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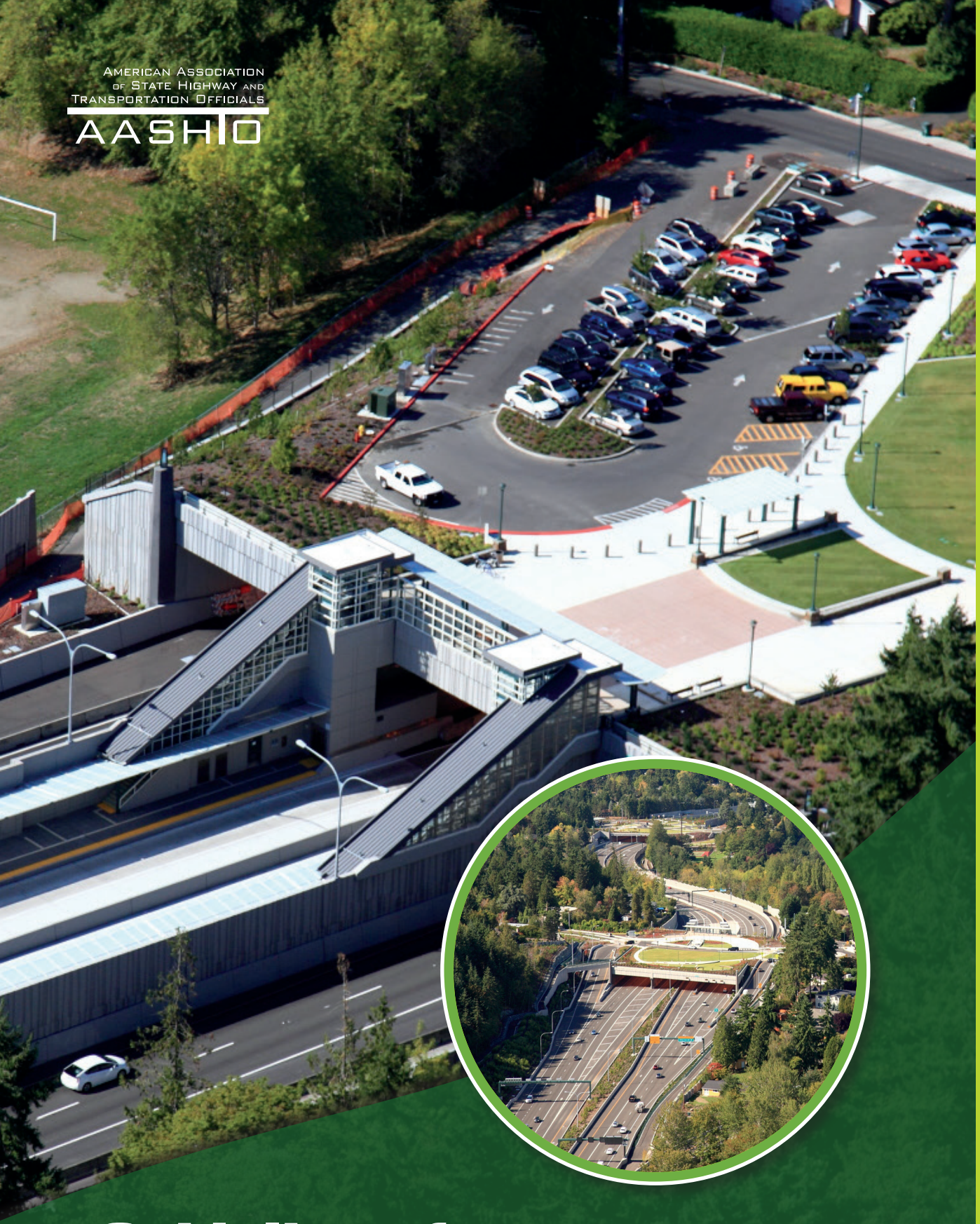

Guidelines for VALUE ENGINEERING

2017 EDITION

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Cover photos: Washington State Department of Transportation's Route 520 Eastside Transit and HOV Lanes project (Honorable Mention in the 2013 Value Engineering Awards, in the category of "Pre-Construction more than $100 million") increased safety, mobility, and access to transit across Lake Washington east of Seattle by widening the freeway, adding HOV lanes and two in-median transit stations, and creating a regional bicycle–pedestrian path.

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1.0 Executive Summary

Benefits of a Value Engineering Program

The American Association of State Highway and Transportation Officials (AASHTO) recognizes the need for the prudent use of resources and revenues while providing a quality transportation program. Value Engineering (VE) is a function-oriented technique that has proven to be an effective management tool for achieving improved design, construction, and cost-effectiveness in various transportation program elements. Data collected by the Federal Highway Administration (FHWA) indicates that the return on investment can approach or exceed 100:1.

Summary of Past VE Savings of Federal-Aid Highway Program

	FY 2015	FY 2014	FY 2013	FY 2012	FY 2011	FY 2010
Number of VE studies	135	215	281	352	378	402
Cost of VE Studies Plus Administrative Costs	$6.4M	$8.67M	$9.78M	$11.98M	$12.51M	$13.55M
Estimated Costs of Projects Studied	$14.1B	$20.86B	$23.03B	$30.27B	$32.26B	$34.25B
Total Number of Recommendations	1,233	1,664	2,381	2,905	2,950	3,049
Total Value of Recommendations	$2.5B	$2.98B	$2.91B	$3.78B	$2.94B	$4.35B
Number of Approved Recommendations	504	697	1,011	1,191	1,224	1,315
Value of Approved Recommendations	$831M	$1.73B	$1.15B	$1.15B	$1.01B	$1.98B
Return on Investment	129:1	200:1	118:1	96:1	80:1	146:1

States that have active VE programs have realized additional benefits beyond design improvements and cost savings including:

- An opportunity for stakeholders to participate in the process
- Improvement of standards and policies
- Responsiveness to stakeholder priorities and improved communication amongst stakeholders participating in studies
- Accelerated incorporation of new materials and construction techniques
- Employee satisfaction from participation in agency decisions
- Increased skills obtained from team participation
- Improved constructability
- Reduced environmental impacts
- Reduced schedule
- Reduced risk
- Improved operations

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Position Statement

To improve design excellence and achieve efficient cost and quality control, it is AASHTO's position that:

Each member state should establish an ongoing VE program.

- The challenges of rising costs and diminished resources are addressed through the application of VE principles and practices in project development, construction, traffic operation, maintenance, and other appropriate areas.
- Guidelines are provided to member organizations to promote and assist in broad acceptance and use of VE with the provision of flexibility to adapt to individual needs.

This document provides guidelines for establishing and administering VE programs. It is the intent of these guidelines to assist state DOTs in developing a successful VE program, to promote the acceptance and use of VE while allowing maximum flexibility to each state.

Critical Success Factors

Executive Support

A firm commitment of resources and support by executive management is the most important element for assuring the success of a VE program. Value engineering is a process that must be believed in and supported to realize benefits.

All levels of management must understand and support value engineering through fostering a climate that encourages participation on studies and welcomes and accepts ideas from VE studies. An organization that is open to change and innovation will welcome VE and have a successful program.

Program Management

A state VE program requires development of a policy directive describing where, when, how, and to what specific areas of work the VE effort should be directed. There should be clear objectives, timelines, follow-up actions, review, and feedback.

For optimum results in the project development phase, VE should be performed:

- Early in the planning–design process to maximize potential product or service improvement and cost savings.
- On high-cost and/or complex projects.

VE programs within the state organization should be actively managed, closely monitored, evaluated, and modified to assure the program's effectiveness.

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Workshop Execution

Each workshop should follow either the Federal Highway Administration (FHWA) or SAVE International VE job plan. The VE team leader must be trained in both the value methodology and team facilitation with strong leadership and communication skills. Multi-disciplinary teams unrelated to the project with positive attitudes and a willingness to investigate new ideas have the most success.

Emerging Trends

There are several emerging techniques in the transportation field that share the goal of improving projects. Integrating value engineering with emerging techniques and new technology will generate opportunities to use the creative power of VE to add value through project improvement.

Cost Savings from the Construction Industry

In addition to performing VE during the project development phase, VE principles can also be applied during the project construction phase through Value Engineering Change Proposals (VECPs or VEPs). A VECP/VEP program encourages contractors to develop construction VE proposals which allow the state to benefit from a contractor's design and construction ingenuity, experience, and ability to work with new techniques. These are also referred to as Cost Reduction Incentive Proposals (CRIPS) or Cost Savings Initiatives (CSI) in some states. Some important elements of a successful, ongoing VECP/VEP program are:

- Processing of proposals must be kept simple and done so as not to delay the contractor's construction schedule.
- Cost savings are shared (normally equally) between the contractor and the implementing agency.
- Change proposals become the property of the state and the concept may be used on future projects.
- Change proposals should not compromise any essential design criteria or preliminary engineering commitments.
- Change proposals cannot be the basis for a contract claim. The implementing agency has the option to reject, with good justification, contractors' proposals.
- It is essential that all VE team recommendations and contractor proposals be fairly reviewed and expeditiously evaluated for implementation.

Please note that the Code of Federal Regulations does not allow federal participation for VECPs to accelerate construction.

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2.0 Introduction and Background

What Is Value Engineering?

Generations of VE users have found it to be a multidisciplinary, systematic tool that is very useful for identifying, analyzing, and solving problems. By carefully examining each component of an undertaking, VE helps to find new and better ways of doing things. It can be used in building highways, constructing factories, designing office procedures, and even in purchasing the family automobile.

Value engineering combines creative and analytical skills to improve the value of products and services by examining their function. Value is the ratio of function to cost, so value can therefore be increased by either improving the function or reducing the cost. VE is unique from other problem solving techniques because of function analysis.

Value engineering is also known as value analysis, the value methodologies, value planning, etc.

History of Value Engineering

VE was developed during World War II by Lawrence Mes of General Electric. Seeking a way to make the most efficient use of war-limited funds and raw materials, Mes devised a team-oriented technique that determines the objective of a project, service, or process; analyzes functions; and examines each step for ways to increase efficiency and to cut costs and completion time.

After Mes's development of the VE process, several agencies realized the benefits and began to implement the process on existing parts and further evolving into conceptual designs. In 1954, the U.S. Navy, Bureau of Ships became the first agency to apply this analysis process to major construction projects.

In 1959, the Society of American Value Engineers (later renamed SAVE International) was established in Washington, DC, to unite practitioners and promote the growth of value engineering. The Society changed its name to SAVE International in 1997. The Society officially defined value engineering as "the systematic application of recognized techniques which identify the function of a product or service, establish a value for that function, and provide the necessary function at the least overall cost. In all instances, the required function should be achieved at the lowest possible life-cycle cost consistent with requirements and/or performance, maintainability, safety, and aesthetics."

During the 1970s, escalating construction and maintenance costs, combined with reduced revenues, led to an increased interest in value engineering by state and federal transportation agencies. VE is now a practice used in most transportation departments in the United States.

FHWA Participation

The Federal Highway Administration (FHWA) has been involved in VE since the early 1970s and continues today in assisting states in developing their individual VE programs.

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FHWA assistance is available in a variety of ways. Training workshops in VE are offered through the National Highway Institute (NHI) and along with publications such as the Federal-Aid Policy Guide help states realize the benefit of a strong VE program.

FHWA also has a website providing VE information and guidance located at www.fhwa.dot.gov/ve/.

Benefits of a Value Engineering Program

As promoted by FHWA and implemented by state and local governments, VE has repeatedly demonstrated its ability to reduce project costs, improve quality and productivity, foster innovation, and eliminate unnecessary and costly design elements. Value engineering applied to a suitable portfolio of projects saves money and improves design. Techniques can be used to improve productivity or the "benefit-to-cost ratio" in nearly every aspect of a state's transportation program, including preliminary engineering, traffic operations, maintenance, right-of-way, environmental, standard plans and specifications, design criteria, and guidelines.

Additional benefits include:

- Constant review of design, construction, and maintenance standards.
- Structured, functional approach using a job plan provides trained employees with a new method of approaching problems.
- Improved communication.
- Appreciation for the concerns and issues of other functional areas or disciplines.
- Enhanced teamwork skills and team dynamics.
- Improved or developed skills in preparing and delivering logical, organized presentations.
- Gained ability to apply VE principles in regular design processes.
- Improved state/contractor relations through more cooperative processing of value engineering change proposals.
- Proven VE designs or techniques and VECP/VEP-accepted changes provide savings and often apply to future projects or contracts.

As stated previously, it is important to have executive management support and a policy directive. A value engineering manager reporting at a high level in the state DOT's organization is also necessary. Failure in any one of these areas reduces the state's effectiveness in obtaining maximum results. These elements apply whether a state trains its own staff to perform VE studies or employs a VE consultant.

State Assistance

Members of the AASHTO Subcommittee on Design (SCOD) Technical Committee on Project Management are available to provide VE assistance to state VE managers. VE is included in the scope of this technical committee, and some of its members are state VE managers, who welcome the opportunity to assist colleagues. Assistance has included:

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