Access Management in Value Engineering

Introduction

The purpose of this presentation is to share experiences of how access management techniques have impacted Value Engineering (VE) studies. Three topics will be described and discussed using results from actual VE studies. The topics include:

- Diamond Interchange footprint
- Urban widening (retrofit with median strip)
- Left turn lanes on rural arterial

First, let's describe the VE process. VE can be described as the systematic review and analysis of a project during the design phase to provide suggestions for adding value to a project by providing an equal or better quality product. A definition of VE contains the following three precepts:

1. An organized review to improve value by a multi-disciplined team of specialists.
2. A function analysis approach concentrating on basic functions the project needs to achieve and the costs of these functions
3. Creative thinking to explore alternate ways of performing the basic functions in a way to improve the value.

Most often a cost reduction is associated with Value Engineering, but note that "adding value" was stated. It is about adding value to the project, not just saving money. Value is defined as performance/cost, VE strives to optimize this relationship, it's goal is to achieve design excellence and efficiency. Value engineering can be simply defined as a search for a second right answer.

Next I need to provide background on our design criteria. MoDOT's Project Development Manual (PDM) contains our current design criteria. In September of 2003, The Missouri Highway & Transportation Commission approved the Access Management Guidelines (AMG) document for use as guidelines. We currently are in the process of incorporating the AMG into our PDM. The AMG allow us to improve our existing roads so that they operate more efficiently.

Diamond Interchange Footprint (VE 03-01, Rte 36 Macon to Hannibal, March ,03, NE District)

The subject of this VE study is the Rte 36 corridor from Macon to east of Monroe City in northeast Missouri. Rte 36 is on the National Highway System and is proposed to be future I-72. The scope of the project is to upgrade the existing 2 lane to a 4 lane expressway. Right of Way for freeway will be acquired as part of this project.

Current MoDOT standards for diamond interchange layout include a distance of 430' from the ramp terminals to the outer road for rural intersections (700' for urban interchanges with signals). Our Access Management Guidelines (AMG) utilize a

distance of 1320' between the ramp terminals and outer road. For the purposes of this presentation we'll refer to the 430' value as minimum and the 1320' value as "desirable". The original thoughts of the VE team were that the basic function of the interchange would perform adequately at the current standard (430') and that the AMG values of 1320' were excessive and not needed in this part of rural Missouri.

Further analysis of the options revealed two significant findings: first, the cost of the larger footprint was not significantly higher, and second, it was recognized that the larger spacing would operate better.

The economic analysis is summarized in the table below.

Distance Between Ramp Terminals and Outer Road	Right-of-Way Area (Acres)	Right-of-Way Cost at $2000/Acre	Length of Outer Road (Miles)	Outer Road Construction Cost at $771,500/mile
Minimum - 430 feet	65.8	$131,600	1.15	$888,400
Desirable - 1320 feet	62.8	$125,600	1.61	$1,244,900
	(3)	($6,000)	0.46	$356,500

It was determined that the total interchange area was about the same for each option. This is due to the area between the ramp and the outer road not being in the required r/w acquisition for the desirable option. The construction cost of the larger footprint will be greater because of longer outer roads in each quadrant.

Traffic operation advantages include:

- It is recognized that the 1320' is the minimum distance to optimize signal progression at 45 mph
- It allows time for turning vehicles
- Ensures queues do not develop down ramps onto freeway
- Less congestion-better economic development opportunities.

For the above reasons the VE team decides that it is best to fully implement access management practices especially at rural interchanges. Increasing the distance from the ramp terminal to the outer road allows for a longer operational life, also, the bridge will not need to be needed for storage, so it will not have to be widened for a longer time.

The R/W costs are about the same, and in this example, construction costs amount to about $350K more at each interchange. In this study, the plan was to acquire freeway r/w and build expressway design. The team pointed out that increases in future outer road construction costs would be offset by the savings realized in purchasing the needed r/w at current costs vs. higher future costs.

Urban Widening (VE 03-04, Boone Co, Rte 763, Columbia)

The subject of this VE study is the urban widening of an urban arterial from 2 lanes to 4 lanes with a raised median providing protected left turns at appropriate locations. This route has light industrial, commercial and residential development along the corridor. There are many driveways and the route is experiencing a high accident rate due to turning vehicles.

One of the goals of the study was to find the proper balance between applying access management and minimizing r/w impacts. Several options were analyzed that would improve the mobility and implement access management for this project. Synchro with Sim Traffic was used to analyze and determine how well each option performed.

The recommendation of the VE team included closing 6 entrances and relocating 3 to side roads. Also, three, ¾ intersections (restricting left outs) were added. The recommendation also included expanding some city streets to provide backage roads. The bottom line is that project costs were increased but the VE team showed this was necessary for the project to accomplish its goals. Performance and cost were optimized, but the cost of the project went up. This needed to be done to improve capacity and decrease accidents. The design team agreed with these recommendations.

Addition of Left Turn Lanes (VE 03-03, Camden Co., Rte 5, Camdenton)

This project is to relocate approximately 8 miles of Rte 5 around Camdenton South to the Laclede Co. line. Completion of this project will provide a relocated part 4 lane, part 2 lane. Route 5 connects central Missouri to I-44 and is a main route to Springfield, Branson and southwest Missouri. Again, a goal for this project is to apply Access Management judiciously and as economically as possible.

One area the team focused on was the addition of left turn lanes (LTL's). Currently there is significant difference in the threshold warrants for LTL's between our design manual and our Access Management Guidelines. The PDM requires 100 left turns in the peak hour, while the AMG requires only 10.

The recommendations of the VE team was to add LTL's at locations warranted by Access Management Guidelines. The team believed that the increased costs were offset by the increased capacity and increased safety by separating turn movements from through traffic.

Conclusions

The lessons I've learned are that often a VE team initially thinks that Access Management principles are considered excessive, but when they analyze the given situation, they have actually recommended to increase costs for the project so that the project will deliver it's purpose and need and achieve it's goals. VE studies have been helpful by having "fresh eyes" review the current design and developing alternate designs. VE team recommendations also can help with consensus building.

The main goal of this presentation of these case studies is to show that implementation of Access Management techniques is the direction to take with most projects.