VALUE ENGINEERING CHECK SHEET

VE # 08-04

TYPE OF WORK

(Check one that applies)

25/75

- ☐ Bridge/Structure/Footings
- X Drainage Structures (RCP, RCB, CMP's, ect.)
- ☐ TCP/MOT
- ☐ Paving (PCCP, ect.)
- ☐ Grading/MSE Walls
- ☐ Signal/Lighting/ITS
- ☐ Misc. _____

SUMMARY OF PROPOSAL

(If needed, condense summary to a couple of lines)

_The proposal is to relocate the removal limits of the box culvert closer to the headwall. This leaves more of the existing box in place reducing quantities associated with the culvert extension.

SCANNING OF DOCUMENT

If the proposal is large, please mark or make note, which pages need to be scanned into the database. If there are special instructions, make note of them here.

_____

_____

_____

MEMORANDUM

Missouri Department of Transportation

Construction
2675 North Main

TO: Brian A. Williams
Construction and Materials

CC: Jackson Construction
file

FROM: Debbie Strobel
DFPRP

DATE: February 22, 2008

SUBJECT: District 10 - Construction
Value Engineering Proposal
Job No. J0P0848
Route 72
Bollinger County

Attached is the above-mentioned proposal that has been approved at the district level. Please make review and return to District 10 for distribution. If you have any questions, please contact Lynelle Luther.

Attachment

ds

MEMORANDUM

Missouri Department of Transportation
Construction
Jackson Project Office

TO: Lynelle Luther
District Construction and Materials Engineer

FROM: Darius W. Dowdy DWD
Resident Engineer

DATE: January 30, 2008

Subject: VE Proposal #1
Project: J0P0848
Contract: 071026-X02
Route: 72, Bollinger County

Please find attached to this memo Value Engineering Proposal number 1 as it pertains to project J0P0848 in Bollinger County.

The VE Proposal submitted by Apex changes the location of the cut and removal line on the existing box culvert located at station 707+59. This change in location benefits the department in a few ways.

1. By moving the cut line to the outside edge of the headwall, there is no decrease in the existing roadway and shoulder width during construction of the box culvert extension.

2. By moving the cut line to the outside edge of the headwall, the box culvert extension can be built by MODOT standard plans and a transverse construction joint can be installed at the cut line. If the headwall has to be removed, Bridge Division will need to be contacted and they will provide direction on how the contractor should reinforce and connect the existing structure to the new section.

3. By moving the cut line to the outside edge of the headwall, the contractor believes the extension can be built without using the temporary Type F Concrete Barrier. If that proves to be the case, this allows the possibility of under-running this pay item. The net savings of under-running the Type F concrete Barrier and related items, if not needed somewhere else, would be $7,813 dollars.

Based upon the information received and the discussions that I've had with the contractor and the Bridge Department, I recommend accepting this proposal.

How much fill will be over the headwall? 6-8' below bottom of AC

Does headwall fall within the shoulder? at edge of shoulder

Form C-104
Rev. 2/01

CONSTRUCTION VALUE ENGINEERING CONCEPT PROPOSAL
MISSOURI DEPARTMENT OF TRANSPORTATION

Date 01/24/2008

Contract ID 071026-X02 **Job No.** JOPO848 / JOPO887

County Bollinger / Cape Gir. **Route** 72 **Original Bid Cost** $7,333,994.96

Contractor Apex Paving Company **By** Glen Graham

Designed By Penzel Construction Co., Inc. **Phone** (573) 331-7561

VE # 08-04 25% Savings

1. Description of existing requirements and proposed change(s). Advantages/Disadvantages

Eliminate removal of existing Box Culvert behind the headwall and would eliminate excavation close to the existing pavement. Eliminates an un-safe edge of roadway condition.

2. Estimate of reduction in construction costs. $6,858.08

3. Prediction of any effects the proposed change(s) will have on other department costs, such as maintenance and operations.

None

4. Anticipated date for submittal of detailed change(s) of items required by Section 104.6 of the Specifications.

01/18/2008
(date)

5. Deadline for issuing a change order to obtain maximum cost reduction, noting the effect of contract completion time or delivery schedule.

02/04/2008 (date) — We want to start box culvert work by late February, 2008 (effect)

6. Dates of any previous or concurrent submission of the same proposal.

None
(date and/or dates)

RECEIVED
JAN 29 2008
Jackson Project Office

Additional Comments:

***** Portion Below This Line To Be Filled Out by MoDOT *****

Comments: Attached, is a string of e-mails from Bridge. If the existing headwall has to be removed or modified, this V.E. proposal must be rejected, as the removal of the headwall poses structural concerns to the existing box culvert

Dan Wilcox — 1-29-08

Submitted By Resident Engineer — Date

Comments: The headwalls lie at the outside edge of the shoulder and well below the bottom of the asphalt shoulder. I recommend this as a Practical Design 75/25% split to be consistant with similar proposals.

☒ **Approval Recommended**

☐ **Rejection Recommended**

Pamela A. Hahn DCME — 2-22-08

District Engineer — Date

Comments: Approve as practical design V.E. w/75/25 split.

☒ **Approval**

☐ **Rejection**

David D. Ahlvers
by Brian A. Williams CEMLE — 2-25-08

State Operations Engineer — Date

Distribution: Resident Engineer, District Operations Engineer, State Operations Engineer
*Value Engineering Administrator - *MoDOT, P.O. Box 270, Jefferson City, MO 65102

PENZEL
CONSTRUCTION COMPANY, INC.

325 W. Jackson Blvd. • P.O. Box 330 • Jackson, MO 63755 • (573) 243-8191 • (573) 243-3526 • fax (573) 243-2425 • www.penzel.com

1-18-08

Apex Paving
PO Box 637
Cape Girardeau, Mo.63701

Attn: Glen Graham; Project Manager

Re: Rte; 72 Cape JOP0887, Bollinger JOP0848
VE Proposal

Dear Mr. Graham:

We have put together the following VE Proposal to be submitted to MoDot. The proposal involves work on the 8'x5' box culvert @ Station 707+59.18.

VE Proposal #1

1) Eliminate the removal of the existing box (2' behind the headwalls), removing only the existing portion of the wings as required.
2) Treat new joint as a transverse joint. This would add an additional headwall on the new extension. We would also add a thickened slab(toe wall) on the end of the extension that will be next to the old box. (there is no bottom in the old box)
3) Build new extension Right (21'-3'=18') and Left (19'-3'=16'). Total of 6' of new box to be eliminated (2' behind existing headwall + headwall)
4) Eliminate some traffic barrier and excavation close to roadway thus reducing unsafe conditions to the traveling public. The over-excavation required and existing narrow lanes with basically no shoulder, present a possible safety hazard. The Temp. Con. Bar. Will not be used and will not be included in this VE Proposal.

Total Deductions;

1.) Removal of Improvements -- removal of portion of existing box.
Item 2022010 LS $79,200 @3% $2,376.00
2.) Class IV Excavation ---- Deduct 25.7cy excavation
Item 2063300 25.7cy @ 27.00 $693.90
3.) Class B-1 Concrete ---- Deduct 4.62cy Concrete
Item 7034040 4.62cy @ 544.00 $2513.28

4.) Granular backfill -----	Deduct 5.2cy rock Item 2064500 5.2cy @ 45.75	$237.90
5.) Reinforcing steel----	Deduct 741 lbs. Item 7061020 $741lbs @1.40	$1037.00
	Total VE Proposed savings	$6858.08

This procedure has been performed successfully on other projects in the past. We appreciate your consideration of this proposal. Weather permitting, we anticipate this work starting late winter/early spring 2008.

Thank you for your time. If you have any questions, don't hesitate to call us.

Sincerely,

Paul Koeper
VP Penzel Construction Company, Inc.

Paul D Porter /SC/MODOT
12/31/2007 09:24 AM

To Richard C Lamb/D10/MODOT@MODOT
cc Dennis W Heckman/SC/MODOT@MODOT, Gregory G Sunde/SC/MODOT@MODOT, Darius W Dowdy/D10/MODOT@MODOT, Lynelle S
bcc
Subject Re: VE concept 884 and 887 Job

I was reluctant to contact you again, but in discussing this internally we thought of something else in regard to the possibility of omitting the bottom slab. If the bottom slab is omitted, then MoDot Standards would not necessarily apply anymore and the extension would need to be designed by a qualified professional engineer.

Again, from where sit we don't know all the situation you have, or the background on why the existing culvert doesn't have a bottom slab or even if keying into rock is feasible. I mentioned this so you would have as much information up front in the beginning as possible.

Paul D Porter/SC/MODOT

Paul D Porter /SC/MODOT
12/28/2007 03:44 PM

To Richard C Lamb/D10/MODOT@MODOT
cc Dennis W Heckman/SC/MODOT@MODOT, Gregory G Sunde/SC/MODOT@MODOT, Lynelle S Luther/D10/MODOT@MODOT, Darius W Dowdy/D10/MODOT@MODOT
Subject Re: VE concept 884 and 887 Job

Rick,

One thing I forgot to mention, if you determine that conditions are such that you find you are able to omit the bottom slab and key the new walls into rock then if the entire culvert would be on a uniform foundation, this opens the door for installing some dowels at the cut line to assist with the stability of the extensions. For this situation I would tend to favor connecting the boxes instead of the expansion joint that would go along with a box on differing foundation materials. This illustrates why it is difficult to provide an all inclusive answer the first time due to the interactive nature of design .. using a different option on one item affects what is the best approach on another.

I thought this additional information might be useful as a more complete answer to Darius' question on the pros and cons of an expansion joint.

Paul D Porter/SC/MODOT

Paul D Porter /SC/MODOT
12/28/2007 02:21 PM

To Paul D Porter/SC/MODOT@MODOT
cc Dennis W Heckman/SC/MODOT@MODOT, Gregory G Sunde/SC/MODOT@MODOT, Lynelle S Luther/D10/MODOT@MODOT, Darius W Dowdy/D10/MODOT@MODOT, Richard C Lamb/D10/MODOT@MODOT
Subject Re: VE concept 884 and 887 Job

Rick, I have gotten a chance to look at the contractor's VE Concept Proposal. Since this a concept proposal and there were not many specific details provided, I am basing my comments on the brief descriptions of the work that were provided. In addition to providing my initial comments and suggestions for further shaping of the contractor's VE that I hope will be helpful, at the same time I will also try to address the additional questions posed by either yourself or Darius that were not in the contractor's original proposal that you faxed to me on the 26th.

The contractor's general idea of completely removing the wings up to a point just outside of the existing headwalls, and then extending the box with new construction has merit from a technical standpoint. I think it could be made to work provided some modifications are made to address important issues that relate to the structural function of the concrete headwall on skewed single box culverts that are briefly discussed below.

In the Contractor's proposal for #4, it mentions removing the existing headwall if necessary (if the asphalt shoulder is found to have inadequate cover).
Again, I am just getting my impressions from the brief descriptions, but I don't believe this part of the proposal is advisable from a structural point of view. Also, I don't think that the structural concerns generated by removing the headwall can necessarily be addressed solely by installation of the dowel bars (F-bars) mentioned in item #2. I think there would need to be something more to address this, and perhaps the contractor's engineer has something more in mind to address these issues.

In a skewed box culvert, the headwall has the important structural function to act as an edge beam to support the skewed edge of the slab end. Since the typical orientation of the main reinforcing steel in the top slab of a box culvert runs perpendicular to the centerline of the barrel (following the structural load path for positive moment beam action along the culvert width or span), the triangular piece of the top slab left after removal of the headwall would then be left as structurally unstable. The same issue would exist if the interfering headwall height is reduced since the original design would have counted on the height in combination with the bottom steel that was provided for the edge beam action to occur. This is some of the background as to why MoDOT's Standard Drawing for cutting details (703.38A) requires that, in addition to the F-bars, a minimum length of the transverse steel (A - bars) need to be saved and lapped with new transverse steel. It is to preserve the positive moment beam action. Also, you will notice that this requirement for edge beam action is reflected in MoDot's Standard Drawings for single box culverts as they show considerably more bottom reinforcing steel in the headwall for skewed box culverts over square ones.

My thoughts on a possibility for how the contractor's proposal could be modified to work (this assumes the existing headwalls won't interfere and a way can be found to leave them in place), would be to start at the cutting line at the outside face of the headwall and then from there provide an expansion joint. Next to the expansion joint you could then proceed in accordance with the Standards for a new box along with a new headwall adjacent to the old one (again - you need some way to provide the edge beam action for the beginning of the extension since the free edge of the new slab will be skewed in this situation).
Where the bottom slab starts at the old culvert, the contractor's suggestion of providing either a thickened slab or a toe wall seems to be a reasonable approach. Filter cloth should be provided over the expansion joint with the "double" headwalls.

If for some reason the existing headwalls will be too tall, consideration could be given to going to an appropriate removal line that would provide for lapping of reinforcing steel and replacing them with a different low-profile design. In current MoDOT standards the headwalls stick up about 6 inches so perhaps they could be adapted to use in this situation. If this approach is desired, the details of how this could be done would need some more discussion.

Darius- I think this should answer most of your earlier questions. Regarding your questions 4 and 5, I'm assuming that the existing box does not have a floor because of the presence of rock. It was common to key the bottom of the walls into rock. If there is some reason you want to keep the floor in the new extension and encounter rock, MoDOT Std Specs has provision for providing a granular cushion.

Because of the difference in bearing material (old culvert vs. new) I tended to favor your expansion joint idea over the doweling if our other earlier suggestions can be followed. You asked about potential problems... one I can think of is you will need to find some way of preventing leaks from occurring at the joint where the bottom slab begins which would eventually undermine the granular material under the culvert. Food for thought....if there is good rock close to the surface where the new walls can be properly keyed in, it may be possible to also omit the bottom slab in the extensions.

Rick- Your email mentions trying to keep the existing wings and doweling in where the contractor's proposal does not mention this. I don't think this idea is feasible since you would need to remove about 2 foot of the height all along the top of wings to provide lap splices with new vertical steel for continuity of reinforcing for bending action in the walls. I don't think that just doweling into the top of the wings would provide the necessary beam action. Also, since there is no bottom slab in the existing culvert I don't think this is very practical to do a partial removal of the walls, so you would probably be as well off to remove the existing wings altogether as is being proposed by the contractor..

I hope these thoughts and suggestions are helpful. After you have had a chance to look at these there may be other questions or ideas and I would be happy to discuss these through a phone call if desired.

Paul D Porter/SC/MODOT

Paul D Porter /SC/MODOT
12/26/2007 09:58 AM

To Richard C Lamb/D10/MODOT@MODOT
cc Dennis W Heckman/SC/MODOT@MODOT, Gregory G Sunde/SC/MODOT@MODOT, Lynelle S Luther/D10/MODOT@MODOT, Darius W Dowdy/D10/MODOT@MODOT
Subject VE concept 884 and 887 Job

Rick, If you fax the contractor's concept you mentioned to me, I'd be happy to take a look at it. My fax number is 573-526-5488.

Richard C Lamb/D10/MODOT
12/21/2007 03:24 PM

To Gregory G Sunde/SC/MODOT@MODOT
cc
Subject Fw: VE proposal from Apex Box Culvert Extension

Greg,

On the contract 071026-X02, Jobs J0P0848 & J0P0887, we have a box culvert, 5x8, that is to be extended on each end for roadway widening. The design was to remove the wingwalls end to 2' behind the headwall, and extend from there. The contractor is making a VE proposal to instead leave the wings and headwall in place and dowel into the existing concrete to extend. What this will do is give and extra 2'+ distance from traffic to be a bit safer, and save us on some labor and materials for that 2' removal. At this point the proposal is conceptual only - we're just weighing the pros/cons prior to the contractor taking extra time to run some numbers for the actual VE.

The box in place does not appear to have a floor in it, though the extension was computed with a floor. Several questions have arisen, and are included below. Can you address the concerns that apply to

Bridge for this proposal and any other questions you may have? I can fax the conceptual proposal to you if you'll send me your fax number. After you have some time to review, we can discuss via phone call if needed. Just let me know when.

Thanks!

Rick Lamb, P.E.
MoDOT

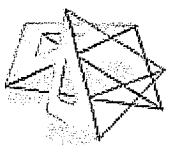
----- Forwarded by Richard C Lamb/D10/MODOT on 12/21/2007 03:15 PM -----

Lynelle S Luther/D10/MODOT
12/21/2007 09:17 AM

To Darius W Dowdy/D10/MODOT@MODOT
cc Richard C Lamb/D10/MODOT@MODOT
Subject Re: VE proposal from Apex Box Culvert Extension

I think that covered it.

Darius W Dowdy/D10/MODOT



Darius W Dowdy/D10/MODOT
12/21/2007 07:29 AM

To Richard C Lamb/D10/MODOT@MODOT
cc Lynelle S Luther/D10/MODOT@MODOT
Subject VE proposal from Apex Box Culvert Extension

Rick,

After speaking with Lynelle on the box culvert extension below are some items that I would like for you to discuss with Greg Sundae.

1 You need to talk to Greg about the std plan this box was originally built to.

2 Discuss the VE proposal with Greg and what the contractor has submitted.

3 You will want to send Greg the proposal so he can see what is actually being proposed.

4 The existing box does not have a floor. Our extension does, is this going to cause any problems?

5 Do we need to drill/dowel into the existing box? can we put a transverse joint at the extension?

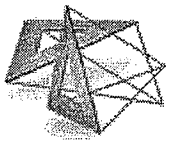
6 How much removal of the hdwl is required?

7 Are there any concerns with removing only the wings and extending from that point out?

Lynelle, is there anything that I missed?

thanks

Darius W. Dowdy, PE
Resident Engineer
Phone (573) 243-0899
Fax (573) 243-6281



Darius W Dowdy/D10/MODOT
02/21/2008 01:33 PM

To Lynelle S Luther/D10/MODOT@MODOT
cc
bcc
Subject VE proposal J0P0848

Lynelle,

from my calculations, we will have 0.55' from the top of the hdwl to the bottom of the asphalt. My arrival of 0.55' is based on field shots and not the cross sections. The cross section at the box is skewed and the info from MS is not accurate.

The outside edge of the hdwl is located at 17.8' LT and 18.4'RT. The hdwl is 6 inches high and 8 inches wide where it connects to the top slab. This is normal. However, on top of the 6 x 8 inch section there is a ribbon of concrete that measures 1 foot by 1 foot. This section looks like it could be an add on.

Darius W. Dowdy, PE
Resident Engineer
Phone (573) 243-0899
Fax (573) 243-6281

12' lanes
6' shoulders