

**DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA**

INTERDEPARTMENT CORRESPONDENCE

FILE: NH-IM-285-1(354) DeKalb
P.I. No. 713290
I-285 @ Flat Shoals Road

OFFICE: Engineering Services

DATE: February 12, 2004

FROM:  David Mulling, Project Review Engineer

FEB 12 2004

TO: Brent Story, State Consultant Design Engineer

**SUBJECT: IMPLEMENTATION OF VALUE ENGINEERING STUDY
ALTERNATIVES**

Recommendations for implementation of Value Engineering Study Alternatives are indicated in the table below. Incorporate the VE alternatives recommended for implementation to the extent reasonable in the design of the project.

ALT #	Description	Potential Savings/LCC	Implement	Comments
1-1A	This VE alternative uses bulb T beams continuous under live load in lieu of continuous steel plate girders on the Flat Shoals Road Bridge.	\$1,940,733	No	GDOT does not design PSC beam bridges continuous for live load. Also, the span is greater than Bridge Office recommends at this time.
1-2B	This VE alternative reduces the typical section on the Flat Shoals Road Bridge by eliminating both outside lanes on the bridge between the ramp terminals and uses bulb T beams.	\$2,291,317	No	Eliminating the outside lanes on the bridge results in a lower Level of Service (LOS) for the through movements across the bridge which is not "equal or better".
2-1A	This VE alternative uses a two span bulb T beam bridge rather than a four span bulb T beam bridge on Panthersville Road.	\$2,798,667	No	Does not adequately address future HOV/C-D Road needs. Also, introduces a dual parallel type exit ramp design in the future in lieu of the GDOT Standard tapered exit ramp design.

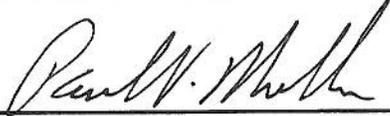
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 Implementation of Value Engineering Study Alternatives
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ALT #	Description	Potential Savings/LCC	Implement	Comments
3	This VE alternative eliminates the widening of the Shoal Creek bridge on both sides of I-285.	\$963,635	No	Not widening the Shoal Creek bridge in each direction on I-285 does not provide the total "Desirable" Ramp "C" & "D" lengths. Does not provide an "equal or better" situation.
4	This VE alternative uses Modular Block pre-cast walls for both the cut and fills Walls.	\$1,855,047	No*	Modular Block walls are not allowed for heights over 20 feet, where traffic railing is required at the top of the wall or beneath bridge end bents.
5	This VE alternative uses asphalt pavement on the ramps rather than concrete.	\$2,491,950	Yes	Grade change at ramp intersections make asphalt more desirable for ease of construction and minimized construction time.
6	This VE alternative uses a single point urban interchange (SPUI) rather than a diamond interchange.	\$763,684	No	Cost savings may not be realistic because of Staging and Maintenance of Traffic issues that were not addressed as part of this VE alternative.

* When the specifications for Modular Block Walls have been approved, it will be possible to allow the Contractor to bid on "Alternate" Wall Systems in the Contracts. This would have to be approved on a project by project basis by OMR and the Bridge Office.

A meeting was held on February 5, 2004 to discuss the above recommendations. Walter Boyd of the FHWA, Joe Wheeler of the Office of Consultant Design, Jim Kennerly, Al Bowman, and David Henry of the LPA Group and Ron Wishon of the Office of Engineering Services were in attendance. In addition, John Tiernan of the Bridge Office provided recommendations/comments for the meeting.

The results above reflect the consensus of all who provided input.

Approved:  Date: 2/17/04
 Paul V. Mullins, P. E., Chief Engineer

Approved:  Date: 25 FEB 04
 Robert Callan, P. E., FHWA Division Administrator

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DTM/REW

Attachments

c: Walter Boyd, FHWA
Gus Shanine, FHWA
Jim Kennerly, Al Bowman, and David Henry, The LPA Group
Lyn Clements, Bridge Design, G. O.
Joe Wheeler, Consultant Design, G. O.
Randy Hart, Construction, G.O.
Shun Pringle, District 7 Construction, Chamblee
Persephone Goodwin, District 7 Construction, Chamblee
Christa Wilkinson, Environmental/Location
Jerry Milligan, Right of Way, G. O.
Lisa Myers, Engineering Services, G. O.
General Files

DEPARTMENT OF TRANSPORTATION

**STATE OF GEORGIA
DIVISION OF HIGHWAYS
OFFICE OF CONSULTANT DESIGN
LETTER OF TRANSMITTAL**

TO: David Mulling, P. E.	DATE: January 26, 2004
Office of Engineering Services	PROJECT: NH-IM-285-1(354)
	COUNTY: Dekalb
Attention: Ron Wishon	P.I. NUMBER: 713290

PROJECT DESCRIPTION: **I-285 @ Flat Shoals Road Interchange**

WE ARE SENDING YOU
THE FOLLOWING ITEMS:

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| <input checked="" type="checkbox"/> CORRESPONDENCE | <input checked="" type="checkbox"/> ATTACHED | <input type="checkbox"/> UNDER SEPARATE COVER |
| <input type="checkbox"/> SPECIAL PROVISIONS | <input type="checkbox"/> PRELIMINARY PLANS | <input type="checkbox"/> UTILITY PLANS |
| <input type="checkbox"/> RIGHT OF WAY PLANS | <input type="checkbox"/> REVISION(S) | <input type="checkbox"/> GEOMETRIC LAYOUT |
| <input type="checkbox"/> CONSTRUCTION PLANS | <input type="checkbox"/> PLAN SHEETS | <input type="checkbox"/> ORIGINAL TRACINGS |
| | <input type="checkbox"/> PROFILE SHEETS | <input type="checkbox"/> SUMMARY OF QUANTITIES |
| <input type="checkbox"/> PRINTS | <input type="checkbox"/> TYPICAL SECTIONS | <input type="checkbox"/> DETAILED ESTIMATE |

COPIES	DESCRIPTION
1	Response as prepared by the LPA Group to the recommendations in the VE study for the referenced project

THESE ARE TRANSMITTED AS CHECKED BELOW:

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| <input checked="" type="checkbox"/> AS REQUESTED | <input checked="" type="checkbox"/> FOR YOUR USE | <input type="checkbox"/> FOR APPROVAL |
| <input type="checkbox"/> FOR REVISION | <input type="checkbox"/> FOR REVIEW AND COMMENT | |

REMARKS: If you have any questions, please contact Joe Wheeler at (404)657-9759.

CC: File (2)

SIGNED Joe D. Wheeler
for STATE CONSULTANT DESIGN ENGINEER

NH-IM-285-1(354) DEKALB COUNTY PI 713290

**RECONSTRUCTION OF THE FLAT SHOALS ROAD (SR 155) INTERCHANGE
@ I-285 AND THE PANTHERSVILLE ROAD BRIDGE OVER I-285.**

RESPONSE TO THE VALUE ENGINEERING (VE) RECOMMENDATIONS

Please find below our responses to the VE recommendations for the above project. Please be advised that the numerical response corresponds with the same numerical VE recommendation in the VE report.

RESPONSE TO VE RECOMMENDATION NO.1

Removal of the outside or third lanes on the proposed bridge between the ramp terminals on the Flat Shoals Road bridge will reduce the traffic capacity of the interchange to an unacceptable level of service. Three lanes in each direction are needed to process the Flat Shoals Road peak hour through volumes as well as the turning volumes being received from the exit ramps. Removal of the outside lanes on the bridge provides virtually no relief for traffic congestion and provides no enhancements to operational capacity when compared to the current condition for the peak through movements. Based upon the detailed traffic study we performed using Synchro and the SIM Traffic animation program, the proposed six through lanes, (three lanes each direction) results in design year levels of service of D and E for the westbound and east bound ramp intersections respectively. The VE recommendation of two through lanes on the bridge in each direction results in levels of service of E and F respectively. We can only assume that the VE recommendation also retains the six lane section on each of the bridge approaches which will result in dedicated right turn lanes for the entrance ramps and exit ramps onto Flat Shoals Road. The VE recommendations provide little in back up HCS analysis and no evidence that a Synchro or SIM traffic animation analysis was done for progression through the corridor. Based on what was provided, we cannot concur with the VE recommendation to remove the proposed outside lanes from the bridge.

It is also our understanding that current policy of the GDOT Bridge Office is not to use pre-stressed beams made continuous for live loads. While it may still be possible to design a simple span bulb T beams (157 ft. 7 in.) with ultra high strength concrete and increased reinforcing, the GDOT Bridge Office recently informed us that they are not comfortable with using such a design at the current time for a major interstate highway crossing. They prefer to use conventional plate girders at this location. We certainly are agreeable to design a simple span bulb T bridge at this location if the Bridge Office will approve this type design. Additionally, the Sq. Ft. cost differential in the VE report between the two superstructure types (Plate girder vs. Bulb T) may be excessive for this particular location and width of the proposed bridge.

RESPONSE TO VE RECOMMENDATION NO. 2

During the concept validation process a four span bridge was selected, due to our understanding at the time that the maximum length of the concrete bulb T beam acceptable to the GDOT Bridge office was 145 feet. This length was not sufficient to span the future I-285 approved typical section and the entrance and exit ramps. Therefore, we selected a four span bridge that consisted of two spans at 125 ft. 4in. (each) to span I-285 (concrete bulb T), and two spans at 56 ft. 8 in. each (AASHTO pre-stressed concrete) to span the proposed entrance and exit ramps. This is the most economical structure with the constraints that we had at that time. Due to a change in GDOT bridge policy regarding high strength concrete, it is now possible to design a pre-stressed bulb T simple span bridge that can span the required 150 feet+/- over I-285 and the associated ramps, provided such a design is acceptable to the GDOT Bridge office. We concur with this VE recommendation provided that the Bridge Office concurs and provided that the GDOT is agreeable to utilizing a dual parallel type exit ramp design in the future in lieu of the GDOT standard tapered exits.

Another consideration for selecting a four span bridge instead of a two span bridge would be the possible future need for a C-D road between the Flat Shoals Road interchange and the Bouldercrest Road Interchange for a potential HOV interchange in between. Access to such an interchange would need to come from C-D road located between these interchanges. Also be advised of the potential for long traffic queues in the future on the eastbound exit ramp that could create a safety hazard for high speed exiting traffic into a dual parallel exit ramp to Flat Shoals Road. The future gore under the VE alternate will be located east of the Panthersville Road bridge closer to Flat Shoals Road as compared to remaining west of the bridge in the future with the four span alternative. It is our opinion that the four span bridge alternative is more compatible to future considerations than the VE recommended two-span alternate.

The VE alternative will reduce wall costs by tightening the distance between the mainline I-285 and the ramps, but the 75% reduction is questionable at this time. We believe that further design is needed to determine those areas that require retaining walls. It may well be possible to reduce wall cost by eliminating some of the concepted wall locations by use of steeper slopes with improved stabilization and other design considerations.

RESPONSE TO VE RECOMMENDATION NO. 3

We do not concur with the recommendation not to widen the Shoal Creek bridge on I-285. We believe that the safety, capacity and operational needs of the entrance and exit ramps will require that the bridge be widened to accommodate the needed ramp construction.

RAMP C

The information provided in the VE recommendation is correct however we believe the assumptions made for the design of this ramp are incorrect. The assumed ramp entrance speed of 15 mph does not account for right turn vehicles from Flat Shoals Road which will enter the ramp from a stop condition. Therefore the acceleration distance required for 0 mph to 70 mph is 1620 feet, not 1560 feet. The VE recommendation also assumes that the vehicles will begin accelerating immediately down the ramp unimpeded. There is no discussion of the fact that this ramp is a two-lane entrance ramp that is merged into a one-lane ramp. The two lane entrance portion of the ramp will require advance warning of the upcoming lane drop and will require appropriate PIEV (perception, identification, decision making, execution) distance beyond the warning sign for the drivers to perform the maneuver to one lane before encountering the taper from two lanes to one. We believe that these maneuvers cannot be safely made while accelerating to achieve the I-285 mainline design speed. Instead, we believe that most vehicles will only accelerate to the design speed of the ramp (45 mph) by the end of the taper (after maneuvering from two lanes to one lane) and additional acceleration distance will be needed from the end of the taper to the beginning of the last ramp pavement taper into I-285. This point is where the left edge of the ramp intersects with the right edge of the outside lane of I-285. Table 10-70 in the Green Book states that the acceleration distance required from 45 mph to 70 mph is 820 feet. The final ramp pavement taper at the minimum taper rate of 50:1 will add an additional 600 ft. in ramp length. Please find below our recommendation for the minimum ramp length of Ramp C for safe traffic operations:

Location of advance warning sign "lane drop ahead"—200 ft. east of ramp C radius return. (400 ft. along the centerline of Ramp C from the N.E.P. of Flat Shoals Road)

PIEV distance required (Table 2C-4,MUTCD) 45 mph---550 ft.

Taper distance (45 mph; taper from 24 ft. to 16 ft)---360 ft.

Acceleration distance (45 mph to 70 mph) Green Book, Exhibit 10-70—820 ft.

Final ramp taper: 600 ft. (12 ft. @ 50:1) GDOT standard entrance ramp detail R-3

Total minimum ramp length: **2730 ft.** (400 ft.+ 550 ft.+360 ft.+ 820 ft.+600 ft.)

Available distance to Shoal Creek Bridge along Ramp C centerline: **2080 Ft.**

We continue to recommend the widening of Shoal Creek Bridge as a part of Ramp C design.

RAMP D

The VE recommendation to shorten the exit Ramp D to 2015 ft. does not consider the fact that the proposed design recommends a two-lane exit ramp due to capacity requirements instead of a single lane exit ramp. We can only assume that the VE recommendation has taken this into consideration and discounted the capacity needs of this exit. Two lane exits require an auxiliary lane for exiting traffic that is 1500 feet in length prior to the gore area of the ramp to develop the full capacity of the ramp. The use of the two-lane exit requires that the Shoal Creek Bridge be widened to accommodate the needed auxiliary exit lane.

We continue to recommend that the two-lane exit be utilized for Ramp D and that the Shoal Creek Bridge be widened as a part of the ramp design for this project.

RESPONSE TO VE RECOMMENDATION NO. 4

We understand that it is the policy of the GDOT Bridge Office not to use modular block walls at bridge abutments. For other locations modular block walls could be utilized but the GDOT Standard Specifications requires that modular block walls also be backfilled with special granular material of the same type that would be utilized behind a conventional MSE wall panel. This requirement raises the cost of the modular block walls almost equal to the MSE panel walls.

RESPONSE TO VE RECOMMENDATION NO. 5

During the concept validation process we were instructed by OCD project management to design the ramps and the approaches along Flat Shoals Road in the ramp terminal areas utilizing concrete pavement in lieu of asphalt pavement. The VE recommendation is founded on life cycle cost analysis. Their comparison has a thirteen year resurfacing cycle for asphalt which may be too long. We believe that the asphalt pavement will require resurfacing on a lesser cycle especially in the areas of the ramp terminal where heavy truck traffic will surely cause shoving problems due to the braking of the trucks on relatively flat grades. This VE recommendation must be decided by GDOT and we will follow whatever direction is given on this matter.

RESPONSE TO VE RECOMMENDATION NO. 6

The VE recommendation, which proposes a Single Point Urban Interchange (SPUI) instead of the Tight Urban Diamond Interchange, fails to provide any discussion of how such a bridge would be constructed while maintaining five lanes of traffic on Flat Shoals Road. The sketch as shown in the VE report indicates no realignment of the Flat Shoals Road centerline to allow for staged construction of the SPUI bridge. We believe this bridge cannot be constructed on the current alignment without constructing additional permanent or temporary structure for traffic handling that would drive projects costs far beyond any presumed savings mentioned in the report.

Furthermore, the Flat Shoals Road project contains accommodations for bicyclists and pedestrians and the SPUI is not very compatible in handling these users. If a SPUI type interchange is to be considered as a viable alternate for this project, then a more in depth, detailed engineering and traffic study should be performed between the two types that can flush out all advantages and disadvantages of each type and its application at this location. It is our opinion that no substantial cost savings can be assured by using a SPUI at this location due to the excessive skew angle and the need to maintain multilane traffic through the construction period. On the contrary, we believe that a SPUI configuration will likely greatly increase project costs ultimately.

We also disagree with the statement in the VE recommendation that the two signals at the ramp terminals will be operating at "over capacity" with the 2026 traffic volumes. In fact, the planning level operational HCS analysis contained in the VE report for the SPUI results in 'near capacity and 'at capacity' condition only because **all** right turn movements at both ramp intersections are treated as free-flow movements. When compared with the proposed Tight Urban Diamond Interchange with the same free flow right turn movements, our analysis indicates an even better v/c ratio than the SPUI. We have tried to study the limited and incomplete capacity analysis information provided in the VE report and we certainly have questions and concerns about the assumptions and methodology used in their comparisons of the two types. We do not concur with the recommendation of the VE Team to select a SPUI for this location.

Wishon, Ron

From: Tiernan, John
Sent: Thursday, February 05, 2004 9:19 AM
To: Wishon, Ron; Wheeler, Joe; Myers, Lisa
Cc: Liles, Paul
Subject: IM-NH-285-1(354)DeKalb, P.I. No. 713290

I-285 Interchange at Flat Shoals Road

Value Engineering Proposal Review

Flat Shoals Road bridge over I-285:

- 1) GDOT does not design PSC beam bridges continuous for live load
- 2) The Bridge Office recommends that this bridge be constructed using the steel plate girders as originally proposed. A 155'-6" span is longer than the Bridge Office recommends at this time.
- 3) The bridge width will be determined by the final roadway section.

Panthersville Road bridge over I-285

- 1) The bridge width will be determined by the final roadway section
- 2) Using a 2-span bridge is feasible if the span lengths do not exceed 150'-0", and the bridge is not designed to be PSC beams continuous for live load.

I-285 bridge over Shoal Creek

The need to widen this bridge will be determined by the ramp geometry.

Retaining walls:

Modular block walls are not allowed:

- 1) for heights over 20 feet
- 2) where a traffic railing is required at the top of the wall
- 3) beneath bridge end bents

Please call or email if there are any questions.

John P. Tiernan, P.E.
Assistant State Bridge Engineer
Office of Bridge Design
Georgia Department of Transportation
404-656-5284