MEMORANDUM

TO: Value Engineering Decision Makers
and Other Interested Parties

FROM: Robert T. Semones, P.E., R.L.S. R.T.S.
Division of Highway Design

DATE: August 28, 1998

SUBJECT: Warren County
I-65 Widening from William Natcher Parkway to Cumberland Parkway
FD52 114 0065 028-042 025D IMNH 00651 062
Item No. 99-5001.0
Value Engineering Study

The value engineering study for this project has been completed. Twelve areas were identified for possible value opportunities. If the appropriate recommendations were implemented, possible savings of $11,692,540 could be realized. Comments on the Value Engineering study were received from the Division of Bridges, Pavement Branch, the project consultants (J>FAST), and Division of Operations.

Value Opportunity No. 1 involved the pavement drainage blanket. The "As Proposed" drainage blanket is Drainage Blanket Type II, a bituminous treated stone.

The Value Opportunity involves using an untreated drainage blanket. The proposed savings from this value opportunity are $3,677,649. The treated drainage blanket provides more stability for construction equipment, but it is about twice the cost of the untreated drainage blanket. The Division of Materials is currently developing an untreated drainage blanket specification that will provide a material with desired permeability characteristics and also have a higher stability to reduce surface distortion created by construction equipment. This value opportunity should be implemented once this specification is approved.

Value Opportunity No. 2 involved the width of the median shoulder. The "As Proposed" median shoulder width is 4.2 meters.

The VE opportunity is to use a 3.6 meter median shoulder. AASHTO criteria for shoulders on multi-lane freeways is 3.6 meters. This value opportunity reduces full depth pavement quantities, minimizes template widening on the outside, and reduces structure lengthening or widening. The expected savings from this opportunity are $488,848. The District recommended using the 4.2 meter shoulder. The consultant indicated that reducing the 4.2 meter shoulder would change the crown point and increase the amount of leveling and wedging required. This recommendation is not accepted for implementation. The Department has maintained a 4.2 meter shoulder on several interstate projects, and they wish to maintain consistency between projects.

Value Opportunity 3 involves barrier wall. The "As Proposed" barrier wall is bought and furnished by the contractor. The barrier wall then becomes the property of the state.

The Value Opportunity recommends using state owned barrier wall, if available at time of construction. It was determined at the time of the study that there was an excess of 100,000 feet of wall that could be used for this project. The wall is stored at exit 28, I-65 in Bowling Green (5,000') and a location in Lexington, Ky. Once the wall has been hauled to the site, it can be used on other widening jobs of I-65. Implementation of this value opportunity can save $3,877,800.

Value Opportunity No. 4 concerned the I-65 bridges over Porter Road. The "As Proposed" is a four span (12.65m-15.39-15.39-12.65) utilizing the existing piers and existing end bent No. 2. The existing piers and end bents will be widened. A new pier, end bent No. 1 and superstructure will be constructed to accommodate the six lanes and shoulders of I-65. The new superstructure will be a concrete deck supported on PPC Type II girders. The interior spans will accommodate two lanes and 1.83m shoulders in each span.

The Value Opportunity recommends a three span (12.65m-15.39-12.65) bridge utilizing the existing substructures and superstructure. The substructures and superstructures will be widened to accommodate the six lanes and shoulders of I-65. The Value Engineering Alternate utilizes the recently rehabilitated bridges remaining design life (22 years according to inspection reports). The loading capacity of the existing bridge exceeds the required HS-25 loading. The existing superstructure would have six more inches of overlay added if the existing superstructure is widened. It was in the opinion of the J>FAST Team and the Division of Bridges that the added dead load of two layers of overlay in addition to the HS25 Live Load and the lack of vertical reinforcement extending into the overlays plus the widened portion between existing bridges consisting of a normal slab on PCI beams, being attached to the previously described arrangement makes a less than desirable bridge. The J>FAST Team along with the Division of Bridges felt it necessary to construct new structures during the time of the I-65 widening. Implementation of this Value Opportunity could save $815,778 if implemented. This would prohibit any construction and lane closures in the future. This recommendation is not accepted for implementation.

Value Opportunity No. 5 involved the I-65 bridges over KY 446. The "As Proposed" structure is a completely new four span structure with span lengths of 15.25m-27.5-27.5-15.25

The superstructure is PPC 840x12.2 spread box beams. The piers are supported on spread footings and the end bents are pile supported.

The Value Opportunity is a four span (14.631m-19.050-19.050-14.631) 840x1220 Spread Box Beam. The substructures and superstructures will be widened to accommodate six lanes and 3.6m shoulders of I-65. The Value Engineering Alternative utilizes the recently rehabilitated bridges remaining design life. The loading capacity of the existing bridge exceeds the required HS25 loading. The Value Engineering Alternative recommends no asphalt overlay be installed on this bridge. It was in the opinion of the J>FAST Team and the Division of Bridges that the added dead load of two layers of overlay in addition to the HS25 Live Load and the lack of vertical reinforcement extending into the overlays plus the widened portion between existing bridges consisting of a normal slab on PC Box beams, being attached to the previously described arrangement makes a less than desirable bridge. The J>FAST Team along with the Division of Bridges felt it necessary to construct new structures during the time of the I-65 widening. This would prohibit any construction and lane closures in the future. Implementation of this Value Opportunity could save $1,559,425. This recommendation is not accepted for implementation.

There were general comments regarding MSE walls by the J>FAST Team

a. The walls create an imposing surface along the side of the roadway, and give the driver the perception of a "tunnel" depending on the width and depth of the opening. The spill through end span design provides a more "open" view through the bridge, which may be perceived by the driver as less of an obstruction than the MSE abutment bridge. It was felt that the spill through end span design looks more natural and appropriate for this rural setting than the MSE abutment design.
b. Can integral end bents be used with MSE walls?
c. Can MSE walls be reliably constructed, in stages, on a significant skew?. Temporary shoring (sheet piling) will be required, and will affect MSE wall unit price if not a separate pay item.
d. For most locations, significant excavation of the existing end bent spill through slope will be required to allow for construction of the MSE volume. This is not a pay item, but will affect the MSE wall unit price.
e. For bridges carrying I-65 over a crossroad, future widening of I-65 will require that the MSE walls be extended (either in the future or as part of the current design).

Value Opportunity No. 6 involves Bristow Road Bridge over I-65. The "As Proposed" is a four span bridge (11.25m-25.315-25.315-11.25) utilizing the existing median pier and existing end bents. The median pier and end bents will be modified to accommodate the new box beam superstructure.

The Value Opportunity Alternative consists of a two span (25.95m-25.95) bridge utilizing the existing median pier. MSE walls are used in front of new end bents that are founded on piling. The Value Engineering Alternative span lengths match the "As Proposed" bridge center span lengths. It is in the opinion of the J>FAST Team and the Division of Bridges that the four span bridge provides a more open roadway and is easier to construct under traffic. Implementation of this Value Opportunity could save $70,373. This recommendation is not accepted for implementation.

Value Opportunity No. 7 involves I-65 bridges over Polkville Road. The "As Proposed structure is a three span (12.45m-12.955-12.45) bridge utilizing the existing piers and end bents. The existing substructure units would be widened to accommodate the new superstructure and PPC Type I beams.

The Value Opportunity structure is a single span bridge with spread 535x12 200 PPC box beams. New end bents on piles will be built behind MSE walls at a location to accommodate Polkville Road and appropriate clear zone. Calculations provided by J>FAST involving removing concrete, approach slabs, and temporary sheet piling for staged construction showed an increase in dollars spent. Implementation of this Value Opportunity could save $124,261. This recommendation is not accepted for implementation.

Value Opportunity No. 8 involves I-65 over US 68. The "As Proposed" is a three span (12.19m-18.29-12.19) bridge utilizing the existing piers and end bents. New piers and end bents in the I-65 median area will be constructed. An entirely new superstructure with PPC Type II beams would be constructed.

The Value Opportunity Alternative is a single span (21.29m) bridge with abutments on spread footings behind MSE walls. The single span provides for US 68 and the appropriate clear zone. Calculations provided by the design team show an increase due to increase in bridge width, removing concrete, suggested increase in box beam size, included quantities for diaphragms, end bent footings, pavement (for NB and SB), approach slab and temporary sheet piling. Implementation of this Value Opportunity could save $124,261. This recommendation is not accepted for implementation.

Value Opportunity No. 9 involved KY 101 bridge over I-65. The "As Proposed structure is a four span (12.10m-26-26-12.10) bridge utilizing the existing median pier and end bents. The existing median pier and end bents will be modified to accommodate the new CB 40x1220 box beam superstructure. New shoulder piers will be built at locations to accommodate six lanes of traffic and a 9.1m clear zone.

The Value Opportunity Alternative structure is a two span (24.1m-24.1) bridge utilizing the existing median pier. New end bents will be constructed in front of the pile supported end bents. The Value Engineering Alternative proposes maintaining only one lane of traffic over the bridge during Stage I construction, then two lanes during Stage II construction. Calculations provided by the design team showed a savings of $15,262 instead of the proposed savings of $244,000. This recommendation is not accepted for implementation.

Value Opportunity No. 10 involved Hays-Smith Grove Road over I-65. The "As Proposed" structure is a four span (13.10m-29-29-13.10) bridge utilizing the existing median pier and end bents. New shoulder piers will be constructed to accommodate six lanes of I-65 traffic and 9.1m clear zone. The Value Opportunity Alternative is to use the existing four span bridge "as is". The loading capacity of the existing bridge exceeds the required HS25 loading criteria. This Alternative also utilizes the remaining design life of the existing bridge. (sufficiency rating 93.7, estimated remaining life of 22 years). The design team is of the opinion that the structure should be replaced during construction of the widening of I-65. Implementation of this recommendation could have a possible savings of $499,930. The implementation of this recommendation will be at the discretion of the Division of Bridges and the design team.

Value Opportunity No. 11 involved the KY 259 bridge over I-65. The "As Proposed" structure is a four span (10.624m-29-29-10.624) bridge utilizing the existing median pier and end bents. The existing median pier and end bents will be modified to accommodate the new superstructure and PCC Type IV beams. The new shoulder piers will be located to accommodate six lanes of I-65 traffic and 9.1m shoulders.

The Value Opportunity Alternative is a two span (30.732m-30.732) bridge utilizing the existing median pier. New end bents on piles will be located behind MSE walls. The walls will be located to accommodate six lanes of traffic and a 9.1m clear zone. The Value Engineering Alternative assumes the bridge will be closed during construction, using adjacent roads as detours. This avoids concerns about temporary sheet piling, and staged construction MSE walls on a skew. The calculations of the design team showed an increase versus the savings of $14,000 as proposed by the value engineering team. This recommendation is not accepted for implementation.

Value Opportunity No. 12 involved the KY 1339 over I-65. The "As Proposed" structure is a four span (13.672m-29-29-13.672) bridge utilizing the existing median pier and end bents. New shoulder piers and superstructure will be constructed. The new superstructure will be a deck slab on PPC Type IV beams. The new shoulder piers will be located to accommodate the six lanes of traffic and 9.1m clear zone.

The Value Opportunity Alternative structure is a two span (30.732m-30.732) bridge utilizing the modified existing median pier. End Bent 1 is built on a rock bluff and End Bent 2 is Built on piles behind an MSE wall. These spans will accommodate six lanes of I-65 traffic and 9.1m clear zone. The design team calculations showed a savings of $47,292 versus savings of the value engineering team at $83,000. Although the MSE wall could be implemented on one side, the unit cost of such a small quantity of wall would not prove feasible. This recommendation is not accepted for implementation.

Design Comment:

The value engineering recommendation is to remove the 5 ½ inch bituminous overlay and break and seat the existing concrete pavement 700m south of US 231 between Stations 8+705 and 13+300. This would prevent the reflective cracking from extending through the new 4 ½ inch overlay as quickly as it had occurred with the earlier overlay.

Design Team Comments:

A similar recommendation was put forth during the Value Engineering review of the Statewide Pavement Design Catalog. More extensive evaluation of the structural design aspects of this recommendation are currently being developed. The maintenance of traffic ramification or benefits are currently being studied by the design consultant for this project. Another aspect of this recommendation is the past condition relating to expansive aggregates used in the existing pavement. This will need further attention.

We would like to thank those who participated or assisted in making this a successful value engineering study. Please contact this office if you have any additional information or need additional information.

cc:

L. Yates	W. Crace	D. Newman
K.W. Cox	B. Powell	J. Stone
S. Goodpaster	S. Cornett	G. Sharpe
J. Story - FHWA	C. Raymer	J. Sacksteder

American Engineers. Johnson Depp Quisenberry
Ventry Engineering Value Engineering Team Members
Florence and Hutcheson, Inc. Skees Engineering, Inc.
T.H.E. Engineers, Inc.