

Value Engineering Program Administration Manual

1. Value Engineering

Value Engineering (VE) is defined by the Society of American Value Engineers International as "the systematic application of recognized techniques by a multi-disciplined team that 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 necessary functions, reliably, at the lowest overall cost." The key elements in this definition are the systematic approach using a multi-disciplined team, the identification of the basic function of the product or service, and the use of creative thinking to generate alternatives.

A VE study follows the VE Job Plan which includes the following phases:

Selection: selection of specific projects or processes to be studied, and selection of VE study team

Investigation: acquisition of knowledge of design to be studied to determine its major functions and assess cost and relative worth;

Speculation: generation of alternatives for those functions identified in the investigation phase of the study;

Evaluation: use of the VE methodologies to eliminate some of the alternatives generated during the speculation phase and narrow number of alternatives;

Development: thorough analysis of the remaining alternatives, incorporating supporting cost data, sketches, and life-cycle cost analysis to ensure feasibility for implementation;

Presentation: written and possibly oral presentation of recommended alternatives to decision-makers for acceptance;

Implementation: incorporation of accepted value opportunities into project plans or process;

Audit: certification that desired results have been attained, properly documented, and reported.

Value Engineering at VDOT

The Virginia Department of Transportation (VDOT) has had an active VE program since the mid-1970's. At that time, the program consisted of one or two 40-hour training workshops per year. In 1986, the VE program became a permanent program within the Management Services Division, and a full-time coordinator was assigned. The VE coordinator managed the program, solicited projects to be studied from the central office preliminary engineering divisions and from the district offices, and facilitated all studies. The majority of studies since 1986 have been performed on highway construction plans. Between 1986 and June, 1990, over 60 studies were held, with accepted value opportunities averaging savings of approximately 10% of the overall project cost.

In December, 1989, the Commissioner approved plans to expand the VE program. The expansion included establishment of regional VE coordinators with an increase in the number of studies and yearly training sessions. It also created clearly defined procedures for selecting projects and tracking VE recommendations. In June, 2004, the program was transferred to the Scheduling & Contract Division, which is now the Construction Division.

The program currently is comprised of the State Value Engineer and Value Engineering Managers.

State and Federal Legal Requirements

During the 1990 session, the Virginia General Assembly passed House Bill 423, which added Section 33.1-190.1 to the Code of Virginia. This section requires that value engineering be employed on any VDOT highway construction and maintenance projects costing more than \$2 million. The new law was effective on July 1, 1990. This legislation was amended by the 2001 session of the Virginia General Assembly raising the threshold to \$5 million, effective July 1, 2001. In 2014 the Virginia General Assembly passed House Bill 311, which revised and re-codified Title 33.1 of the Code of Virginia (A copy of HB 311 is contained in Section 1 of Appendix A). The new law was effective October 1, 2014.

The MAP-21 – Moving Ahead for Progress in the 21st Century passed by the Federal Government in 2012 raised the requirement for Value Engineering studies on all Federal Aid projects with an estimated total cost of \$50 million or more and bridges with a total cost of \$40 million or more, however the state law threshold remains at \$5 million.

2. VDOT VE Program Mission

The mission of the VE program is to assist VDOT management in obtaining optimum value from transportation funds through the VE process by:

- Improving project quality
- Eliminating unnecessary costs
- Reducing overall life-cycle costs.

This is accomplished by using the VE methodology to identify and define the basic functions of highway projects and their components, and recommend ways to meet the identified functions at the lowest possible cost.

Activities conducted by the VE program staff to meet the mission include conducting value engineering studies, facilitating and tracking implementation of VE recommendations generated through the VE process, and training VDOT staff in the value engineering methodology.

3. VE Program - Organizational Structure and Operations

The Value Engineering Program is assigned to the Construction Division which is located in the Department's Central Office in Richmond Virginia. The State Value Engineer, who is located in the Central Office, reports directly to an Assistant Construction Division administrator. The regional Value Engineering Managers report directly to the State Value Engineer and are located in their regions of responsibility.

VE Studies

VE studies of highway design projects can occur at one or more stages of project development. First, they can be conducted at the Scoping (conceptual) stage prior to commencement of design activity.

Second, they can occur at the "Preliminary Field Inspection" (PFI) stage, or when approximately 20% of the design is complete. At this point, the project design is at a stage where the team can make recommendations on the alignment and overall design of the project without concern that changes will affect the project schedule.

A third appropriate time for the VE study is at the "Field Inspection" stage, when approximately 70% of the design has been completed. At this stage, the VE team has access to more complete project information, including most of the specific items to be included in the completed roadway. Cost estimates are more likely to be complete at this stage.

Construction Projects

While it is the responsibility of the Project Manager to ensure the VE Study requirements are met, the VE Staff uses the following tools to identify potential projects to study:

- latest revision of the Six-Year Improvement Program
- 36 Month Advertisement Schedule
- Project Cost Estimating System (PCES) Schedule Activity 32, (i.e., The Value Engineering Study should be conducted at the Preliminary Field Inspection (PFI) Design Phase 20%-30% design. Contact the Value Engineering Staff at least three months in advance to schedule the study).
- preliminary field reviews
- interviews with the Location and Design, Structure and Bridge, Urban, Local Assistance and Asset Management managers in the respective Districts or Central Office.

All projects with expected construction costs of over \$5 million are included in the list of projects for potential study. All bridges with an estimated construction cost of \$5 million or more will be studied. Other projects will be selected to complete the annual work plan based on the following criteria:

- high estimated project construction or operation cost;
- project schedule, including projects which have:
 - ◊ proposed long construction times,
 - ◊ short design schedules,
 - ◊ complicated and lengthy design processes, or
 - ◊ significant time between completion of design and actual construction;
- project complexity; and
- recommendations from district and central office preliminary engineering managers.

Design/Build and Public/Private Transportation Projects

Value Engineering is required on all VDOT Design/Build and PPTA projects in accordance with Section 33.2-261, Code of Virginia, 1950, with an estimated cost of \$5 million or greater, unless a waiver is granted by the Commissioner. This has been confirmed by the Chief Engineer and the Assistant Attorney General for Transportation. This requirement is further supported by federal legislation requiring Value Engineering on all projects meeting the \$50 million threshold (ref MAP 21).

The schedule for conducting Value Engineering studies will be prior to release of the "Request for Proposals" document; for projects where contracts for design have been awarded, the following policies will be implemented:

Innovative Program Delivery will coordinate the tracking of Design/Build and PPTA projects that meet the criteria requiring a Value Engineering study and notify the State Value Engineering Manager to schedule these studies.

Soundwalls

Sound wall studies are to concentrate on the construction components (i.e., landscaping, drainage, fencing, etc.) rather than the specific sound wall design. The Commissioner has approved a policy mandating a VE study of Sound Barrier standards every two years in addition to the above detailed individual project studies.

Maintenance Projects

In accordance with the Code of Virginia, Section 33.2-261, highway maintenance projects costing \$5 million or greater that serve to upgrade an existing system or produce a new system accompanied by, at least, a minimum set of plans will be subject to a Value Engineering study. Projects funded by a combination of maintenance and construction funds totaling a cost of \$5 million or greater will be subject to a Value Engineering study.

EXEMPTION CLAUSE: Projects/contracts repetitive in nature, such as plant mix overlays, sign overlays, bridge painting, surface treatments, slurry seals, guardrail maintenance, pavement repairs, pavement markings, and epoxy or latex overlays do not lend themselves to VE study as the costs of such contracts are multiples of the same project. Projects of this repetitive nature will only be Value Engineered as components of the VDOT Standards studies and VDOT Policies and Procedures studies.

Projects/contracts that are considered "Emergency", where immediate action must take place to ensure the safety of the traveling public, will be eliminated from consideration for VE study.

For maintenance project selection the State VE Manager will be copied on the six-month maintenance schedule along with the final budgets. For projects/contracts where alternative cost analysis meetings are held, a VE Manager will be invited to participate.

Local Assistance Projects

Section 12.2.5.0 of the Local Assistance Manual outlines the requirements for Value Engineering Studies for those projects over 5 million in construction cost. The manual states:

"Locality will complete the VE process and, all recommendations must be submitted to VDOT. The final decision as to which recommendations are incorporated into the final plans is made by the Chief Engineer."

For those localities with VDOT maintained roads, the Chief Engineer has the final approval on recommendations that are incorporated into the plans. Localities that operate and maintain their own roads manage their own VE Approval process and approve recommendations that are incorporated into the plans.

NOTE: For recommendations that may impact US Primaries or State Routes, where VDOT has maintenance responsibility, the Locality will need to coordinate those recommendations with VDOT.

While the locality has the option of using consultant VE Services to conduct the study, VDOT offers VE services to localities at their request.

Urban Construction Initiative (UCI Projects)

Section II. D. of the Urban Construction Initiative Program Administration Manual outlines the requirements for Value Engineering Studies. The manual states:

“Federal regulations outline requirements for value engineering (VE) studies. The Code of Virginia further defines these regulations and requires a VE study on all projects exceeding \$5 million in construction cost. There is a provision for waiver of this requirement which also must be submitted to VDOT for approval. The VE report consists of recommendations for changes to the proposed project. The final Decision as to which recommendations are to be incorporated into the final project may be made by a person of responsible charge from the municipality. A copy of the final VE study should be submitted to the Urban Program manager for record keeping purposes, however no VDOT action is required.”

While the locality has the option of using consultant VE Services to conduct the study, VDOT offers VE services to localities at their request.

VE Annual Work Plan

After the projects for potential VE study are identified, an Annual VE Work plan is prepared. The work plan lists all projects expected to be studied during the fiscal year, estimated costs of the projects, planned locations of the studies, and the months in which the studies are expected to occur.

Throughout the year, additions and deletions may be made to the work plan due to changes in project schedules and cost (see Work Flow Chart at Appendix A).

Assignments of Projects

The State Value Engineer assigns projects for study to specific VE managers based on the location of the project and the workload. It is the responsibility of the assigned manager to establish and maintain communications with the project manager to ensure that the VE study occurs at the appropriate stage of project development (i.e., PFI or FI).

VE Team Selection

VE study teams are typically composed of four to eight members familiar with highway design. Team members are selected based on expertise in the specific discipline(s) needed for the project. While it is helpful to have team members that are familiar with the VE process, it is not a requirement to serve as a team member. Once the VE study is scheduled, the regional VE manager coordinates with the project manager to determine the specific disciplines required on the study team.

EXAMPLE: For a study of a bridge and approach design project that crosses wetlands, team members from the following divisions or sections may be included:

- Environmental, for expertise in permits and wetlands;
- Location and Design, for expertise in roadway design;
- Structure and Bridge, for expertise in bridge design;

- Traffic Engineering, for expertise in traffic control; and
- Materials, for expertise in soil conditions and pavement design
- NOTE: On all projects that have Federal oversight, an FHWA Representative will be invited to serve as a VE team member.

The VE manager contacts the appropriate district section managers to request VE team members. In addition, the VE manager will copy the district administrator and the State Value Engineer.

VE managers may request team members from other districts as well as the central office. Representatives from cities may be requested through the district Local Assistance representative. Additionally, an FHWA Representative will be invited to attend all projects with Federal oversight.

The VE manager notifies selected team members by E-mail, telephone, or in person, indicating the project to be studied, the location of the study, and the daily schedule.

When establishing beginning times for the study sessions, consideration is given to team members' travel time.

Conducting VE Studies

Under the Concurrent Engineering Process (CEP) implemented at VDOT in 2002, VE studies will normally be conducted at the PFI stage of project development.

As soon as the dates for the VE study are scheduled, the VE manager reserves a meeting room. The manager also obtains all information available on the project for the VE study. Suggested information includes but is not limited to

- project plans;
- project correspondence;
- project file;
- photographs/video;
- adjacent project/roadway design;
- detailed cost estimate;
- environmental documents and other studies; and
- list of individuals involved with the project and their telephone numbers

During the study, questions about the history of the project will be directed to the project manager by telephone or in person.

The VE manager functions as team leader, is responsible for leading team interaction, and ensures that the VE process is followed. The manager provides the team members with forms necessary to document the VE process and completely develop the recommendations.

One step in the VE study process is the identification of those persons who will make the final decisions on the VE recommendations, or the identified decision-makers. These persons will receive the final report after the study.

VE studies usually require two to three days for an average project. However, the actual length of time required is determined by the complexity of the project and the team composition. A condensed study format, which requires one to two days, may be used for low cost/complexity projects and topic specific studies.

Performance Measures

VE Team recommendations, which are forwarded to the applicable decision-makers, may include Quantitative Performance Measures (cost savings/increases) and Qualitative Performance Measures which identify applicable benefits of the recommendation. The Qualitative measures include: (1) Minimize Environmental Impact; (2) Improve Constructability; and (3) Enhance Operational Performance. These categories are further defined below:

Minimize Environmental Impact

- Parks/Recreation
- Historic/Cultural
- Aesthetics
- Wetlands/Streams
- Permitting
- EIS/CE
- Noise
- Wildlife

Improve Constructability

- Maintenance of Traffic
- Construction Time
- Construction Materials
- Sequence of Construction
- Feasibility

Enhance Operational Performance

- Safety
- Maintainability
- Level of Service
- User Costs
- Future Expansion
- Driver Expectancy

Presentation of VE Recommendations

At the conclusion of the study, the VE manager develops an Executive Summary of the study and the resulting VE recommendations, which, with the completed Study Documentation, serves as the official report. The VE manager submits the completed Study Report, which includes the Executive Summary, Study Documentation, a VE response form, and all appropriate cover letters, to other members of the VE staff and VE team members for editorial review. When the package is approved by the reviewers, it is sent to the decision makers responsible for approval of the VE recommendations. A copy of the cover letter, Executive Summary and response form is also sent to the State Value Engineer.

The list of identified decision-makers may include the District Location and Design Engineer, the District Construction Engineer, and the State Location and Design Engineer. Whenever a VE recommendation directly relates to right of way is submitted, the Right of Way Division Administrator is included. Similarly, the Materials Division Administrator should be included whenever a VE recommendation addresses pavement. Responsible persons may also include the Structure & Bridge Engineer, Local Assistance Engineer, the Resident Engineer, representative of a locality or if applicable, an FHWA Division Administrator may elect to serve as a decision-maker on Federal oversight projects. These persons are requested to respond to the VE recommendations, in writing, with a copy to the State Location and Design Engineer. The responses are sent to the VE manager assigned to that project.

Acceptance of VE Recommendations

Responses received from the decision-makers indicate which VE recommendations are approved for implementation, and provide reasons for rejecting those that are not approved. The responses are combined into a summary package and sent to the Chief Engineer for his review.

Implementation of VE Recommendations

Notification of the Chief Engineer's approval is sent to all the decision-makers, project manager and VE team members. If the project has Federal Oversight, the approval form will also be sent to FHWA, even if they did not participate as a VE team member in the study.

The project manager verifies the incorporation of each accepted VE recommendation in writing or by E-mail to the central office VE Manager.

Any VE recommendation which is approved by the Chief Engineer pending further investigation is monitored until the study is complete and final resolution is determined.

Appeal of Accepted VE Recommendations

If the project manager should find that an accepted VE recommendation cannot be implemented, a letter or E-mail explaining the situation and requesting repeal of the VE recommendation is sent to the appropriate value engineering manager. The VE manager adds his or her comments, and forwards it to the State Value Engineering Manager. It is then sent to the Chief Engineer for his action.

5. Value Engineering Proposals (VEPs)

The VE Staff tracks and offers assistance in the resolving VEPs submitted by contractors in VDOT District's throughout the State. In addition, a database of VEPs is maintained for future reference.

6. VE Training

VE training is offered to the employees of VDOT in two ways: a 32 hour session for potential team members, and a one day session for managers. The VE Training Manager, assigned by the State Value Engineer, develops an annual training plan. The plan identifies when each of the courses will be presented at respective districts.

Appendix A

1. House Bill 311

HB 311 33.2-261

§ 33.2-261. (Effective October 1, 2014) Value engineering required in certain projects.

The Department shall employ value engineering in conjunction with any project on any highway system using criteria established by the Department, including all projects costing more than \$5 million. For the purposes of this section, "value engineering" means a systematic process of review and analysis of an engineering project by a team of persons not originally involved in the project. Such team may offer suggestions that would improve project quality and reduce total project cost, ranging from a combination or elimination of inefficient or expensive parts or steps in the original proposal to total redesign of the project using different technologies, materials, or methods.

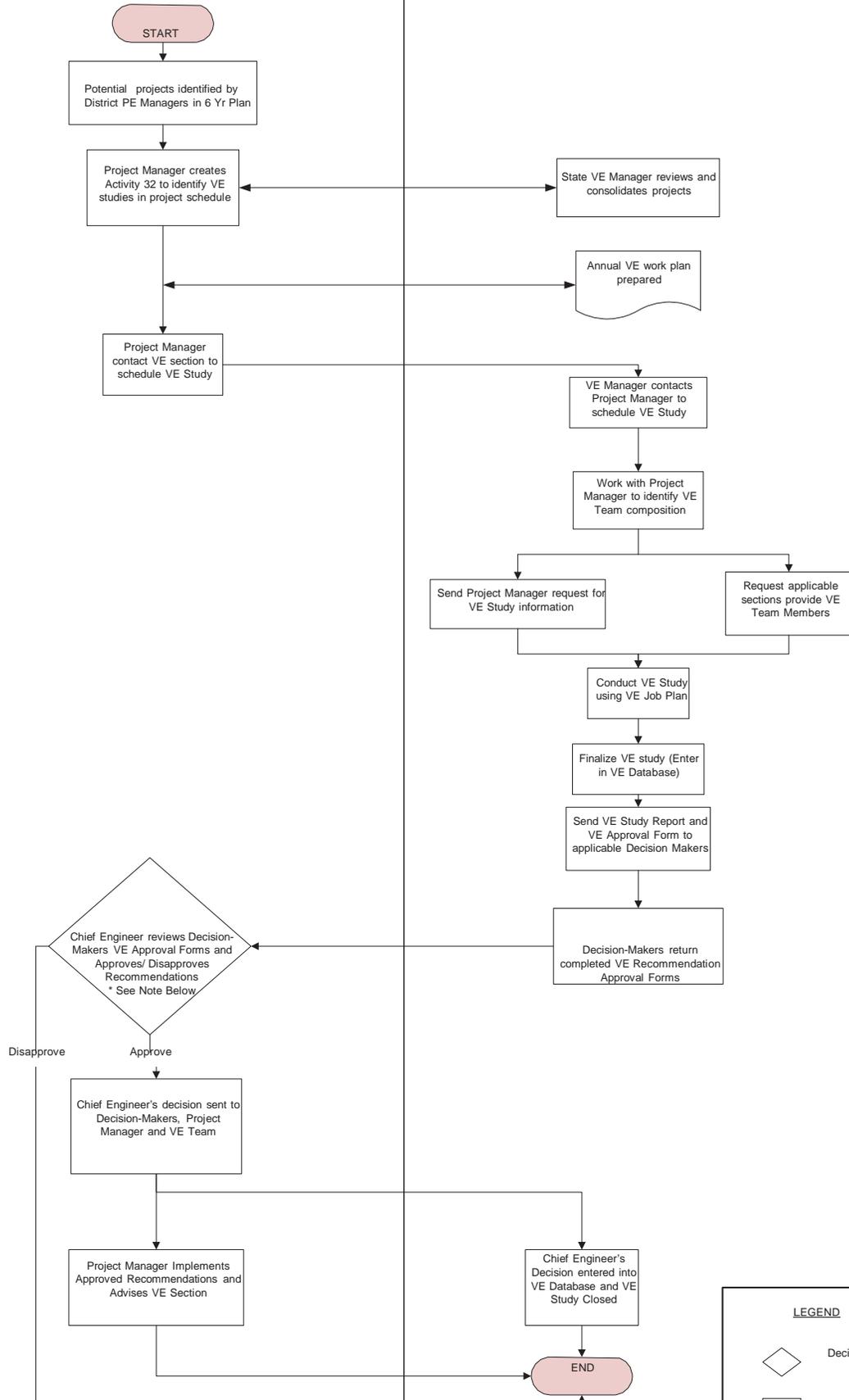
After a review, the Commissioner of Highways may waive the requirements of this section for any project for compelling reasons. Any such waiver shall be in writing, state the reasons for the waiver, and apply only to a single project. (1990, c. 160, § 33.1-190.1; 2001, cc. 90, 104; 2014, c. 805.)

2. Value Engineering Work Flow Chart on following page:

Design Phase - Value Engineering

District Project Manager/Chief Engineer

VE Analyst/Manager/Team



* Note: Recommendations (approved or disapproved) may be appealed with sufficient justification to the Chief Engineer.

LEGEND

-  Decision
-  Document
-  Process