# Chapter 310  Value Engineering

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## 310.01 General

Value engineering (VE) analysis is a systematic process of reviewing and assessing a project by a multidisciplinary team not directly involved in the planning and development phases of a specific project. The VE process incorporates the values of design; construction; maintenance; contractor; state, local, and federal approval agencies; other stakeholders; and the public.

Value engineering analyses are conducted early in WSDOT project development to identify ideas that might reduce cost, refine scope definition, improve design functionality, improve constructability, improve coordination/schedule; and identify other value improvements, including reduced environmental impacts and congestion.

A VE analysis 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

### 310.02(1) Federal Laws and Codes

- Title 23 U.S.C. Section 106(e) – Value Engineering Analysis
- Title 23 CFR Part 627 – Value Engineering
- MAP-21 (Moving Ahead for Progress in the 21st Century), Section 1503
- Circular A-131, Office of Management and Budget (OMB)
  - [http://www.whitehouse.gov/omb/circulars_a131](http://www.whitehouse.gov/omb/circulars_a131)
- FHWA Value Engineering Policy (Order #1311.1A)

### 310.02(2) Design Guidance


- WSDOT Value Engineering website: [www.wsdot.wa.gov/design/valueengineering/](http://www.wsdot.wa.gov/design/valueengineering/)
310.03  Statewide VE Program

310.03(1)  Annual VE Plan

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

310.03(2)  Selecting Projects for VE Analysis

310.03(2)(a)  Requirements

WSDOT 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 or construction are considered in the selection process. These include projects that have critical constraints, difficult technical issues, expensive solutions, external influences, and complicated functional requirements, regardless of the estimated project cost.

WSDOT may conduct VE analyses on any project the project manager determines will benefit from the exercise. In addition, WSDOT conducts VE analyses for all projects as required by the criteria set forth in Federal Highway Administration (FHWA) Value Engineering Policy Order 1311.1A, May 25, 2010:

1. A value engineering analysis is required for:
   - Any project with an estimated cost (which includes project development, design, right of way, and construction costs) of $25 million or more, regardless of funding;
   - Each bridge project located on or off of the federal-aid system with an estimated total cost of $20 million or more (WSDOT policy is to conduct a VE analysis regardless of funding source); and
   - Any other projects the Secretary or FHWA determines to be appropriate.

2. In addition to the projects described above, WSDOT strongly encourages a VE analysis on other projects where there is a high potential for cost savings in comparison to the cost of the VE analysis, or the potential exists to improve the projects’ performance or quality. Projects involving complex technical issues, challenging project constraints, unique requirements, and competing community and stakeholder objectives offer opportunities for improved value by conducting VE analyses.

3. Any use of Federal-Aid Highway Program (FAHP) funding on a Major Project requires that a VE analysis be conducted. In some cases, regardless of the amount of FAHP funding, a project team may be required to perform more than one VE analysis for a Major Project.

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1 Based on the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), signed into law on August 10, 2005, a Major Project is defined as "a project with a total estimated cost of $500 million or more that is receiving financial assistance." FHWA also has the discretion to designate a project with a total cost of less than $500 million as a Major Project. FHWA may choose to do so in situations where the projects require a substantial portion of the State Transportation Agency’s (STA’s) program resources; have a high level of public or congressional interest; are unusually complex; have extraordinary implications for the national transportation system; or are likely to exceed $500 million in total cost.
4. After completing the required VE analysis, if the project is subsequently split into smaller projects in final design or is programmed to be completed by the advertisement of multiple construction contracts, an additional VE analysis is not required. However, splitting a project into smaller projects or multiple construction contracts is not an accepted method to avoid the requirements to conduct a VE analysis.

5. WSDOT may require a VE analysis to be conducted if a region or public authority encounters instances when the design of a project has been completed but the project does not immediately proceed to construction.
   a. If a project meeting the above criteria encounters a three-year or longer delay prior to advertisement for construction, and a substantial change to the project’s scope or design is identified, WSDOT may require a new VE analysis or an update to the previous VE analysis; or
   b. If a project’s estimated cost was below the criteria identified above but the project advances to construction advertisement, and a substantial change occurs to the project’s scope or design, causing an increase in the project cost so that it meets the criteria identified above and results in a required re-evaluation of the environmental document, WSDOT requires that a new VE analysis be conducted.

6. When the design of a project has been completed but the project does not immediately proceed to construction, the requirement to conduct a VE analysis is considered to be satisfied, or not necessary, if:
   a. A project met the criteria identified above and had a VE analysis conducted, and the project advances to advertisement for construction without any substantial changes in its scope or its design; or
   b. A project’s estimated cost initially fell below the criteria identified above, but when advancing to advertisement for construction, falls above the criteria due to inflation, standard escalation of costs, or minor modifications to the project’s design or contract.

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
310.03(3) VE Analysis Timing

310.03(3)(a) When to Conduct the VE Analysis

Timing is very important to the success of the VE analysis. A VE analysis should be conducted as early as practicable in the planning or development of a project, preferably before the completion of preliminary design. At a minimum, the VE analysis is to be conducted prior to completing the final design.

The VE analysis should be closely coordinated with other project development activities to minimize the impact approved recommendations might have on previous agency, community, or environmental commitments; the project’s scope; and the use of innovative technologies, materials, methods, plans, or construction provisions. In addition, VE analyses should be coordinated with risk assessment workshops such as Cost Risk Assessment (CRA) or Cost Estimate Validation Process (CEVP) (see \( \text{www.wsdot.wa.gov/design/saeo/} \)).

Benefits can potentially be realized by performing a VE analysis at any time during project development; however, the WSDOT VE program identifies the following three windows of opportunity for performing a VE analysis.

1. Scoping Phase

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

When conducting a study during the scoping phase of a project, the VE analysis 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 costs 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 costs, and schedule will define the limits of the VE analysis 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. Provided that the Design Approval is early enough to incorporate the adopted VE recommendations, the VE analysis should focus on constructability, construction sequencing, staging, traffic control, and any significant design issues identified during design development.

An additional VE analysis 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.
310.03(4) VE Program Roles and Responsibilities

310.03(4)(a) Region VE Coordinator
- Identifies region projects for VE analyses (from Project Summaries and available planning documents).
- Makes recommendations for timing of the VE analysis for each project.
- Presents a list of the identified projects to region management to prioritize into a regional annual VE Plan.
- Identifies potential team facilitators and members for participation statewide.

310.03(4)(b) State VE Manager
- Reviews regional VE Plans regarding content and schedule.

310.03(4)(c) State VE Coordinator
- Incorporates the regional annual VE Plans and the Headquarters Plan to create the Statewide VE Plan.
- Prepares annual VE Report.
- Maintains policy documents for the department.
- Coordinates studies.
- Arranges training for future VE team leaders and members.

310.03(4)(d) VE Team Leader

The quality of the VE analysis largely depends 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 VE team leader should be knowledgeable and proficient in transportation design and construction and in the VE analysis process for transportation projects.

The VE team leader’s responsibilities include the following:
- Plans, leads, and facilitates the VE study.
- Ensures proper application of a value methodology.
- Follows the Job Plan.
- Guides the team through the activities needed to complete the pre-study, the VE study, and the post-study stages of a VE study.
- Schedules a pre-workshop meeting with the project team and prepares the agenda for the VE study.

Team leaders from within WSDOT are encouraged but not required to 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 using consultant team leaders, SAVE certification is required.
310.03(4)(e) VE Team Members

The VE team is typically 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 not directly involved in the planning and development phases of the project and are selected based on the identified expertise 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. It is desirable for team members to have attended Value Engineering Module 1 training before participating in a VE study.

310.04 VE Procedure

The VE analysis uses the Seven-Phase Job Plan shown in Exhibit 310-1. A detailed discussion of how each phase is supposed to be conducted can be found in the document, Value Methodology 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/

310.04(1) Pre-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 is located on the WSDOT value engineering website: 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. Contacts are listed on the WSDOT value engineering website: www.wsdot.wa.gov/design/valueengineering

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).

310.04(2) VE Analysis Requirements

The time required to conduct a VE analysis 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 analysis Final Report includes an executive summary; a narrative description of project information; the background, history, constraints, and controlling decisions; the VE team’s focus areas; a discussion of the team’s 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.
Post-VE analysis activities include:

- Implementation and evaluation of the approved recommendations and their outcomes.
- Documentation of the reasons for not implementing approved recommendations.

Note: These post-analysis activities are conducted prior to the final design phase to ensure the recommendations are included in the final design or the reasons for not implementing the recommendations are included in the design documentation.

310.04(3) Resolution Phase (Phase 7 of the VE Study)

As soon as possible, preferably no more than two weeks following the VE analysis, the project manager reviews and evaluates the VE team’s recommendation(s). The project manager completes the VE Recommendation Approval form included in the Final Report and returns it to the Statewide VE Manager. For each recommendation that is not approved or is modified by the project manager, the project manager provides justification 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 recommendations in the project.

The project manager sends the completed VE Recommendation Approval form and, if necessary, the VE Decision Document to the State VE Manager within three months following receipt of the Final Report or by September 1 of each year, whichever comes first, so the results can be included in WSDOT’s annual VE Report to FHWA.

A VE Decision Document must be submitted and forwarded to the Director & State Design Engineer, Development Division, for review; the only time a VE Decision Document is not submitted is if all of the recommendations were adopted and implemented (in other words, no recommendations were rejected or modified).

310.05 Documentation

Refer to Chapter 300 for design documentation requirements.

The following value engineering documentation is required:

- **Project File** – Value Engineering Final Report
- **Design Documentation Package** – Value Engineering Recommendation Approval Form
- **Project File** – Value Engineering Decision Document
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<th>VE Study Phase</th>
<th>Job Plan</th>
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| 1. Information Phase | Gather project information, including project commitments and constraints.  
  - *Investigate technical reports and field data*  
  - *Develop team focus and objectives* |
| 2. Function Analysis Phase | Analyze the project to understand the required functions.  
  - *Define project functions using active verb/measurable noun context*  
  - *Review and analyze these functions to determine which need improvement, elimination, or creation to meet project goals* |
| 3. Creative Phase | Generate ideas on ways to accomplish the required functions that improve project performance, enhance quality, and lower project costs.  
  - *Be creative*  
  - *Brainstorm alternative proposals and solutions to lower project costs, improve project performance, and enhance quality* |
| 4. Evaluation Phase | Evaluate and select feasible ideas for development.  
  - *Analyze design alternatives, technical processes, and life-cycle costs* |
| 5. Development Phase | Develop the selected alternatives into fully supported recommendations.  
  - *Develop technical and economic supporting data to prove the benefits and feasibility of the desirable concepts*  
  - *Develop team recommendations (long-term as well as interim solutions)* |
| 6. Presentation Phase | Present the VE recommendation to the project stakeholders.  
  - *Present the VE recommendation to the project team and region management in an oral presentation*  
  - *Provide a written report* |
| 7. Resolution Phase | Evaluate, resolve, and implement all approved recommendations and document in the VE Recommendation Approval form and VE Decision document. |

*Note:* Phases 1–6 are performed during the study; see *Value Standard and Body of Knowledge* for procedures during these steps.
### Project-Related Input* (Study Package)

- Collision 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

### Study-Related Facilities and Equipment

- AASHTO Green Book
- Bridge list
- Calculators
- Computer / projector
- Design Manual
- 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
- Standard Plans
- Standard Specifications
- 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.