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### 310.01 General

Value engineering (VE) is a systematic process that uses a team from a variety of disciplines to improve the value of a project through the analysis of its functions. The VE process incorporates, to the greatest extent possible, the values of design; construction; maintenance; contractor; state, local and federal approval agencies; other stakeholders; and the public.

The primary objective of a value engineering study is value improvement. The value improvements might relate to scope definition, functional design, constructibility, coordination (both internal and external), or the schedule for project development. Other possible value improvements are reduced environmental impacts, reduced public (traffic) inconvenience, or reduced project cost.

Value engineering can be applied during any stage of a project's development, although the greatest benefits and resource savings are typically achieved early in development during the planning or scoping phases.

Value engineering may be applied more than once during the life of the project. Early application of a VE study helps to get the project started in the right direction, and repeated applications help to refine the project's direction based on new or changing information. The later a VE study is conducted in project development, the more likely it is that implementation costs will increase.

A VE study may be applied as a quick response study to address a problem or as an integral part of an overall organizational effort to stimulate innovation and improve performance characteristics.

### 310.02 References

#### (1) *Federal/State Laws and Codes*

23 United States Code (USC) 106, Project approval and oversight

#### (2) *Design Guidance*

*Value Engineering for Highways, Study Workbook*, U.S. Department of Transportation, FHWA

*Value Standard and Body of Knowledge*, SAVE International, The Value Society:

☞ [www.value-eng.org/](http://www.value-eng.org/)

WSDOT value engineering website:

☞ [www.wsdot.wa.gov/design/ValueEngineering/](http://www.wsdot.wa.gov/design/ValueEngineering/)

### 310.03 Definitions

**value engineering (VE)** A systematic process used by a multidisciplinary team to improve the value of a project through the analysis of its functions. The team identifies the functions of a project, establishes a worth for each function, generates alternatives through the use of creative thinking, and provides the needed functions to accomplish the original purpose—thus ensuring the lowest life cycle cost without sacrificing safety, quality, or environmental attributes. Value engineering is sometimes referred to as Value Analysis (VA) or Value Management (VM).

**project** The portion of a transportation facility that the Washington State Department of Transportation (WSDOT) proposes to construct, reconstruct, or improve, as described in the State Highway System Plan or applicable environmental documents. A project may consist of several contracts or phases over several years that are studied together as *one project*.

### 310.04 Procedure

The VE process uses the Seven-Phase Job Plan shown in Exhibit 310-1. Phase 7 is discussed in this chapter. A detailed discussion of Phases 1 through 6 can be found in the document, *Value Standard and Body of Knowledge*, developed by SAVE International, The Value Society. This document can be downloaded at the SAVE website: [www.value-eng.org/](http://www.value-eng.org/)

#### (1) Project Selection

##### (a) Requirements

Projects for VE studies may be selected from any of the categories identified in the Highway Construction Program, including Preservation and Improvement projects, depending on the size and/or complexity of the project. In addition to the cost, other issues adding to the complexity of the project design are considered in the selection process. They include critical constraints, difficult technical issues, expensive solutions, external influences, and complicated functional requirements.

The Federal Highway Administration (FHWA) requires a VE study for all design-bid-build and design-build projects that meet the following criteria:

- Each project on the federal-aid system with a total estimated cost of \$25 million or more.
- A bridge project with a total estimated cost of \$20 million or more.
- Any other project the United States Secretary of Transportation determines to be appropriate (23 USC 106).

Additionally, WSDOT policy requires a VE study for any non-NHS project with a *total* estimated cost of \$25 million or more. This *total* estimated cost includes preliminary engineering, construction, right of way, and utilities. Other projects that should be considered for value engineering have a *total* estimated cost exceeding \$5 million and include one or more of the following:

- Alternative solutions that vary the scope and cost
- New alignment or bypass sections
- Capacity improvements that widen the existing highway

- Major structures
- Interchanges
- Extensive or expensive environmental or geotechnical requirements
- Materials that are difficult to acquire or that require special efforts
- Inferior materials sources
- New/Reconstruction projects
- Major traffic control requirements or multiple construction stages

(b) **Statewide VE Study Plan**

On an annual basis, the State VE Manager coordinates with the Region VE Coordinators to prepare an annual VE Study Plan, with specific projects scheduled quarterly. The VE Study Plan is the basis for determining the projected VE program needs, including team members, team leaders, and training. The Statewide VE Study Plan is a working document, and close coordination is necessary between Headquarters (HQ) and the regions to keep it updated.

The Region VE Coordinator:

- Identifies potential projects for VE studies from the Project Summaries and the available planning documents for future work.
- Makes recommendations for the VE study timing.
- Presents a list of the identified projects to region management to prioritize into a regional annual VE Study Plan.

The State VE Manager:

- Reviews the regional annual VE Study Plan regarding the content and schedule of the plan.

The State VE Coordinator:

- Incorporates the regional annual VE Study plans and the HQ Study plans to create the Statewide VE Study Plan.

(c) **VE Study Timing**

Selecting the project at the appropriate stage of development (the timing of the study) is very important to the success of the VE study. Value can be added by performing a VE study at any time during project development; however, the WSDOT VE program identifies three windows of opportunity for performing a VE study.

1. **Scoping Phase**

As soon as preliminary engineering information is available and the specific deficiencies or drivers are identified, the project scope and preliminary cost are under consideration. This is the best time to consider the various alternatives or design solutions, with the highest potential for the related recommendations of the VE team to be implemented. At the conclusion of the VE study, the project scope, preliminary cost, and major design decisions can be based on the recommendations.

When conducting a study during the scoping phase of a project, the VE study focuses on issues affecting project drivers. This stage often provides an opportunity for building consensus with stakeholders.

## 2. Start of Design

At the start of design, the project scope and preliminary cost have already been established and the major design decisions have been made. Some Plans, Specifications, and Estimates (PS&E) activities may have begun, and coordination has been initiated with the various service units that will be involved with the design. At this stage, the established project scope, preliminary cost, and schedule will define the limits of the VE study and there is still opportunity for the study to focus on the technical issues of the specific design elements.

## 3. Design Approval

After the project receives Design Approval, most of the important project decisions have been made and the opportunity to affect the project design is limited. The VE study focuses on constructibility, construction sequencing, staging, traffic control, and any significant design issues identified during design development.

An additional VE study may be beneficial late in the development stage when the estimated cost of the project exceeds the project budget. The value engineering process can be applied to the project to lower the cost while maintaining the value and quality of the design.

## 4. Design-Build Projects

For design-build projects on which a VE study is required, perform the study prior to issuing the Request for Proposal (RFP). It is not practicable to perform a VE study in the design-build contract phase.

### (d) Study Preparation

To initiate a VE study, the project manager submits a Request for Value Engineering Study form to the Region VE Coordinator at least two months before the proposed study date. The form may be downloaded from the WSDOT Value Engineering website: [www.wsdot.wa.gov/design/ValueEngineering/Tools/](http://www.wsdot.wa.gov/design/ValueEngineering/Tools/)

The Region VE Coordinator then works with the State VE Coordinator to determine the team leader and team members for the VE study.

The design team prepares a study package of project information for each of the team members. (A list of potential items is shown in Exhibit 310-2.) The VE team members should receive this information at least one week prior to the study so they have time to review the material.

The region provides a facility and the equipment for the study (see Exhibit 310-2).

**(e) Team Leader**

The quality of the VE study is dependent on the skills of the VE team leader. This individual guides the team's efforts and is responsible for its actions during the study. The best VE team leader is knowledgeable and proficient in transportation design and construction and in the VE study process for transportation projects.

The VE team leader's responsibilities include the following:

- Plan, lead, and facilitate the VE Study.
- Ensure proper application of a value methodology and follow the Job Plan.
- Guide the team through the activities needed to complete the prestudy, the VE study, and the poststudy stages of a VE study.
- Schedule a preworkshop meeting with the project team and prepare the agenda for the VE study.

For best results, the team leader should be certified by the Society of American Value Engineers (SAVE) as a Certified Value Specialist (CVS) or as a Value Methodology Practitioner (VMP).

Team leadership can be supplied from within the region, from another region, or from Headquarters. A statewide pool of qualified team leaders is maintained by the State VE Coordinator, who works with the Region VE Coordinator to select the team leader. When no qualified team leader is available, or it is deemed beneficial for a particular study, consultants or other qualified leaders outside WSDOT may be employed.

**(f) Team Members**

The VE team is usually composed of five to ten people with diverse expertise relevant to the specific study. The team members may be selected from the regions; Headquarters; other local, state, or federal agencies; or the private sector.

Team members are selected based on what expertise is needed to address the major functional areas and critical high-cost issues of the study. All team members must be committed to the time required for the study. For best results, team members should have attended Value Engineering Module 1 training before participating in a VE study.

**(g) VE Study Requirements**

The time required to conduct a VE study varies with the complexity and size of the project, but typically ranges from three to five days. The VE team leader working with the project manager will determine the best length for the study.

The VE study Final Report includes an executive summary; a narrative description of project information; the background, history, constraints, and controlling decisions; the VE team focus areas; a discussion of the team speculation and evaluation processes; and the team's final recommendations. All of the team's evaluation documentation (including sketches, calculations, analyses, and rationale for recommendations) is included in the Final Report. A copy of the Final Report is to be included in the Project File. The project manager will specify the number of copies to be provided to the project team. The State VE Manager also provides a copy of the report to the FHWA for projects on the National Highway System or federal-aid system.

## **(2) Implementation**

The project manager reviews and evaluates the VE team's recommendation(s) that are included in the Final Report. The project manager completes the VE Recommendation Approval form included in the Final Report.

For each recommendation that is not approved or is modified by the project manager, justification is to be provided in the form of a VE Decision Document. The VE Decision Document includes a specific response for each of the disapproved or modified recommendations. Responses include a summary statement containing the project manager's decision not to use the recommendation in the project.

Send the completed VE Recommendation Approval form and, if necessary, the VE Decision Document to the State VE Manager by September 1 of each year so the results can be included in the annual WSDOT VE Report to FHWA. If a VE Decision Document was submitted, it is to be forwarded to the State Design Engineer for review. The VE Recommendation Approval form and VE Decision Document are to be included in the Design Documentation Package.

### **310.05 Documentation**

For the list of documents required to be preserved in the Design Documentation Package and the Project File, see the Design Documentation Checklist:

☞ [www.wsdot.wa.gov/design/projectdev](http://www.wsdot.wa.gov/design/projectdev)

<b>1. Information/Investigation Phase</b>	Gather information. Investigate background information, technical input reports, and field data. Develop team focus and objectives.
<b>2. Function Analysis Phase</b>	Define project functions using a two-word active verb/measurable noun context. Review and analyze these functions to determine which need improvement, elimination, or creation to meet the project's goals.
<b>3. Creative/Speculation Phase</b>	Be creative and brainstorm alternative proposals and solutions.
<b>4. Evaluation Phase</b>	Analyze design alternatives, technical processes, life cycle costs, documentation of logic, and rationale.
<b>5. Development Phase</b>	Develop technical and economic supporting data to prove the feasibility of the desirable concepts. Develop team recommendations. Recommend long-term as well as interim solutions.
<b>6. Presentation Phase</b>	Present the recommendations of the VE team to the project team and region management in an oral presentation, and provide a written report.
<b>7. Implementation Phase 310.04(2)</b>	Evaluate the recommendations. Prepare an implementation plan (VE Decision Document), including the response of the managers and a schedule for accomplishing the decisions based on the recommendations.

**Note:**

Phases 1–6 are performed during the study; see *Value Standard and Body of Knowledge* for procedures during these steps.

**Seven-Phase Job Plan for VE Studies**  
*Exhibit 310-1*

<b>Project-Related Input* (Study Package)</b>
Accident data
Aerial photos
Contour maps
Cross sections and profiles
Design file
Environmental documents
Estimates
Existing as-built plans
Geotechnical reports
Hydraulic Report
Land use maps
Large-scale aerial photographs
Plan sheets
Quadrant maps
Quantities
Right of way plans
Traffic data
Vicinity map
<b>Study-Related Facilities and Equipment</b>
AASHTO Green Book
Bridge list
Calculators
Computer projector
<i>Design Manual</i>
Easel(s) and easel paper pads
Field tables
Marking pens
Masking and clear tape
Network computer access (if available)
Power strip(s) and extension cords
Room with a large table and adequate space for the team
Scales, straight edges, and curves
<i>Standard Plans</i>
<i>Standard Specifications</i>
State Highway Log
Telephone
Vehicle or vehicles with adequate seating to transport the VE team for a site visit**

\* Not all information listed may be available to the team, depending on the project stage.

\*\* If a site visit is not possible, provide video of the project.

**VE Study Team Tools**  
*Exhibit 310-2*