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310.01 General

Value Engineering is one of the most effective techniques known to identify and eliminate unnecessary costs in design, testing, manufacturing, construction, operations, maintenance, data, procedures and practices.

Value engineering (VE) is a systematic review of a project by a multidisciplinary team not directly involved in the planning and development phases of the project. The VE process includes consideration of design; construction; maintenance; contractor; state, local, and federal partner agencies; other stakeholders; and the public.

Properly timing a Value Engineering analysis influences its benefits. Value analyses are typically conducted fairly early in project development to improve project value by identifying ideas that improve function, offer efficiencies, reduce cost and; refine scope. Section 310.02(3) VE Analysis Timing, of this chapter offers additional information about timing.

A VE analysis 1 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.

Value Engineering is a critical part of good project management practices. Project managers are accountable for ensuring that, at a minimum, those projects near the threshold include Value Engineering activities in the project schedule. Project managers should carefully plan the timing of the VE analysis for optimum benefit. Project managers should evaluate each project individually and consider the benefits a VE analysis could provide regardless of delivery method or whether the project is above or below the threshold. In addition, local programs projects are accountable for ensuring they comply with Local Agency Guidelines requirements. In all cases, when a VE study is completed, the project manager is accountable for completing, signing, and submitting the VE Recommendations Approval Form.

310.02 Statewide VE Program

310.02(1) Annual VE Plan

The State VE Manager, located in the X division coordinates annually with the Capital Program Development & Management division and region VE Coordinators to prepare an annual VE Plan, with specific projects scheduled quarterly.

1 The terms “value management”, “value engineering”, and “value analysis” are used interchangeably.

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 that reflects coordination between Headquarters and the regions to keep it updated and projects on schedule.

310.02(2) Selecting Projects for VE Analysis

310.02(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. Projects that do not require a VE study can still benefit from one. In addition to cost, other considerations include: project complexity in design or construction, engagement with stakeholders, public interest, technical challenges or limited budgets.

WSDOT may conduct VE analyses on any project the project manager deems 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.

1. The following projects require a value engineering analysis
 - A total estimated cost (includes project development, design, right of way, and construction costs) of \$25 million or more, regardless of funding.
 - A bridge project located on or off of the federal-aid system with an estimated total project cost of \$20 million or more. WSDOT policy is to conduct a VE analysis regardless of funding source.
 - A Major Project with Federal-Aid Highway Program (FAHP) funding. 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.
 - Any other project the Secretary or FHWA determines to be appropriate.
1. WSDOT encourages a VE analysis on other projects where there is a potential for significant cost savings or improved project 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.
2. After completing the required VE analysis, if the project is 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.
3. WSDOT may require a VE analysis 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 advances to contract procurement and scope or design changes are made that results in a required re-evaluation of the environmental document, WSDOT requires that a VE analysis be conducted.

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:

- Significant risks
- Alternative solutions that vary the scope and cost
- New alignment or bypass sections
- Capacity improvements that widen the existing highway
- Major structures
- Interchanges
- Social justice concerns and inclusion of underserved communities
- Possible or likely presence of cultural/archaeologic resources
- Geotechnical or geographical challenges
- Extensive or expensive environmental or geotechnical requirements
- Materials that are difficult to acquire or that require special efforts to acquire, transport, or store
- Inferior materials sources
- New/Reconstruction projects
- Major traffic control requirements or multiple construction stages
- Existing or expected high pedestrian and/or bicyclist use
- Existing or expected use by other modes (trucks, rail, etc.)
- No transportation demand management elements

310.02(3) VE Analysis Timing

310.02(3)(a) When to Conduct the VE Analysis

Timing is a key to the success of the VE analysis. A VE analysis must be coordinated with other project development activities. For example, a project requiring an Access Revision Report (ARR), NEPA and a VE must consider how to best integrate the processes with development of project need statements. Conducting VE analysis's in conjunction with these efforts ensures any revisions to the scope of the project due to the VE outcomes are considered during your environmental documentation and avoids the necessity to re-evaluate NEPA.

- When conducting VE analyses for design-build projects, timing of the analysis is critical. As with the design-bid-build delivery method, the VE analysis for design build projects need to occur in scoping. VE workshops conducted for design build projects enable WSDOT to be a better informed owner in the selection of the design builder by focusing the VE analysis effort on response actions to identified risks
- specific areas of interest or concern to the project manager and team
- the procurement process and in particular the request for proposal (RFP)
- maximizing value by delivering the required project function(s) most efficiently

Optimizing the timing of a VE analysis minimizes impacts of approved recommendations on previous commitments (agency, community, or environmental) and project's scope. VE analyses can also be coordinated with project risk assessments.

See <https://wsdot.wa.gov/engineering-standards/all-manuals-and-standards/manuals/cost-estimating-manual-wsdot-projects>. Benefits can 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.

i Planning / pre-scoping

An early Value Engineering study can be conducted to assess early concepts and alternatives and help refine the assortment of alternatives. VE analysis in planning and pre-scoping also promotes the identification of performance attributes that can be carried forward to future more focused and in-depth VE analysis during design.

In fact this early effort could be a Value Engineering / Practical Design peer review and used as a forum for community engagement with major stakeholders. Value Engineering in Planning can also inform the project with respect possible risks that need to be examined more fully at a future Cost Risk Assessment or Cost Estimate Validation Process workshop.

Coordination timing with NEPA and Access Revision Report activities. Optimize the VE process so that it integrates naturally with these complementary processes and can utilize or inform project need statements.

ii Scoping Phase

Scoping is a good time for value analysis consideration. Along with deciding which recommendations to use from a planning study, this is a time to consider other alternatives or design solutions. At the conclusion of the VE study, the project scope, preliminary costs, and major design decisions are informed by the recommendations.

When conducting value engineering during the scoping phase of a project, the VE analysis focuses on project drivers. This stage often provides an opportunity for community engagement and building consent with stakeholders.

iii Start of Design

At the start of design, the project scope and preliminary costs have been established and major design decisions have been made. Some Plans, Specifications, and Estimates (PS&E) activities may have begun, and coordination with support groups and subject matter experts is underway. At this stage, the project scope, costs, and schedule define the limits of the VE analysis. There is opportunity to focus on the technical issues of the design elements.

iv Design Approval

After Design Approval, most of the important project decisions have been made and the opportunity to affect the design is limited. Provided there is time to incorporate VE recommendations, the VE analysis may likely focus on constructability, construction sequencing, staging, traffic control, and significant design issues.

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.

310.02(4) VE Program Roles and Responsibilities

310.02(4)(a) Region VE Coordinator

- Identifies region projects for VE analyses (for the next 12 to 36 months).
- Work with HQ and the project team to optimize timing of the VE analysis.
- Present a list of identified projects to region and HQ management to prioritize into a region and HQ annual VE Plan.
- Identifies potential team facilitators and members for participation statewide.
- Provides assistance in planning and conducting the VE study.

310.02(4)(b) State VE Manager

- Reviews regional VE Plans regarding content and schedule.

310.02(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.
- Maintains a statewide list of qualified VE team leaders.

310.02(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 analysis. 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 SAVE International as a Value Methodology Associate or Certified Value Specialist (CVS). 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.

Consultants who lead VE teams are required to be a current SAVE International Certified Value Specialist.

310.02(4)(e) VE Team Members

The VE teams are usually composed of six to ten people with diverse expertise relevant to the project under study. The team members may come from regions; Headquarters; other local, state, or federal agencies; or the private sector.

Ideally VE team members should not be directly involved in the planning and development phases of the project. They are selected based on the expertise needed to address 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 Methodology Fundamentals 1 training before participating in a VE study.

310.03 VE Procedure

The WSDOT 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. This document can be downloaded at the SAVE website:

https://cdn.ymaws.com/www.value-eng.org/resource/resmgr/standards_documents/vmstd.pdf

310.03(1) Pre-Analysis Preparation

To initiate a VE study, the project manager submits a Request for Value Engineering Study form to the Region VE Coordinator at 10 to 12 weeks before the proposed study date. The form is located on the WSDOT value engineering website: <https://wsdot.wa.gov/engineering-standards/project-management-training/project-management/value-engineering>

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: <https://wsdot.wa.gov/engineering-standards/project-management-training/project-management/value-engineering>

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). Work with the State VE Coordinator for the best/most concise list of materials to send to the team members. If the package is provided via a network drive or FTP site, make sure the materials are well titled and sorted in a well-titled file structure. The VE team members should receive this information or a link to this information at least one week prior to the study so they have time to review the material.

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

310.03(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 of time for the study. The VE analysis Final Report includes:

- an executive summary;
- a short description of the VE process;
- a narrative description of project information;
- the background, history, constraints, and controlling decisions;
- a list of VE team members;
- the VE team's focus areas;
- a discussion of the team's creative 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. A copy of the report is also provided to FHWA for projects on the National Highway System or federal-aid system.

Post-VE analysis activities include:

- The Project Manager and Project team are responsible for:
- Implementation of approved recommendations.
- Documentation of reasons recommendations were not implemented.

310.03(3) Implementation Phase

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.

Recommendations not approved or modified by the project manager require a brief justification in the VE Recommendation Approval form.

The project manager sends the completed VE Recommendation Approval form to the State VE Manager following receipt of the Final Report and not later than September 1 of each year, whichever comes first, so the results can be included in WSDOT's annual VE Report to FHWA.

Exhibit 310-1 Job Plan for VE Studies

VE Study Phase	Job Plan
Pre-study	Identify projects and needs; schedule prep meeting(s); identify and invite VE workshop team members; obtain and distribute project information to VE team members; project manager reserves meeting venues; develop plan for site visit (virtual or actual)
1. Information	Gather project information, including commitments and constraints. Investigate technical reports and field data Review project management plan and risk management plan Develop team focus and objectives Identify and define performance requirements
2. Function Analysis	Analyze the project to understand the required functions. Define project functions using active verb/measurable nouns Review and analyze functions to determine which need improvement, elimination, or creation to meet project goals
3. Creative	Generate ideas on how to accomplish the required functions that improve project performance, enhance quality, and lower costs. Be creative Brainstorm alternative proposals and solutions to lower project costs, improve performance, and enhance quality
4. Evaluation	Evaluate and select feasible ideas for development. Analyze design alternatives, technical processes, and life cycle costs
5. Development	Develop selected alternative ideas into recommendations. Develop technical and economic supporting data to prove the benefits and feasibility of the desirable concepts Develop team recommendations (long-term and interim)
6. Presentation	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. Implementation	The decision to implement or not implement recommendations is documented in the signed VE Recommendation Approval form. The Project Manager implements approved recommendations.

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

Exhibit 310-2 VE Analysis Team Tools

Project-Related Input* and Design Resources (Study Package)	
Project Management Plan	Cultural resources / Archeological surveys
Vicinity map	Basis Of Estimate
Aerial photos	Estimates
Large-scale aerial photographs	Risk Assessments
Pertinent maps - Land use, contours, quadrant, etc.	Geotechnical reports
Speed study data	Hydraulic Report
Vehicle volumes	Plan sheets
Bicyclist volumes	Quantities
Pedestrian volumes	Right of way plans
Crash data with collision analysis	Bridge List/Bridge condition report
Transit data	Design Manual
Existing as-built plans	Field Formulas and Field Tables
Design file	Standard Plans
Cross sections and profiles	Standard Specifications
Environmental documents Environmental constraints, and commitments	State Highway Log / Roadway data
Utility Locations	Other manuals as needed

Study-Related Facilities and Equipment
AASHTO Green Book
Calculators
Computer (with network if available) / projector
Easel(s) and easel paper pads
Marking pens
Pencils and erasers
Masking and clear tape
Power strip(s) and extension cords
Room with a large table and adequate space for the team
Scales, straight edges, and curves
Vehicle or vehicles with adequate seating to transport the VE team for a site visit**

*Not all information may be available. Work with your Region VE Coordinator or the State VE Coordinator to verify that all needed information is available.

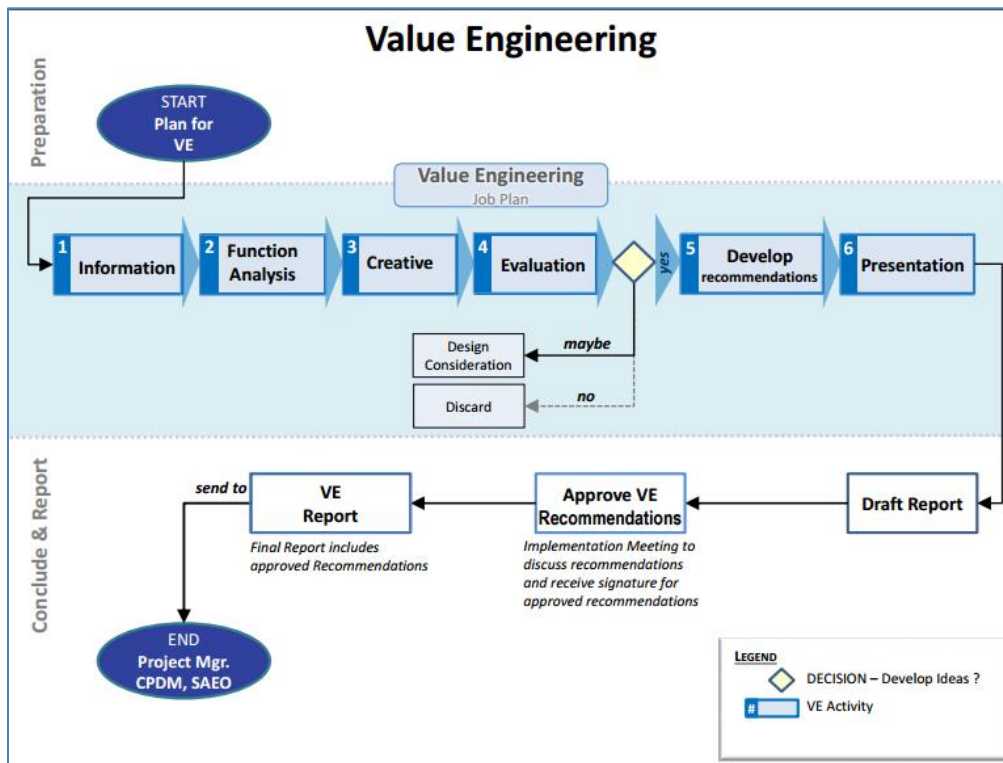
**If a site visit is not possible, perform a “virtual” tour of the project.

310.04 Value Engineering Job Plan

The VE process is comprised of a 6-step Job Plan. FHWA adds a “7th” step known as implementation. Exhibit 310-3 depicts the process for Value Engineering. An interactive version of this exhibit is available at:

www.wsdot.wa.gov/publications/fulltext/CEVP/VE_JobPlan.pdf

Exhibit 310-3 Value Engineering Job Plan



310.05 Project Management Accountability

Project Managers are required to make a determination for each VE recommendation. To that end, project managers, in consultation with their project teams, support staff, other management support, and subject matter experts, decide the action to be taken for each recommendation.

310.06 Documentation

Refer to Chapter 300 for design documentation requirements.

The following value engineering documentation is required to be included in:

- Project File – Value Engineering Final Report with the signed VE Recommendation Approval Form
- Design Approval – Design Documentation Package for Approval – the Value Engineering Recommendation Approval Form

310.07 References

310.07(1) Federal Laws and Codes

Title 23 U.S.C. Section 106(e) – Value Engineering Analysis

Title 23 CFR Part 627 – Value Engineering

Circular A-131, Office of Management and Budget (OMB)

FHWA Value Engineering Policy www.fhwa.dot.gov/legsregs/directives/orders/13111b.cfm

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

310.07(2) Guidance and Resources

WSDOT Value Engineering website:

<https://wsdot.wa.gov/engineering-standards/project-management-training/project-management/value-engineering>

SAVE International

<https://wsdot.wa.gov/engineering-standards/project-management-training/project-management/value-engineering>

Miles Value Foundation

www.valuefoundation.org/

Value Standard and Body of Knowledge, SAVE International:

www.value-eng.org/