

Extending Applications of Value Engineering Within WSDOT

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**EXTENDING APPLICATIONS OF
VALUE ENGINEERING
WITHIN WSDOT**

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Disclaimer

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification or regulation.

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CONCLUSIONS AND RECOMMENDATIONS

The value engineering program in the WSDOT continues to grow and expand. Engineering studies enable WSDOT to save money and produce items that are functionally more efficient. Employees are also motivated as they participate in the studies and realize that they can help to bring about a better end result.

This report identifies topics within the WSDOT that may benefit from a value engineering study. These topics have been grouped into the larger functional areas of maintenance, project development, and administration. This organization will help the WSDOT determine in which areas value engineering studies will be most beneficial.

A list of the value engineering studies that appear to be most important is listed below. These topics indicate the potential for savings. It may be noted that the importance of a particular topic as indicated in this report is subjective. The final choice of topics for possible implementation will rest with the decisions of administrators of the WSDOT.

BUILDING OF MAINTENANCE FACILITIES

A significant amount of money will be spent on these facilities. Approximately three to five buildings will be built each biennium. Depending on the size of the building and other factors, these buildings will range in cost from \$300,000 to \$1,000,000 each. Because the function of the buildings will

be similar, they present a good opportunity for reducing costs and increasing efficiency through a VE study.

SAFETY REST AREAS

Safety rest areas are expensive to build and maintain. WSDOT spends approximately \$4.5 million per biennium to maintain the rest areas, about \$120,000 per rest area. The cost to build or upgrade a rest area varies greatly depending on the size and site work involved. Because of these high costs, a VE study would be likely to result in a significant cost savings.

PAVEMENT MAINTENANCE

The condition of the pavement is an important part of the state highway system as well as being highly visible to the public. Much time and money are spent in this area; therefore, a VE study might result in savings and more effective ways to maintain the pavement.

RIGHT-OF-WAY ACQUISITION.

A substantial amount of time and effort is involved in acquiring right-of-way. Furthermore, it is highly visible to the general public. A VE team might devise alternative acquisition methods to save time, streamline the process and thereby save money.

ENVIRONMENTAL PROCESS

Environmental concerns are often expensive and time consuming to address. In complex projects, there are many issues to consider and delays due to environmental concerns may occur. A VE study with people involved that

had different backgrounds and from different environmental agencies might determine an optimum way to approach these problems.

STANDARD PLANS

The standard plans are used frequently throughout the state in varying degrees. By periodically reviewing the standard plans in a VE study, new technology will be incorporated into the standards. The benefits from a VE study on the plans would be multiplied with each use.

PROJECT PRIORITY PLANNING PROCESS

A study in this area might reduce overall design costs and result in positive long term effects on employee morale. This would be accomplished by eliminating those projects early in the design process which will not be completed.

INTRODUCTION

The WSDOT has become more active in the field of value engineering within the last few years as it applies to activities and work in state departments of transportation. WSDOT has spent a considerable amount of effort to implement a value engineering program that includes the training of personnel and the application of value engineering studies. These studies have in the past been conducted on selected design projects within WSDOT's districts, and it was felt that the scope of application could be expanded still further. The objective of this investigation is to identify the areas within the WSDOT that may benefit from a Value Engineering study.

However, value engineering has been applied to few specific items, projects, or operations under the control of other WSDOT offices.

Value engineering has been defined as the systematic application of recognized techniques by multi-disciplined team(s) which identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, at the lowest overall cost.

For the WSDOT, Value Engineering has meant that savings have been realized through better designed and functionally more efficient projects using the VE process. The VE process at WSDOT typically begins with a team of people from across the state with varied backgrounds and experience together for about a three to five day period. These people establish the functions of the project, use a creative, interactive thinking process to come up with alternatives that provide the required functions, and then evaluate the alternatives. Finally, recommendations are made to the design office.

By including a VE process in other offices, the WSDOT will benefit from a functionally more efficient design or process in other areas besides the design of construction projects. The VE process will aid in the decision making process by drawing on the experience and background that the VE teams will have.

This study identifies additional areas within the WSDOT that would benefit from value engineering applications. These are grouped by their respective office in this report. A list of functional areas and topics are shown in Table 1 and the topics are prioritized into three categories, namely high, medium, and low.

TABLE 1

Functional Areas and Topics

	High	Priorities Med	Low
<u>Operations and Maintenance</u>			
* The Building of Maintenance Facilities	x		
* Safety Rest Areas	x		
Contracting Out Maintenance Work	x		
* Pavement Maintenance	x		
Maintenance Operations	x		
Illumination, Traffic Control Equipment on Contract		x	
Scheduling Snow and Ice Personnel		x	
The Use and Allocation of Radios in Trucks		x	
Bridge inspection process			x
Bridge Deck Management			x
Effectiveness of Bridge Deck Overlays			x
Ditch Section Maintenance			x
State Striping Program			x
Sign Post size, Sign Supports, Sign Bridges			x
<u>Project Development</u>			
Roadside Landscaping	x		
* Environmental Process	x		
* Standard Plans	x		
Writing Specifications for Final Product Inspection	x		
Capital Engineering Facilities	x		
* Right of Way (R/W) Acquisition	x		
Pavement Design and Life Cycle Costs		x	
Patching Program		x	
Survey Work		x	
Guidelines on Pipe Alternatives		x	
Contractor Provided Engineering Vs. State Contract Engineering		x	
Methods of Measurements in Contracts		x	
The Review Process in Headquarters		x	
Significant Change Orders		x	
Process of Scheduling Projects			x
Setting the Contract Time			x
The Advertisement Date			x
Safety Requirements for Working on Bridges			x
Guidelines on Setting Materials Sources			x

Administration

The Process for Educating Personnel	x		
* Project Priority Planning Process	x		
Budget Preparation		x	
Accounting Procedures		x	
Payroll Procedures		x	
Training Seminars			x
Administrative Review Board			x
* Value Engineering topics that hold the best potential for savings.			

PROCEDURES

Interviews were conducted during the fall of 1987 to identify activities within each division that might be potential candidates for a value engineering study. The research team interviewed managers and supervisors because they generally have the best idea of the cost of various items of work within their sector of responsibility. People from WSDOT headquarters and Districts 4, 5, and 6 were interviewed.

The information gathered from these WSDOT personnel forms the basis for this report. They shared their ideas about perceived problem areas within their own divisions, as well as problems they saw in other parts of the WSDOT. In addition, they raised some problems and complaints based on their experience with WSDOT's current value engineering program. The ideas they shared involved situations that had potential for improvement and change. Most of the ideas presented in the interviews could be studied for ways to save money through increasing efficiency or decreasing the cost of the work.

The people interviewed were as follows:

Headquarters

Willis Whitney - Bridge Condition Engineer

Terry Cooper - Right of Way, Property Management Supervisor

Jack McIntosh - Hydraulics Engineer

Matt Wieteki - Hydraulics Engineer

Jerry Cheek - Utilities Engineer

Bernie Chaplin - Environmental Engineer

Tom Nelson - Construction, Grading Engineer

John Strada - Materials Engineer

Bob Krier - Bridge Administration Engineer

Dennis Ingham - Maintenance Engineer

Wayne Gruen - Maintenance, Traffic Engineer

Al Kilian - Soils Engineer

District 4

Keith Ahola - Project Development Engineer

Gerry Edwards - Construction Engineer

John Allinger - Project Engineer

Jerry Sorrell - Project Engineer

District 5

Tom Lyon - Operations and Maintenance Engineer

Guy Couture - Asst. Operations and Maintenance Engineer

Phil Nickson - Asst. Construction Engineer

Jim Buss - Project Development Engineer

Leonard Pittman - Asst. Project Development Engineer

District 6

Don Trantum - District Administrator

Larry Chatterton - Operations and Maintenance Engineer

Ron Anderson - Project Development Engineer

Ron Hart - Construction Engineer

DISCUSSION

The topics for value engineering studies are grouped by functional areas: Operations and Maintenance, Project Development, and Administration. Some of these ideas overlap, and savings might be realized in more than one area.

OPERATIONS AND MAINTENANCE

Operations and maintenance performs many different work items on a regular basis throughout the year. The savings that could be generated from the application of value engineering studies in this area would be cumulative over a long period and not just for a single project. The first application of a VE study might not show great savings, but when savings are added up over the years, a significant amount of money would be saved. The savings would be all in state monies and over the long term, would be very attractive.

High Priority

The Building of Maintenance Facilities. (Terry Cooper, Dennis Ingham)

WSDOT has a number of outdated maintenance facilities. It plans to replace these maintenance facilities at the rate of approximately three to five per biennium. The cost for these buildings range from \$300,000 to \$1,000,000 each depending on the size of building needed. This represents a considerable investment. Because these facilities will serve similar functions, the adoption of a standard design for them could result in savings. Also savings could be realized in the construction of these facilities if one group of workers (whether

state or contractor) constructed all of them. These people would gain experience as they built each building.

Possible alternatives for the construction of these maintenance facilities include the following: a) design and build on contract, b) have the maintenance buildings built for WSDOT on a 20-year lease, after which the buildings become the property of WSDOT, c) design and build using WSDOT personnel.

Safety Rest Areas. (Jack McIntosh, Dennis Ingham)

In developing and maintaining rest areas, the WSDOT incurs a high cost for building, operating, and maintaining the water and sewer systems. Approximately \$4.5 million per biennium is spent to maintain the rest areas, about \$120,000 per rest area. These rest areas are isolated, and therefore these systems generally have to be self contained. Furthermore, because these rest areas are in rural areas, the cost of repairing vandalism is high and so is the maintenance of the buildings. These items could be addressed through a VE study.

Contracting Out Maintenance Work. (Bob Krier)

One way of reducing maintenance costs might be to contract some maintenance to outside organizations. Work items that are routine would be good candidates. Work items that need quick response, related to safety, have an irregular cycle or are hard to measure would be more difficult to contract out. A VE team could set criteria for determining whether a work item could be considered for a contract. Then different work items would be examined to determine which ones fit the criteria. Included in the study would be a cost analysis to determine whether this decision would save money. Also the study would analyze the quality of service to be expected and the effect on the labor force.

Pavement Maintenance. (Dist. 5, Dist. 6)

A pavement will continue to deteriorate between upgrades. Some maintenance is needed to slow this deterioration. The issue is finding the best method for maintaining the pavement until the next contract to upgrade is awarded. One option is to chip seal. A VE team could examine whether this is effective and look for other ways to accomplish the same function of maintaining the pavement. The issues of when to chip seal, which methods to use, and what types of roads to seal could be investigated.

Maintenance Operations. (Dennis Ingham)

Many maintenance operations are possibilities for VE studies, particularly the high cost work items. In choosing specific maintenance work operations, WSDOT must be careful not to exclude any operations from consideration just because an alternative method does not seem possible. A VE team should be given the opportunity to allow the process to work and develop new solutions. The work operations that are the most expensive as well as the most complex should be investigated first for the best possible savings. Those work operations within the top 20 percent could be considered high priority.

Some specific items that a VE team should consider include the following:

- 1) Impact attenuators - they cost \$20,000 to \$30,000 to build and are expensive to maintain.
- 2) Oil separators - are they effective?
- 3) Guard rails - they are expensive and time consuming to repair.
- 4) The need for a cold, wet weather asphalt for patching.
- 5) Guide Posts - both steel and fiberglass posts still have problems.

6) Changeable traffic signs - these are expensive and will be used increasingly in the future.

7) A way to keep silt out of closed drainage systems.

Medium Priority.

Illumination, Traffic Control Equipment on Contract. (Dennis Ingham)

In large metropolitan areas, the amount of illumination, traffic control, and electronic equipment can be significant. The increasing complexity of contemporary electronic equipment makes keeping current with new technology difficult for maintenance personnel. A possible alternative to having WSDOT personnel maintain these systems would be to contract the portions of this work that are either high in volume or highly technical. A VE team could consider under which circumstances such an approach would be economical and feasible. It would determine the requirements for implementing this idea, such as the degree of complexity, the volume of work, and the size of the area to be maintained.

Scheduling Snow and Ice Personnel. (Dist. 5)

When a snow storm hits, the WSDOT must be ready to plow the roads and keep them open for the public. The people that work these shifts frequently work long hours to get the job done. This can create problems in scheduling work. The merit system rules also reduce flexibility in scheduling. A VE team could analyze the critical factors necessary to attain the required flexibility in scheduling and recommend changes to the merit system rules to allow that flexibility.

The Use and Allocation of Radios in Trucks. (Dist.5)

The WSDOT provides radios in its maintenance vehicles so supervisors and workers can communicate with each other. Radios are also used by construction inspectors. Good communication, especially in large geographic

areas, is important for effective coordination of work. A VE team would study how the radios are currently being used, determine the functions that the radios provide, develop alternative methods for using the radios, and make recommendations for how they should be used more effectively. The recommendation might indicate which vehicles should be equipped with a radio and the personnel entitled to have access to a radio.

Low Priority.

Bridge Inspection Process. (Willis Whitney)

The bridge inspection process is the primary means of collecting information about the condition of its bridges. The time spent inspecting each bridge varies from 20 minutes to two to three days, depending on the type, size, and accessibility of the bridge.

Needless to say, many personnel-hours are spent inspecting, and the process is repeated periodically. A study of the methods used, the frequency of inspection, and the data collected might uncover ways to do this more efficiently and effectively.

Bridge Deck Management. (Willis Whitney)

At least one administrator questioned whether the Department is getting its money's worth from the bridge deck management program. By the time a bridge deck is found to be deficient, it is usually too deteriorated to be given any additional service life. A VE study might suggest alternative ways for maintaining the bridge decks and determining the life cycle costs of the management alternatives.

Effectiveness of Bridge Deck Overlays. (Dist. 5)

As a bridge gets older, the deck tends to wear because of traffic and weather. Rutting may result. In order to slow down this deterioration, the deck is customarily overlaid. However, problems exist in placing an overlay. Some overlays delaminate. Others are placed over concrete pavement that is

contaminated or of poor quality. Some administrators feel that the WSDOT is not getting adequate value out of the money it spends on bridge deck overlays, and that it would be better to look at alternatives. A VE team might research the effectiveness of these bridge deck overlays. It might determine the function of the overlays, suggest alternatives for accomplishing that function including the possibility of not overlaying the bridge, and establish life cycle costs for the alternatives.

Ditch Section Maintenance. (Gerry Edwards)

When a maintenance crew cleans out a ditch, material (spoils) is usually removed from the ditch. This can cause slopes that exceed safety standards and ditches that are deeper than what is required for drainage. To help prevent this, standards could be determined and implemented for ditch maintenance. Furthermore, the material that is removed from the ditches could be used to flatten embankment slopes. For such an effort to be successful, a tie between maintenance activities and construction is necessary. Environmental concerns would also need to be considered in this process.

State Striping Program. (Wayne Gruen)

WSDOT has six separate districts, each with its own striping machine. This means that within the state, equipment and personnel skills are duplicated. A VE team could explore alternatives to the present striping program and determine which combinations would be best for WSDOT. Some alternatives include the following:

- a) continue with the present system,
- b) organize a statewide striping crew,
- c) consolidate several district crews into region-wide crews,
- d) contract all or part of the striping out to other organizations.

The team would review the different kinds of equipment available, what outputs could be expected from a crew, and the flexibility needed.

Sign Post Size, Sign Supports, Sign Bridges. (Wayne Gruen)

At least one administrator expressed the concern that the design of sign support systems is insufficient. The type of posts, size of posts, or new ideas for supporting signs would be analyzed with the VE process. Since sign bridges are fairly expensive, a VE team could determine ways to reduce the life cycle costs of that kind of sign while maintaining the function or purpose of the sign.

PROJECT DEVELOPMENT

Value engineering studies are currently being done on selected projects in the area of project development. This program has been very successful in reducing the cost and improving the design of the projects. However, other work items, procedures, and sections within project development that are used often might also be improved through value engineering studies. The savings in these studies would vary depending on the type of study. Some studies that might determine the future direction for the Department in a certain area, might result in very significant savings. Others that consider procedures might not save a great deal of state money but would streamline the process, saving the time of the people involved.

High Priority.

Roadside Landscaping. (Bernie Chaplin, John Allinger)

A considerable amount of money is spent on landscaping roadsides, especially in urban areas. The roadside landscaping is done to make the roadside more aesthetically pleasing and to fulfill environmental obligations. Some people within the WSDOT feel that the Department not getting enough value out of the money it invests for this purpose.

A VE study could review the function that roadside landscaping serves and derive ways to accomplish that purpose with a lower total life cycle cost. Some ideas to consider might include using plants that require little or no maintenance and no irrigation, or devising requirements for determining where roadside landscaping should be used.

Environmental Process. (Bernie Chaplin, Jerry Sorrell)

The environmental aspects of construction projects take a great deal of time, effort and money as well as much coordination among many state and federal environmental agencies. On complex projects, especially when an Environmental Impact Statement is required, there are many issues to address. Unforeseen problems can cause lengthy delays in the project. If the alternatives are defined early in the project, time could be saved.

A VE team could look at the procedure that WSDOT uses to deal with environmental problems. It could consider the best time or times to conduct a VE study on an especially complex project. It could also consider gathering together representatives from the different environmental agencies to work out possibilities. Other subjects that a separate VE team might gather for projects are wetlands and hazardous waste problems.

Standard Plans. (Dennis Ingham, John Strada)

Standard plans are used throughout WSDOT in varying degrees many times each year. Because these plans are used in many different projects, the potential for savings is significant. Furthermore, outdated or inefficient standards present a potential for savings because WSDOT pays for them because of inefficient construction or inferior end products.

A process should be set up to review the standard plans regularly because of the number of standard plans. This process would allow each standard plan to be reviewed periodically and new technology that had been

developed since the last review to be incorporated into the standard. Some flexibility would be needed within the schedule, to accommodate items that change often.

Writing Specifications for Final Product Inspection. (Gerry Edwards, Dist.4; Dist. 6)

WSDOT spends much time and effort in the construction inspection process because each stage of the construction project is inspected. An idea to save WSDOT money would be to write the specifications for the project to force the contractor to be responsible for the intermediate inspection. When the project was completed, WSDOT could make a final inspection to determine whether the contract agreement had been met. A VE team could examine this option and determine whether the benefits would outweigh the possible problems.

Capital Engineering Facilities. (Dist. 6)

Usually the facilities that WSDOT builds represent a major financial investment. These facilities generally have functions similar to those of other buildings within WSDOT. For example, there are many covered sand storage buildings, engineering facilities, and district administration buildings across the state. When a major building is scheduled for construction, a VE team could determine the functions that the building would be likely to serve, compare it with other similarly used structures, and determine a design that would best serve WSDOT's needs while making the building functionally efficient.

Right of Way (R/W) Acquisition. (Terry Cooper)

Acquiring R/W for improvements can be a costly and time consuming process. Much effort is spent buying additional R/W because of plan revisions. Extra money is spent on unreasonable settlements in order to stay on schedule. Some laws may restrict the flexibility of the state in getting the best

value for its money. In acquiring partial pieces of land, the state may end up paying more for the part than if it had been able to buy the whole lot and then sell the remainder to adjacent landowners. Continuous appeals on certain projects make the R/W acquisition process a costly, drawn-out affair. Furthermore, the state has new opportunities to lease air space in highly populated areas.

With the many options, the complexity, and the laws that currently restrict the state (which should be open for changing), opportunities are available for achieving some increase in productivity.

VE studies could investigate some of the following possibilities:

- a) changing the laws governing the acquisition of partial pieces of land, limiting the appeal process (except for disagreement about money) to the period before the Order Adjudicating Public Use is completed,
- b) taking a look at ways to minimize R/W plan revisions once the buying of R/W has begun, and
- c) examining the scheduling process to try to determine ways to avoid unreasonable settlements caused by time constraints.

Another idea that a VE team might consider is the development of the WSDOT's computer aided design system to aid the Department in obtaining the land by showing property owners three-dimensional views of what proposed projects will look like after they are built. This can be used to reduce property owners concerns about development and thereby speed up the process of obtaining right-of-way. A plan could also be developed to encourage the application of leasing airspace for commercial development in metropolitan areas.

Medium Priority.

Pavement Design and Life Cycle Costs. (Dist. 5, Dist. 6)

There are two basic types of pavement, asphalt pavement (flexible) and concrete pavement (rigid). These are both good options, depending on the situation. A VE team could study the characteristics of these pavements in the context of a variety of circumstances, including factors such as expected traffic volume, percentage of heavy vehicles, availability of materials in the area, cost fluctuations of materials, quality of subgrade, maintenance costs and weather conditions normally encountered. The team could also consider reinforced concrete pavement as an option. The VE team could then determine the life cycle costs to be expected for the pavement in these different conditions and make statewide guidelines to be used in determining which pavement to select under generally known conditions.

Patching Program. (Gerry Edwards, Dist.4; Dist. 6)

Overlays make a project look good when they are first laid. However, some overlays are thin, and without much structural value. They may cause some problems in the roadway structure to be overlooked. They have caused some administrators to ask about the value WSDOT is getting out of the thin overlays. A VE team could look at some alternatives to these overlays, the thickness of the overlay that would give the WSDOT the most value for its money, and the timing of the overlays in the life of a roadway. Different pavements would probably be best suited for different alternatives under varying climatic conditions.

Survey Work. (Keith Ahola and Gerry Edwards, Dist.4)

Survey work for certain projects can be costly to WSDOT. A VE team could research the idea of making survey work part of the contract. The team would need to consider different types of contracts, different sizes of contracts, overall personnel requirements and the availability of WSDOT's personnel.

The team could come up with guidelines that could be used to determine whether the contractor should provide surveying or WSDOT should do its own surveying.

Guidelines on Pipe Alternatives. (Dist. 4, Gerry Edwards)

The current logic for evaluating piping may be outdated and districts need guidelines on the different pipe alternatives. In recent years pipe manufacturers have devised many different piping alternatives. There are now about 40 different pipes on the market. This would give a VE team many options to review. The team would need to set up a process for evaluating new pipe alternatives as they come on the market.

Currently WSDOT air tests certain types of pipe after it has been placed in the ground. Other jurisdictions within the state do not always require this air testing. A VE team could look at the benefits that the air testing requirements provide and determine if they help meet the functional demands of the pipe.

Contractor Provided Engineering Vs. State Contract Engineering. (Dist. 6)

A VE team could examine in which conditions or situations "contractor provided engineering" would be better than WSDOT contract engineering. The team could suggest criteria that could be used to evaluate when to seek a contractor. The team would need to anticipate problems in using a contractor and then compare the expected quality of work with WSDOT engineering.

Methods of Measurements in Contracts. (Gerry Edwards, Dist. 4)

Measuring contract items in a construction contract often takes a large amount of effort and time. Furthermore, once the measurement has been made, the resulting amount of paperwork can be very large. The effort on measurement work is compromised for quality control.

A VE team could examine the requirements for accurately measuring the contractor's work by developing procedures for reducing the time needed to measure. Also, the paperwork that accompanies measuring contract items could be reduced. One possibility might be to look at how the contract items are specified for measurement.

The Review Process in Headquarters. (Dist. 5)

Much time is spent in Headquarters reviewing the construction projects that the districts design and put together. Some people in the district offices question whether this review process is worth the effort. Furthermore, some administrators would like to see the districts be given more freedom in what they do. A VE team could examine the costs and benefits of the current review process recommendations for any changes they think would make the review process more efficient and beneficial.

Significant Change Orders. (Jerry Sorrell)

Often during construction work, change orders occur that are major in scope. These change orders may affect many different parts of a contract. A VE procedure could be set up within each district to process these major change orders. A range of parameters would need to be set up for determining which change orders to address in this VE process.

Low Priority.

Process of Scheduling Projects. (Jack McIntosh)

The commencement time of certain projects can be either beneficial or detrimental to both the WSDOT and the contractor. A VE team could determine optimum time frames through the year for various types of projects.

Projects that have critical seasonal constraints should be carefully examined.

Setting the Contract Time. (Tom Nelson)

If the project length is either too long or too short, inefficiencies occur for both WSDOT and the contractor. If the contract does not allow enough time, then the contractor will need to bring extra equipment and personnel to the job and work an excessive amount of overtime, which WSDOT will pay for indirectly. If the contract allows too much time, then the project will be dragged out and be inefficient.

The Advertisement Date. (Tom Nelson)

More flexibility is needed in determining the advertisement (ad) date. Much of WSDOT operations and decision about construction contracts revolves around the ad date. Time and money are wasted by trying to hold the schedule too tight. If a project is rushed, then overtime is used to hurry it up. This can be expensive and can cause mistakes if personnel are not careful enough in the final stages of the design. Personnel may easily overlook things or not consider all the details when they are rushed.

Safety Requirements for Working on Bridges. (Dist. 6)

The government has established many regulations for the safety of workers. These include regulations for working above certain heights and for working near traffic. Often these safety regulations may hinder work performance without significantly increasing the safety of the workers. Some administrators expressed the feeling that many of these regulations are more than what is necessary to ensure reasonable safety. A VE team could investigate the safety requirements, determine the functions that these regulations perform, and recommend the safety features that are really needed. These recommendations, along with the supporting evidence, could then be taken before the governing safety regulatory agency to persuade it to adopt new regulations. Other safety regulations that affect WSDOT could also be examined.

Guidelines on Setting Materials Sources. (Dist. 5)

On construction projects, materials are often a big cost item. Sometimes the WSDOT sets up a materials source for the contractor to use and sometimes the contractor finds their own source. General guidelines could be set up for the districts to use in determining which method to utilize. A VE team could establish certain parameters and typical situations that might be encountered. Using these parameters, the districts would be able to establish which method to use for obtaining the materials would be the least costly for the state while maintaining quality.

ADMINISTRATION

The ideas that are grouped in this section concern support functions for the different functional areas. The value engineering studies undertaken in this group will save time for the people in the office discussed. Savings will result from the detection of unnecessary requirements or functions, the provision of more effective methods for helping the divisions, and from making the most efficient use of people's efforts.

High Priority.

The Process for Educating Personnel. (Jerry Sorrell, Dist. 4)

The tools that WSDOT currently uses to educate and train personnel are usually directives, manuals, training seminars, and policies, among others. This process is not always very effective, especially for people at lower levels within WSDOT. With the current procedure, a considerable amount of time is needed to communicate the desired information to the people for whom it is intended. Furthermore, the information may be misunderstood or misinterpreted by the receiver. A VE team could examine the ways that

WSDOT uses to educate and relay information to its employees. Alternative ways could be developed and examined to determine the most effective and efficient methods for disseminating information.

Project Priority Planning Process. (Jim MacClellan, Dist. 4)

A great deal of the design engineers' time is wasted when a project, that is far along in the design process is discarded or deleted. Also, morale and overall effort drops when a project that has been worked on for some time is thrown out. An examination by a VE team on how projects are prioritized might produce a way to save on engineering costs. An evaluation of the timing of stopping projects might also result in savings.

Medium Priority.

Budget Preparation. (Dist. 6)

Are the funds WSDOT is given to build and maintain the state highway system being used optimally? WSDOT has several different categories of funding. Is the right amount of money being spent on each type of road and in each type of category? What is the balance of funds that would give the state the most value for the money invested? A VE team could examine how the budget is prepared, develop some alternative methods for determining where the money should be spent, and recommend how WSDOT can maximize the condition of its roads for the money available.

Accounting Procedures. (Jerry Sorrell Dist. 4; Dist. 6)

In many of the current accounting procedures, too much paperwork appears to be involved. For instance, the purchase of something as simple as a radiator cap may involve 17 pieces of paperwork. Opportunities should be available to streamline methods of obtaining needed items. A VE team could investigate ways to reduce the amount of paperwork needed while satisfying the requirements of the billing and administration office.

Payroll Procedures. (Dist. 5)

The procedures that the maintenance and engineering people use for payroll have been set up for them by accountants. Although this procedure satisfies the accountants, it is cumbersome, confusing and time consuming for the majority of people who use the payroll, the maintenance and engineering people. A VE team could examine the function of payroll, suggest alternatives for accomplishing the function, and present a solution that would be the most efficient for both ends of the payroll procedure.

Low Priority.

Training Seminars. (Jack McIntosh)

The WSDOT highly values the training and development of its employees. Many one-day or two-day classes are designed to give specialized training or education in a particular field. However the instructors can not be effective in those classes if the students do not have a certain level of competency in the specific subject with which to absorb the contents of the classes. Other problems of effectiveness arise when people are not able to immediately use what they have learned in a training session, even though they may apply the training from the class in the future.

A VE study could be performed to review the criteria used to determine who is recommended for training. Also, the team could look at the scheduling procedure to determine the optimum time in an employee's career to take a particular training class. The team could set basic prerequisites for various training classes.

Administrative Review Board. (Dist.5)

A considerable amount of time is spent by administrative personnel in meetings reviewing projects. Some people have questioned whether WSDOT is benefiting enough to justify the time spent in the meetings. A study could

examine this review board, determine the costs and benefits of the program, and make recommendations to either discontinue the review board or make changes in the procedure to improve the review board's function.

ADDITIONAL IDEAS FOR WSDOT TO CONSIDER

Develop Airspace Leasing Opportunities. (Terry Cooper)

In metropolitan areas, the cost of land for developers is extremely high. Leasing airspace over state right-of-way is a way to work with developers to make area available that previously had been used only to a limited degree. This idea has advantages for both the state and the developer. The state would benefit by receiving a significant income from leasing the airspace to the developer. The developer would be willing to agree to the lease because it would enable him or her to develop property in very good locations that otherwise would not be available. It would open up new opportunities for the developer.

The state has leased airspace to a small degree, but it could encourage more leasing opportunities by planning for them in the project development stage. If airspace leasing is planned for when the highway is designed, then more opportunities will be available for the developers and the sites will better fit the needs of the developer. As space becomes more scarce, the state will have more opportunities to do this and will gain a source of revenue.

Use of Three-Dimensional CADD to show Landowners the Proposed Development Near Their Property. (Terry Cooper)

When right-of-way personnel talk to landowners about purchasing land, many times the landowners want to know what the project will look like after construction is finished. CADD has the capability to work in three dimensions. A feasibility study could be done to determine what the costs would be of setting up CADD to integrate existing topography and proposed

design. The final product would be a perspective plot showing how the completed project would look to the adjacent landowners. These perspective plots could also be used in hearings to show what the final project would look like.

Truck Weight. (Terry Cooper)

It is generally agreed that the majority of road failures caused by usage are due to trucks. Because of this, roads are designed for the anticipated truck load. When the allowable weight of trucks increases, then the roads experience failure much earlier than their anticipated life cycle. The weight that trucks are allowed to carry should be determined and then maintained for a long period. This will allow WSDOT to get the maximum benefit out of the road, and the road to achieve its life cycle in the planned amount of time.

The Ferry System. (Terry Cooper)

The ferry system's employees are under different merit system rules than the rest of the state transportation employees. There should be consistency between these people and the rest of the Department. One option would be for WSDOT to sell the ferry system to a private firm while maintaining certain controls over the performance of the ferry system. Another option would be to bring the ferry system employees under the same merit system rules and a similar pay scale as the rest of WSDOT employees.

Commercial Development at Rest Areas. (Terry Cooper)

Rest areas are expensive places for WSDOT to develop and maintain. However, rest areas are an important aspect of the state highway system because they provide safety stops for the traveling public. Rest areas also are highly visible facilities to visitors. One idea for reducing the state's cost to maintain these rest areas is to promote commercial development at or adjacent to the rest areas. A long term agreement could be set up between a company that specializes in quick service and WSDOT. In return for allowing

the company to operate its business next to the rest area, the company would be responsible for maintenance of the rest area facilities. This idea would reduce the maintenance costs required for upkeep, reduce the vandalism costs and increase the security of the area. The motorist would also be more conveniently served by having gas and quick food close to the rest areas.

Special Money Fund. (Dist. 5)

Sometimes there are small projects that, if done, can benefit the state in the future. These small projects may not be tied to an individual project at the present, but may be in the future or may save a considerable amount of time and money if done right away. An example of this might be the establishment of a rock quarry pit site for use in future construction contracts. This fund would be primarily for the districts to use when they needed it, and its use would have to be flexible.

PROBLEMS MENTIONED ABOUT THE WSDOT VE PROGRAM

Inadequate Feedback. Most of the people interviewed who had participated in a value engineering study enjoyed the experience. They thought it was worthwhile, and most of the people looked forward to being a participant in the future. However, several people said that they wondered what happened to the project after they were done with the value engineering study. They were interested in knowing how the study was implemented, why ideas were not used, and problems that were encountered during the construction phase.

Timing Of the VE Study In The Design Process. For the most benefit to be achieved from the value engineering program, the study must be done after adequate information has been gathered, but not too late in the design process after many of the details have been worked out. When the VE

study is done late in the design process, any changes result in wasted time and a decline in the morale of the design team.

On the other hand some studies in the past have not had enough data with which to make rational decisions about the project. The study must be timed correctly to enable the VE study participants to have adequate information.

Realistic Benefits and Costs. Some think that the costs and benefits of implementing VE study recommendations have been exaggerated. They think that possible alternative solutions have been evaluated differently to show the benefits of value engineering.

Changes in Constraints. When doing a value engineering study, the team may consider alternatives that are quite different than the ones considered by the design team. In looking at the function of the project, items that were formally thought of as constraints might no longer exist. Some perceived this as changing the rules.