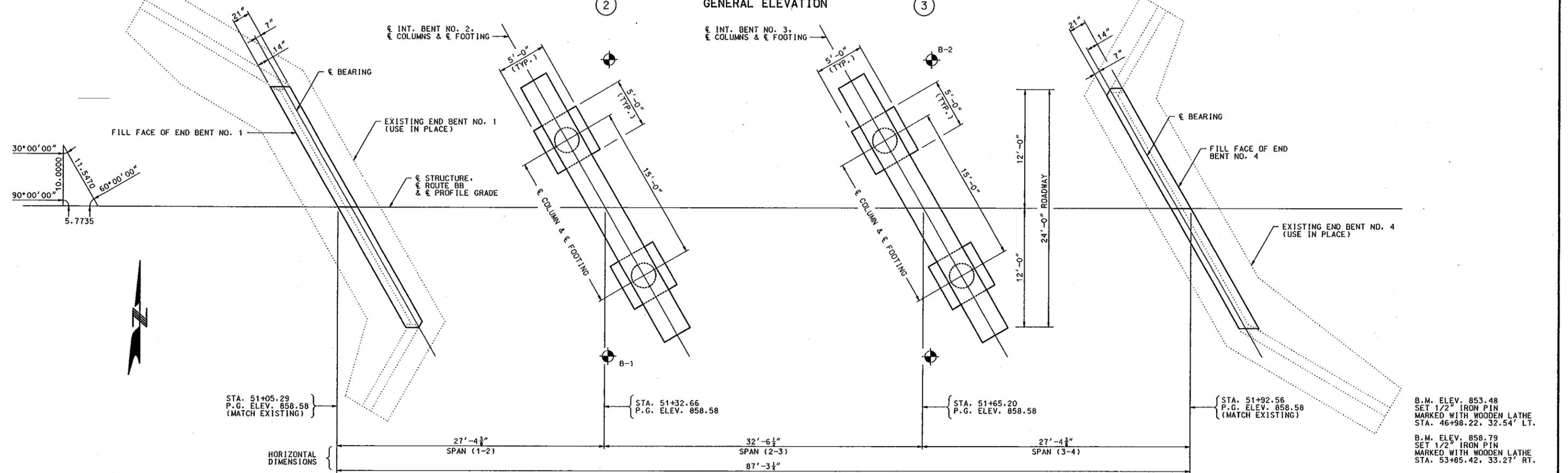
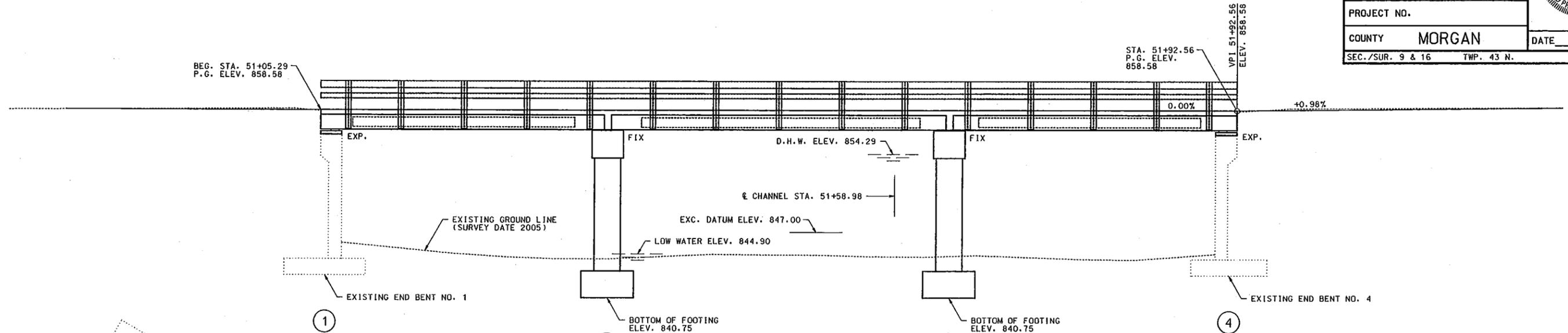
NW 1/4 SEC 15
T63N, R18W

PLAN SHEET

ROUTE BB

MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION
 (25'-30'-25') CONTINUOUS COMPOSITE PRESTRESSED CONC. VOIDED SLAB BEAM

ROUTE	STATE	DISTRICT	SHEET NO.
BB	MO	5	
JOB NO.		J5S0862	
CONTRACT ID.			
PROJECT NO.			
COUNTY		MORGAN	
SEC./SUR.		TWP. 43 N. RGE. 18 W.	
			DATE 1/8/2007



NOTE:
 FOR GENERAL NOTES, ESTIMATED QUANTITIES, ESTIMATED QUANTITIES FOR REINFORCED CONCRETE SLAB OVERLAY AND LOCATION SKETCH, SEE SHEET NO. 2.

INDICATES LOCATION OF BORINGS.

NOTICE AND DISCLAIMER REGARDING BORING LOG DATA

THE LOCATIONS OF ALL SUBSURFACE BORINGS FOR THIS STRUCTURE ARE SHOWN ON THE BRIDGE PLAN SHEET FOR THIS STRUCTURE. BORING DATA FOR THE NUMBERED LOCATIONS IS SHOWN ON SHEET NO. 3. THE BORING DATA FOR ALL LOCATIONS INDICATED, AS WELL AS ANY OTHER BORING LOGS OR OTHER FACTUAL RECORDS OF SUBSURFACE DATA AND INVESTIGATIONS PERFORMED BY THE DEPARTMENT FOR THE DESIGN OF THIS PROJECT, IS AVAILABLE FROM THE PROJECT CONTACT UPON WRITTEN REQUEST AS OUTLINED IN THE PROJECT SPECIAL PROVISIONS. NO GREATER SIGNIFICANCE OR WEIGHT SHOULD BE GIVEN TO THE BORING DATA DEPICTED ON THE PLAN SHEETS THAN IS SUBSURFACE DATA AVAILABLE FROM THE DISTRICT OR ELSEWHERE.

THE COMMISSION DOES NOT REPRESENT OR WARRANT THAT ANY SUCH BORING DATA ACCURATELY DEPICTS THE CONDITIONS TO BE ENCOUNTERED IN CONSTRUCTING THIS PROJECT. A CONTRACTOR ASSUMES ALL RISKS IT MAY ENCOUNTER IN BASING ITS BID PRICES, TIME OR SCHEDULE OF PERFORMANCE ON THE BORING DATA DEPICTED HERE OR THOSE AVAILABLE FROM THE DISTRICT, OR ON ANY OTHER DOCUMENTATION NOT EXPRESSLY WARRANTED, WHICH THE CONTRACTOR MAY OBTAIN FROM THE COMMISSION.

BRIDGE: ROUTE BB OVER RICHLAND CREEK
 STATE ROAD: ROUTE BB FROM ROUTE D TO ROUTE N
 ABOUT 0.75 MILE WEST OF ROUTE D

PROJECT NO. STA. 51+05.29
 JOB NO. J5S0862 ROUTE BB

PLOT 250 9:29:29 AM 1/8/2007 L:\MDDOT\9034090601\Dr-cw\Sheets\A7449\01-gen.pln.dgn

DESIGNED OCT 2006
 DETAILED NOV 2006
 CHECKED DEC 2006



NOTE: THIS DRAWING IS NOT TO SCALE. FOLLOW DIMENSIONS.

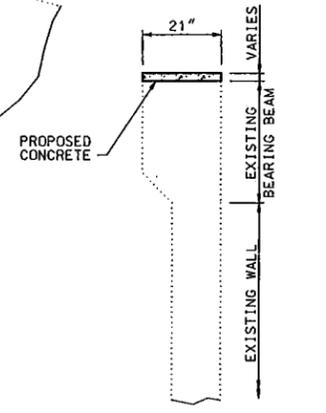
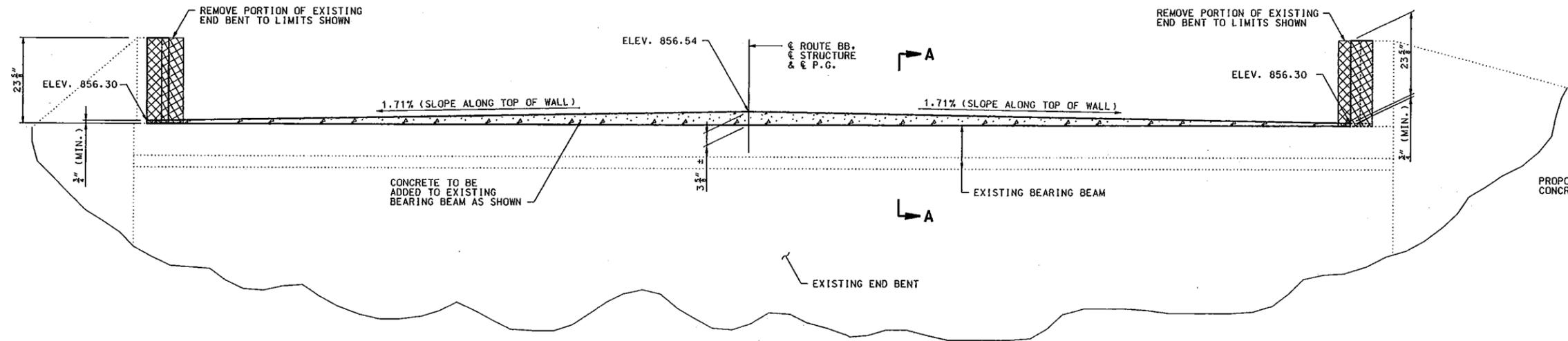
SHEET NO. 1 OF 20

DATE:

STD. 706.35

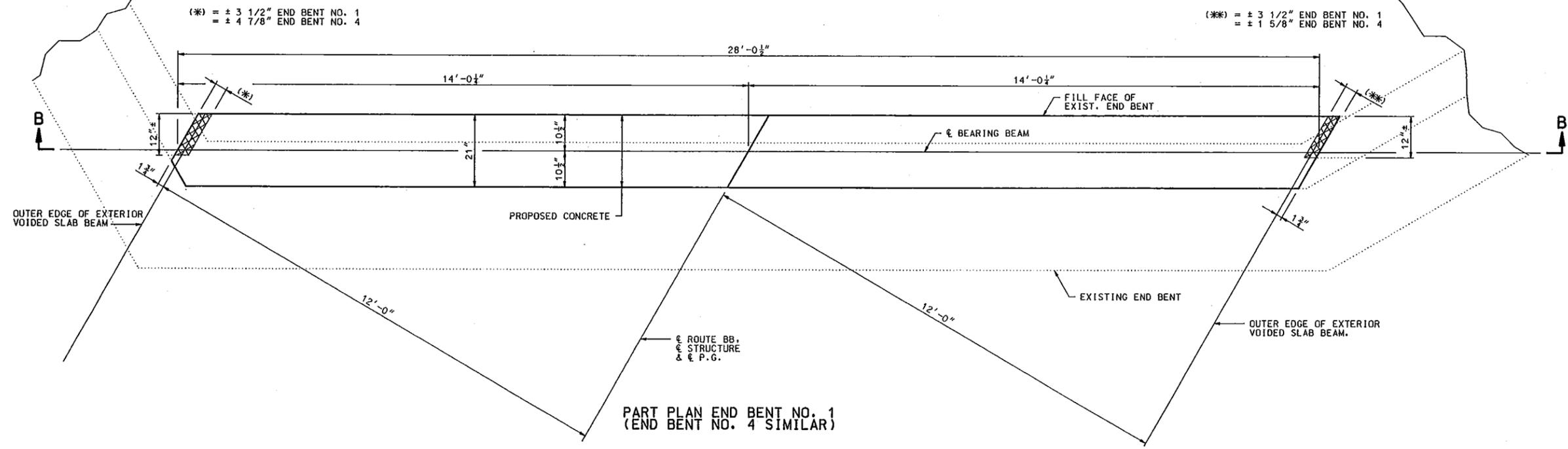
A7449

ROUTE BB	STATE MO	DISTRICT 5	SHEET NO.
JOB NO. J5S0862		CONTRACT ID.	
PROJECT NO.		COUNTY MORGAN	
DATE 1/8/2007			



PART SECTION B-B END BENT NO. 1
(END BENT NO. 4 SIMILAR)

PART SECTION A-A



LEGEND:

CONCRETE REMOVAL

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CMT
 CRAWFORD MURPHY & TILLY, INC.
 CONSULTING ENGINEERS
 SPRINGFIELD, IL ■ AURORA, IL ■ ST. LOUIS, MO

DETAILS OF EXISTING END BENT MODIFICATIONS

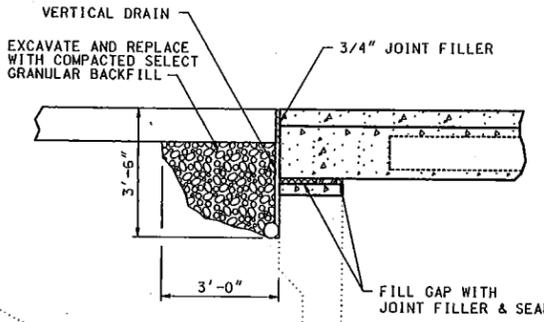
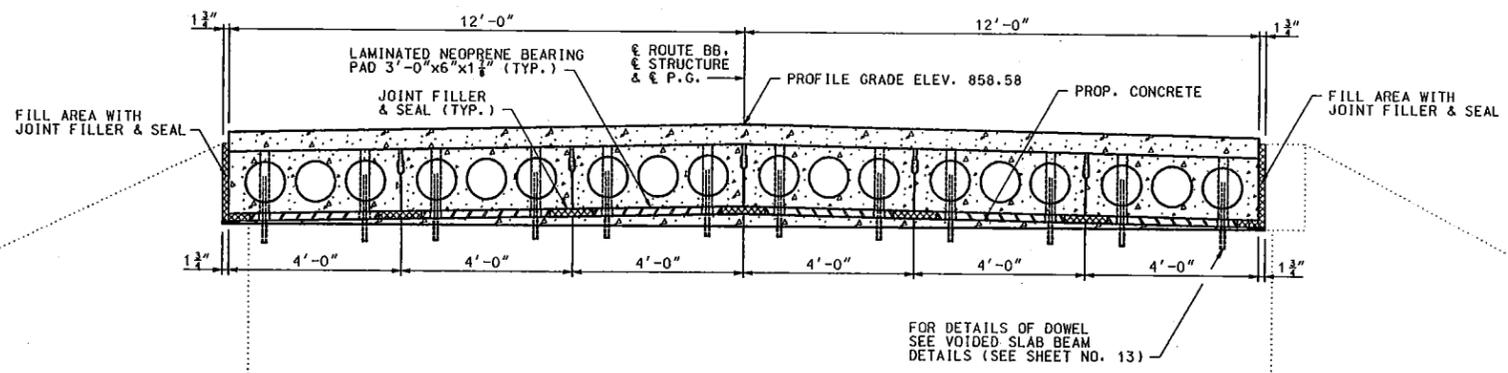
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SHEET NO. 4 OF 20

A7449

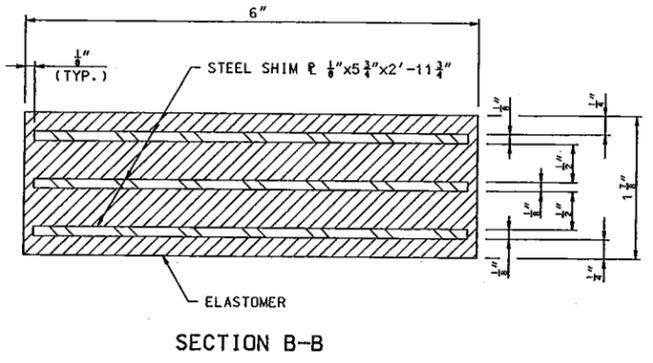
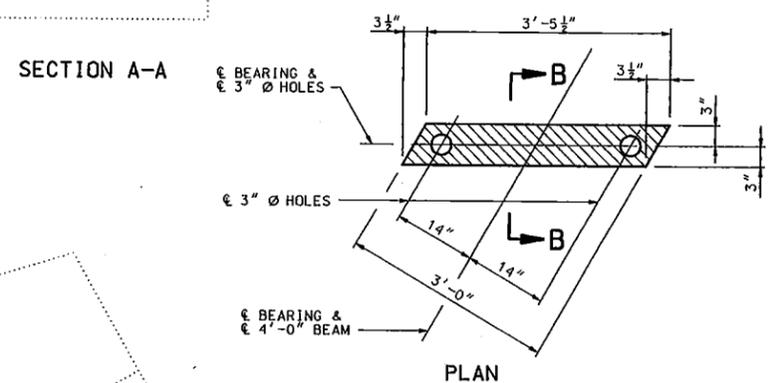
DETAILED NOV 2006
 CHECKED DEC 2006

ROUTE BB	STATE MO	DISTRICT 5	SHEET NO.
JOB NO. J5S0862			
CONTRACT ID.			
PROJECT NO.			
COUNTY MORGAN		DATE 1/8/2007	



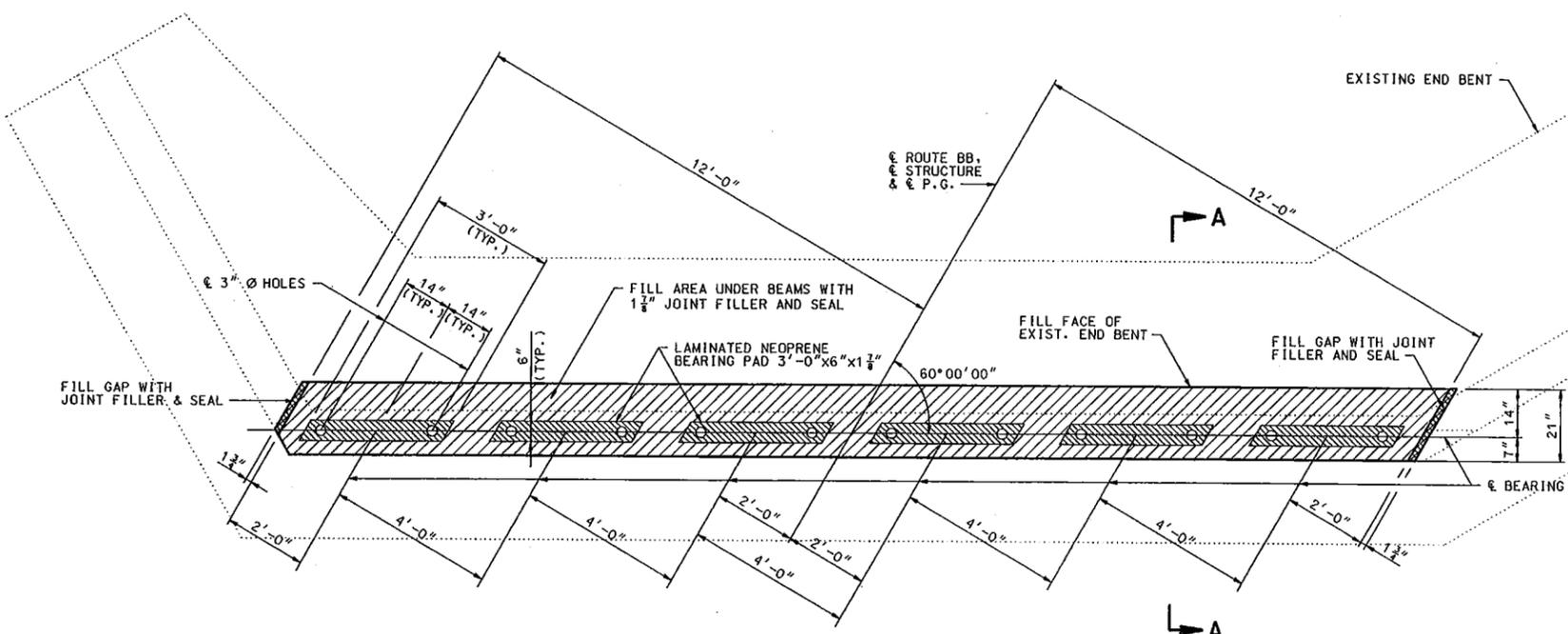
NOTES:
 SELECTED GRANULAR BACKFILL SHALL BE COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR VERTICAL DRAIN AT END BENTS.
 FOR VERTICAL DRAIN DETAILS, SEE SHEET NO. 6.

ELEVATION NEAR END BENT NO. 1
 PERPENDICULAR TO \pm ROADWAY
 (END BENT NO. 4 SIMILAR)



DETAILS OF LAMINATED NEOPRENE BEARING PAD 3'-0" x 6" x 1 1/8"

NOTES:
 NEOPRENE ELASTOMERIC PADS SHALL BE 60 DUROMETER
 LAMINATED NEOPRENE BEARING PAD ASSEMBLY SHALL BE IN ACCORDANCE WITH SEC 716.



PLAN OF END BENT NO. 1
 SHOWING NEW BEARINGS
 (END BENT NO. 4 SIMILAR)

ITEM	QUANTITY
PARTIAL REMOVAL OF SUBSTRUCTURE CONCRETE	LUMP SUM 0.5
CLASS B CONCRETE (SUBSTRUCTURE)	CU. YARD 0.4
VERTICAL DRAIN AT END BENTS	EACH 1

NOTE: THESE QUANTITIES ARE INCLUDED IN THE ESTIMATED QUANTITIES TABLE ON SHEET NO. 2.

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DETAILED NOV 2006
 CHECKED DEC 2006



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DETAILS OF EXISTING END BENT

NOTE: THIS DRAWING IS NOT TO SCALE. FOLLOW DIMENSIONS.