NCHRP
SYNTHESIS 352

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Value Engineering Applications in Transportation

A Synthesis of Highway Practice

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

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A Synthesis of Highway Practice

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Subject Areas
Planning and Administration and Highway and Facility Design

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

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The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical committee, they are not necessarily those of the Transportation Research Board, the National Research Council, the American Association of State Highway and Transportation Officials, or the Federal Highway Administration, U.S. Department of Transportation.

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FOREWORD

By Staff
Transportation
Research Board

Highway administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to highway administrators and engineers. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire highway community, the American Association of State Highway and Transportation Officials—through the mechanism of the National Cooperative Highway Research Program—authorized the Transportation Research Board to undertake a continuing study. This study, NCHRP Project 20-5, "Synthesis of Information Related to Highway Problems," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute an NCHRP report series, *Synthesis of Highway Practice.*

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

PREFACE

This report of the Transportation Research Board summarizes the current value engineering (VE) practices of highway transportation agencies in the United States and Canada. The synthesis identifies the reported best practices, key strengths, and challenges of current VE study processes and agency programs. The report is intended to serve as a guide to those agencies interested in applying VE and/or improving the effectiveness of VE in their projects and programs. Key topics discussed include policies, guidelines, and selection; education and awareness; applications; implementation; monitoring; and future needs. A brief history is provided that traces the development of VE applications in transportation projects from the 1960s to the present.

This synthesis is based on information collected during a detailed literature search and from documents made available by selected transportation agencies and municipalities in North America. In addition, a survey was distributed to 53 transportation agencies in the United States and 13 transportation agencies in Canada (provinces and territories) and major municipalities.

David C. Wilson, NCE Limited, Markham, Ontario, Canada, collected and synthesized the information and wrote the report, under the guidance of a panel of experts in the subject area. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

CONTENTS

VALUE ENGINEERING APPLICATIONS IN TRANSPORTATION

SUMMARY

Value engineering (VE) is the systematic review of a project, product, or process to improve performance, quality, and/or life-cycle cost by an independent multidisciplinary team of specialists. It is the focus on the functions that the project, product, or process must perform that sets VE apart from other quality-improvement or cost-reduction approaches.

The purpose of this synthesis is to summarize the current VE practices in highway transportation agencies in the United States and Canada. Many of these agencies use VE during the planning, design, and construction phases of their projects. Some agencies have expanded the application of VE to standards and processes as well.

In the United States, VE has been used to improve transportation projects for more than 30 years. It was initially applied during construction, in the form of Value Engineering Change Proposals to reduce overall construction costs. However, many transportation agencies now recognize that greater benefits can be realized if VE is introduced earlier in the development of the project. VE can be used to establish project scope, support effective decision making, increase project performance and quality, balance project objectives, and manage community expectations.

NCHRP initially studied VE in transportation in 1981. *NCHRP Synthesis of Highway Practice 78* summarized key observations and forecast transportation agency expectations at the time. The synthesis also provided a capsule history of VE in transportation before and after the formal involvement of the federal government. In 1973, FHWA developed a VE training and support program to assist state transportation agencies (STAs). Further encouragement, support, and guidance in VE eventually came from AASHTO in the form of the initial edition of its *Guidelines on Value Engineering* in 1987. Although interest in VE at the state level began to increase, only a few states were actively using VE by the early 1990s. This has since changed with the introduction of federal legislation.

In 1991, an audit of federal VE practices by the President's Council on Integrity and Efficiency concluded that more could and should be done by federal agencies to realize the benefits of VE. Principal direction was issued by the Office of Management and Budget (OMB). *OMB Circular A-131*, updated in 1993, requires all federal departments and agencies to use VE, where appropriate, to reduce program and acquisition costs. *Circular A-131* also stipulated that each department or agency be required to designate a VE manager, develop a monitoring program, and annually report VE results (only for those departments and agencies with more than $10 million expenditure programs). The 1995 Highway Designation Act instructed the Secretary of Transportation to establish a program that required VE on all federal-aid projects valued at more than $25 million. FHWA VE Regulation 23 CFR Part 627 was issued in 1997 to fulfill this directive.

The federal mandate has increased the number of STAs actively involved in VE. The overall value of the approved VE study recommendations fluctuates annually. In addition, several STAs have enhanced their VE programs by developing agency-specific VE policies and guidelines and/or introduced new elements to their VE toolkits. Several Canadian trans-

portation agencies have recently introduced VE into their engineering and construction phases, drawing on the lessons learned from their U.S. counterparts. Until now, this increased VE activity in North America has not been comprehensively studied.

This synthesis was developed using information collected during a detailed literature search and from documents provided by or available from selected transportation agencies and municipalities in North America. In addition, a survey questionnaire exploring VE policy, guidelines and applications, project selection, implementation and monitoring issues, industry preparedness, and future opportunities, was distributed to transportation agencies in the United States and Canada. Additional insight, gained from the author's personal experiences and through contacts, is also shared, where appropriate.

The survey questionnaire, sent to U.S. and Canadian transportation agencies and selected municipalities, was structured to gain an understanding of current practices in VE, and the challenges and opportunities that exist. Fifty agencies participated in the survey. Approximately two-thirds of the respondents (33 of 50) indicated that the statutory requirement was "always" or "often" the reason that VE was being used. About half of the respondents (27 of 50) indicated that VE was done to meet their funding requirements. Although these results are encouraging and suggest that the legislation is having the desired effect, annual FHWA VE activity reports indicate that only a select few STAs undertake the majority of VE studies on federal-aid projects. However, this observation might be misleading. For example, the current $25 million cost threshold effectively precludes several STAs because they do not have projects in this range and consequently do not have large or active VE programs. Some STAs are also doing VE studies on state-funded projects (i.e., non-federal-aid projects) and these results are not reported at the national level. Municipal transportation VE studies are also not reported at the national level.

The respondents were asked to describe their VE programs using the conventional SWOT (strengths/weaknesses/opportunities/threats) approach. Some common ground was noted in terms of the varied characteristics that the respondents used to describe their programs and experience:

- The VE process and procedures are well-defined and generally well-understood at most levels within an STA, including senior management. VE is recognized as an effective way to improve the performance of a project and/or reduce unnecessary capital and operating costs.
- A key ingredient to the success of the VE program is the quality (qualifications and experience) of the team leader and specialists.
- VE is more effective and influential on the performance, quality, and cost of a project when performed relatively early in the development of the project schedule.
- The $25 million cost threshold trigger for federal-aid projects serves as both motivation and as a limitation for some STAs. Some modest-size transportation agencies with projects falling below the $25 million threshold rarely do VE, whereas some larger transportation agencies rarely consider VE on state-funded or lower-cost federal-aid projects.
- A commonly defined and understood approach to measure implementation benefits (improved performance and/or lower life-cycle costs) of VE studies and VE program success needs to be developed.
- Training is necessary to maintain VE programs and the corporate enthusiasm to allocate resources to VE. However, training initiatives are typically influenced more by the overall funding of transportation programs.
- VE can effectively be integrated with or into other technical or management improvement approaches, such as asset management, road safety audits, context-sensitive design, and accelerated construction technology teams.

Working with FHWA and STAs, AASHTO's VE Technical Committee has evolved to fulfill a key partnership role in the successful mentoring of VE in the United States. This

committee continues to promote VE and to provide VE support to the STAs. They have recently started to develop guidelines to determine the nonmonetary effectiveness of VE proposals by measuring performance. Interest in project performance measures developed in California has now spread to selected STAs and at least one Canadian province.

In the United States, STAs continue to develop and evolve their VE programs in response to current legislation. In some cases, STAs have expanded their programs to consider nonfederally mandated projects, enhanced their basic VE procedures with additional tools, and/or increased the range of projects, products, and processes considered for VE. It is acknowledged that the level of VE activity will continue to vary considerably between STAs, owing to the number, complexity, and value of the projects that constitute their annual transportation programs. Although it is recognized that more VE studies can be performed, it is apparent that road users, taxpayers, and the economy are already benefiting from more efficient and cost-effective transportation facilities across the country as a result of VE applications in transportation.

CHAPTER ONE

INTRODUCTION

BACKGROUND

> State highway and transportation agencies are confronted by many complex problems. Foremost among these is that during the past few years, financial resources have become increasingly scarce in relation to existing and [future] needs. It is widely believed that this condition will persist through the [next decade] and perhaps beyond.
>
> Turner and Reark (*1*)

These words, written almost a quarter of a century ago, introduced NCHRP's initial look at value engineering (VE) in transportation. *NCHRP Synthesis of Highway Practice 78* summarized key observations and forecast transportation agency expectations at the time. State transportation agencies (STAs) continue to face and overcome these challenges today. In many instances, STAs have developed successful VE programs, as one approach, to help them cost-effectively deliver needed infrastructure and satisfy their customers and key stakeholders.

VE is the systematic review of a project, product, or process to improve performance, quality, and/or life-cycle cost by an independent multidisciplinary team of specialists. The VE process, referred to as the Job Plan, defines a sequence of activities that are undertaken during a VE study, before, during, and following a workshop. During the VE workshop, the VE team learns about the background issues, defines and classifies the project (or product or process) functions, identifies creative approaches to provide the functions, and then evaluates, develops, and presents the VE proposals to key decision makers. It is the focus on the functions that the project, product, or process must perform that sets VE apart from other quality-improvement or cost-reduction approaches.

In the United States, VE, or more accurately, the value methodology (VM), has been used to improve transportation projects for more than 30 years (*2*). Traditionally, VE has been used by transportation agencies and municipal organizations to reduce or avoid excess capital construction expenditures. However, VE can play a broader role to support effective decision making for transportation projects to increase project performance and quality, balance project objectives, and manage community expectations.

The application of VE on transportation projects has evolved substantially since the publication of *NCHRP Synthesis of Highway Practice 78* (*1*). In the United States, federal and state policies have been developed and implemented requiring value studies for high expenditure projects. Many transportation agencies now have project delivery strategies in place that incorporate VE and, in some cases, project funding approvals that are selectively tied to the completion of VE studies. The use of VE as a project management tool continues to grow and could be further enhanced by sharing information on the application and management of current VE practices and programs in North America.

OBJECTIVES AND FOCUS

The purpose of this report is to summarize the current practices in VE in highway transportation agencies in the United States and Canada. VE is used by many of these agencies during the planning, design, and construction phases of their projects. Some agencies have expanded the application of VE to standards and processes as well.

This synthesis identifies the reported best practices, key strengths, and challenges of current VE study processes and agency programs. The report is intended to serve as a guide to those agencies interested in applying VE and/or improving the effectiveness of VE in their projects and programs. Key topics discussed in this report include

- Policies, guidelines, and selection;
- Education and awareness;
- Applications;
- Implementation;
- Monitoring; and
- Future needs.

SCOPE AND CONTENT

This synthesis is based on information collected during a detailed literature search and from documents made available by selected transportation agencies and municipalities in North America. In addition, a survey exploring VE policy, guidelines and applications, project selection, implementation and monitoring issues, industry preparedness, and future opportunities, was distributed to transportation agencies in the United States and Canada. Additional insight, gained from the author's personal experiences and through contacts, is also shared, where appropriate.

The survey was distributed to 53 transportation agencies in the United States, including all 50 states, the District of Columbia, Puerto Rico, and FHWA's Central Federal Lands Highway Division (FLH). The survey was also distributed to the 13 senior Canadian transportation agencies (provinces and territories) and major municipalities by the Transportation Association of Canada (TAC). Fifty completed survey responses were received from 42 states, FLH, four provinces, and three cities.

The Nebraska Department of Roads indicated that the survey questionnaire was not applicable to their organization. The province of Newfoundland and Labrador also responded, but indicated that it does not have a VE program at this time. Responding Canadian provinces were British Columbia, New Brunswick, Ontario, and Saskatchewan. New York City (New York), the Canadian cities of Winnipeg (Manitoba) and Ottawa (Ontario), and FLH also completed the survey.

This synthesis report is intended to serve as an extension to *NCHRP Synthesis of Highway Practice 78* (*1*), documenting the continued and evolving application of VE on highway projects in the United States and Canada. The organization and content of the report are discussed here.

Chapter one presents the background for the synthesis including the material generated by the Topic Panel. The genesis of the synthesis as well as the objectives and scope of work are included. Different users and organizations may have variations of the VM definitions. One set of definitions is provided in the Glossary to facilitate reviewing this report.

Chapter two includes a brief history of VE and traces the developments of VE applications in transportation projects, from its early beginnings in the 1960s to the present. Emphasis has been placed on the motivation for transportation agencies to use this management tool in their infrastructure development programs and the eventual development of policies to mandate VE on major projects. The role of SAVE International (SAVE), the U.S.-based international professional society promoting the worldwide use of VM, which influences the value industry and how transportation agencies apply VE, is also presented.

Chapter three presents the observed current VE practices in transportation, gained from the literature search results and the detailed survey. A portion of the chapter presents how transportation agencies initiate VE studies and why. Also included are the approaches and procedures used to select VE team members, and who is typically responsible for their selection. A discussion of the required skill sets of the VE Team Leader and the technical specialists is presented as well. FHWA currently tracks the specifics of VE studies performed by the STAs on the National Highway System (NHS). This is summarized to provide a counterpoint to the total number of VE studies being done by the transportation agencies to reflect the influence and impact that the federal government has on VE activities in the United States. The activities of the Canadian provincial DOTs and the three cities are also compared.

The VE Job Plan for most STAs uses elements of SAVE International's *Value Methodology Standard* (*3*) issued in 1998, or AASHTO's slight variation of it. Several states and provinces have, or are in the process of developing or modifying, the tools in the *Value Methodology Standard* to be more specific to transportation projects and the related issues to improve the outcome of VE reviews. An example of this is the recent interest by some STAs to use project-performance measurement to evaluate the effectiveness of proposed VE alternatives. Several agencies are using VE to manage stakeholder expectations to improve public or stakeholder buy-in and project commitment. These aspects are discussed as well. Training practices and the level of financial commitment that appears to be necessary to sustain value expertise are presented in this chapter.

The VE Job Plan establishes a successful sequence of activities to understand the study subject (project, process, or product), define the project functions, generate and evaluate ideas, and eventually develop and present the VE proposals during the workshop stage. However, no universally accepted process currently exists to implement the VE proposals. Consequently, some STAs have developed their own approaches to ensure that the VE proposals are systematically and fairly reviewed for implementation. The effectiveness of the VE programs is also of interest for two reasons: (1) to be compliant with federal VE program reporting requirements and (2) to attract adequate funding to operate the program. These aspects are also discussed in chapter three.

Chapter four presents the current implementation challenges and how several transportation agencies have attempted to overcome these challenges. Key implementation issues, including the development and maintenance of core agency VE expertise and sustainable program funding, are discussed. This chapter also presents evidence that the traditional motivation to reduce project costs may be, in part, giving way to a broader appreciation and emphasis on the opportunities to increase project value and performance. This improvement typically has a far reaching social benefit, although transportation agency expenditures to achieve this benefit do not always provide a direct and immediate return on investment.

Chapter five focuses on the identification of potential future opportunities and research needs related to the application of VE in transportation. Critical to the sustained success in VE is the ability and readiness of the value community to support the VE programs operated by the transportation agencies. This chapter includes a discussion on how the value community can meet the expectations of the STAs.

Chapter six presents the concluding remarks that reflect on the issues identified and discussed in the synthesis report.

Following the References, Bibliography, and Glossary are these three appendices:

- Relevant Federal Value Engineering Requirements (Appendix A),
- Survey Questionnaire (Appendix B), and
- Summary Responses to Questionnaire (Appendix C).

TERMINOLOGY USED IN THIS REPORT

VM has been used for almost 60 years. During this time, the terminology used to describe aspects and process steps of the methodology has varied to the point that clear and consistent definitions do not exist between agencies and others in the value community. The terms value analysis, value engineering, value planning, value management, and other value variants refer to the same methodology, and are often used interchangeably (*2*). The debate on the "proper" methodology name has raged for decades. Resolving the terminology issue is well beyond the scope of this synthesis. However, for the purposes of this report, the following definitions will apply:

- Job Plan—structured agenda or plan describing the sequence of value study activities.
- Pre-workshop stage—preparatory activities that precede a value workshop, including scope refinement, data collection, VE team member selection, and resolving venue logistics.
- Post-workshop stage—follow-on activities after the value workshop, including implementation review and decisions, presentations, report preparation, and monitoring.
- Value analysis, value engineering, value management, and value planning—all refer to value methodology.
- Value community—practitioners and academics in agencies, educational institutions, not-for-profit societies that promote VM [such as SAVE, Canadian Society of Value Analysis (CSVA), and Miles Value Foundation (MVF)], and the consulting industry specializing in value work.
- Value methodology—systematic (and structural) application of recognized techniques by a multidisciplined team to identify the functions of a (project), product, or (process), establish a worth for that function, generate alternatives through the use of creative thinking, and provide the needed functions to accomplish the original purpose of the project, reliably and at the lowest life-cycle cost without sacrificing safety, necessary quality, and environmental attributes of the project (also referred to as value analysis, value engineering, value planning, and value management).
- Workshop stage—activities undertaken during a value workshop following the six-phase Job Plan, including the Information Phase, Function Analysis Phase, Creativity Phase, Evaluation Phase, Development Phase, and Presentation Phase (*3*).

The Glossary includes a broad range of VE-specific terms that have been taken from SAVE's *Value Methodology Standard* (*3*).

CHAPTER TWO

VALUE ENGINEERING IN TRANSPORTATION

BRIEF HISTORY OF VALUE ENGINEERING

VM emerged in the United States during the 1940s, at a time when challenging decisions had to be made regarding the alternative design choices needed to overcome a general shortage of resources. General Electric's Vice President of Purchasing, Harry Erlicher, observed that design changes and material substitutions often resulted in a better product at a lower cost. He was interested in discovering why this unexpected result had occurred and this set in motion the actions that would eventually yield VM (*2*).

Erlicher requested that Lawrence D. Miles, Manager of Purchasing, develop effective ways to improve value. This program, termed value analysis (VA), was established in December 1947. Miles realized that the functions performed by a product held the key to improved value. In addition, he recognized that the VM was unique—not part of the conventional design process routine. However, sustaining the methodology required a champion and converts. Miles obviously filled the role of the champion. General Electric embarked on an extensive training program in October 1952 in response to the early success it had with the VA program (*2*).

VM has, on occasion, been inappropriately viewed as cost cutting. This likely stemmed from poor or misguided efforts to lower product or project costs without truly understanding how it should perform. However, it is clear that from the start, VM targeted improvement. At the first VA training session in October 1952, E.E. Parker established the ground rules in his opening presentation, indicating that "our creed is the same performance for lower cost." Although the value and design teams ultimately have the same objective, the most cost-effective and appropriate product or project, the approaches taken are different. However, even at this early stage Miles cautioned that "there is no competition between us (value and design teams). Let's never let that thought prevent our cooperation" (*4*).

General Electric's VA program was immensely successful and remained as a competitive advantage for almost a decade. In 1954, the Department of Defense's Bureau of Ships became the first U.S. government agency to embrace VM in its procurement activities. The Bureau of Ships named its program value engineering (*2*).

FEDERAL INITIATIVES

The use of VE spread through the U.S. government in the early 1960s. Navy Facilities Engineering adopted VE in 1963, and by 1965 VE incentive provisions were being introduced into construction contracts. This widespread interest in VE was premised on the belief that VE could improve the cost-effectiveness of publicly funded projects (*5*).

Congress became interested in applying VE to highway projects in the late 1960s, at a time when the highway network was being significantly expanded. The Federal-Aid Highway Act of 1970 reflected this growing interest with a provision requiring that VE and other cost-reduction analyses be performed on any federal-aid highway project or any federal-aid system. In 1973, FHWA appointed a staff position to coordinate its VE program and training requirements. The training program commenced in 1975, and by 1999 8,500 people had been trained. The FHWA program was structured to encourage rather than mandate the application of VE at the state level.

AASHTO formally recognized VE in 1985 and issued the first edition of the AASHTO *Guidelines on Value Engineering* in 1987 (*6*). Both FHWA and AASHTO worked cooperatively to assist the STAs with their VE studies. This assistance included staff training, study team participation, and program performance activities.

Borkenhagan's article in Public Roads, "Value Engineering: An Incredible Return on Investment" (*5*), reported that an average of 324 VE studies per year were completed between 1993 and 1997. However, the majority of these studies were undertaken by a relatively small number of STAs, with 11 states combining to complete 79% of the reported studies. Although many publicly funded projects had been improved in terms of avoided expenditures, it became clear that the "encourage VE" approach taken by FHWA had not fully engaged the majority of STAs across the country.

The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) provided FHWA with the opportunity to revisit its VE mandate. Although the then current approach was considered to be successful, FHWA sought to increase the level of VE activity on federally funded highway projects. Key to increasing VE activity was the need to understand

how the STAs viewed their individual VE programs. For example, Borkenhagan noted that agencies adopted VE to

- Save money and ensure cost-effectiveness,
- Improve quality,
- Eliminate unnecessary design elements, and
- Foster innovation and improve productivity.

Agencies that had not achieved success with VE often cited a lack of resources (staff and time) to complete the VE study. Some STAs noted that VE appeared to duplicate existing programs such as in-house engineering reviews. A key aspect of success appears to be the level of buy-in at the management level.

In 1991, an audit of federal VE practices by the President's Council on Integrity and Efficiency concluded that more could and should be done by federal agencies to realize the benefits of VE. Principal direction was issued by the Office of Management and Budget (OMB). *OMB Circular A-131*, updated in May 1993 (*7*), requires all federal departments and agencies to use VE, where appropriate, to reduce program and acquisition costs. *Circular A-131* also stipulated that each department or agency be required, as a minimum, to

- Designate a senior management official to monitor and coordinate the VE activities,
- Develop criteria and guidelines to identify programs and/or projects with the most potential to yield savings when VE is applied,
- Assign responsibility to a senior management official to grant VE study requirement waivers for certain programs and/or projects,
- Provide VE training to staff involved in VE,
- Ensure that VE funding requirements are included in the annual OMB budget request,
- Maintain documentation records pertinent to the VE program,
- Adhere to applicable federal acquisition requirements,
- Develop an annual VE program plan, and
- Report VE activities to OMB on an annual basis if the annual total agency budget exceeds $10 million.

OMB Circular A-131 is included in Appendix A.

In November 1995, the U.S. Congress enacted the National Highway Designation Act. This legislation instructed the Secretary of Transportation to establish a program requiring that STAs conduct VE analyses on all NHS projects with a cost of $25 million or more. The act provided additional flexibility at the state level in terms of how and when VE studies would be performed and by whom. Team composition restrictions (i.e., VE team members must be completely independent of the design process) and funding controls were also introduced.

FHWA issued its VE Regulation 23 CFR Parts 627 in February 1997 (*8*). The regulation requires that each STA establish a VE program for NHS projects with total projected costs of more than $25 million. Each program will focus on:

- Improving project quality,
- Reducing project costs,
- Fostering innovation,
- Eliminating unnecessary and costly design elements,
- Ensuring efficient investment in NHS projects, and
- Develop implementation procedures.

A companion FHWA VE Policy was issued in September 1998 (*9*) to provide policy guidance for VE studies undertaken on federal-aid projects. The FHWA VE Regulation and Policy are included in Appendix A.

A design–build (D/B) contracting regulation was reviewed in 2002. A Notice of Proposed Rulemaking was extensively discussed in late 2002 (*10*). The *Federal Register* presented the final ruling that VE would be required on all NHS D/B contracts before the release of the D/B request for proposals (RFP). The ruling also notes that a pre-RFP VE study would not preclude future additional VE studies on the NHS project.

The AASHTO VE Technical Committee (formerly Task Force) was established to assist the STAs through positive promotion and distribution of VE knowledge. The VE Technical Committee's charge statement defines its function and responsibilities.

> To establish and maintain policy to assist states in the development of individual Value Engineering Programs, ensure integrity and uniformity of VE practices, and promote VE within all areas of state and federal transportation programs. Plan and deliver a biennial transportation value engineering conference.

The VE Technical Committee developed the following 2002–2012 work plan:

- Plan, develop, and deliver a national VE conference every other year to assist states in developing, maintaining, and improving VE programs.
- Deliver a national conference on the odd years:
  - Hold a planning meeting for the national conference on the even years,
  - Conduct the planning meeting at the same location and time as the Subcommittee on Design,
  - Rotate the location of the national conference so that the conferences are held throughout the country,
  - Develop training tracks and agenda,
  - Nominate and secure speakers,
  - Set fees to cover expenses, and
  - Provide awards for design and construction VE at the national conference (select award winners).

- Update VE guidelines at least every 10 years:
  - Complete update of 2001guidelines by 2011,
  - Work with the task force on D/B to jointly develop best practices for VE for D/B by late 2003, and
  - Develop guidelines for VE performance measures by 2005.
- Maintain an active website providing information about transportation VE and the upcoming national VE conference.
- Provide ongoing assistance to member states to:
  - Comply with the FHWA mandate,
  - Develop VE programs,
  - Provide VE training, and
  - Conduct VE studies.

TRANSPORTATION AGENCY INVOLVEMENT

The California Department of Transportation (DOT) (Caltrans) is acknowledged to have established the first state VE program. Caltrans initiated its VA program in 1969. Its initial focus was on standard specifications, standard plans, and selective elements of highway projects. However, highway projects were not extensively studied until 1985. Turner and Reark reported in 1981 that VE had not been generally applied to highway projects "because of tight schedules and the concern about designer's reactions" (*1*, p. 9).

The Caltrans VE program served as a beachhead for expansion into other STAs. In the 1970s, VE programs were initiated in Florida (1970), Idaho and Virginia (1973), Minnesota (1975), New Mexico (1977), and Oregon and Pennsylvania (1979). In most cases, these early VE programs focused on the improvement of standards and specifications, and staff training (*1*).

FHWA monitors the application of VE on federal-aid projects and produces an annual summary report (*11*). Table 1 summarizes the results for the 7-year period from 1997 to 2003. This corresponds to the time period that the FHWA VE Regulation has been in force. On average, 382 federal-aid VE studies were performed annually. This represents an increase of approximately 18% over the annual average number of federal-aid VE studies observed from 1993 to 1997.

For the latest 5-year period, from 1999 to 2003, the 10 most active STAs (Virginia, Florida, California, Texas, Pennsylvania, New Jersey, North Carolina, Tennessee, Washington State, and Ohio) completed 64% of the total number of VE studies (1,872) performed on federal-aid projects. This is illustrated in Figure 1. The number of VE studies is presented in Figure 2. The average cost per VE study is presented in Table 2.

The average cost per study, calculated from the FHWA VE program reports for the 10 most active STAs, ranges from $2,600 to $60,000. This wide variation in study costs likely reflects differences in how costs are attributed to VE studies, size and composition of the VE team, duration of the VE studies, and complexity of the project being reviewed. For example, California's relatively higher average cost per study takes into account longer study durations—Caltrans typically uses 6-day workshops instead of 5-day workshops—and large study teams assembled for relatively complex projects.

TABLE 1
FEDERAL-AID PROGRAM VALUE ENGINEERING SUMMARY, 1997–2003

VE Program Metrics	FY 1997[a]	FY 1998[a]	FY 1999[b]	FY 2000[a]	FY 2001[c]	FY 2002[c]	FY 2003[d]	Total/Avg.
No. of VE Studies	369	431	385	388	378	377	344	2,672
Cost of VE Studies Plus Administrative Costs	$5.10	$6.58	$7.47	$7.78	$7.29	$9.02	$8.45	$51.69
Estimated Construction Cost of Projects Studied	$10,093	$17,227	$18,837	$16,240	$18,882	$20,607	$19,241	$121,127
Total No. of Recommendations	N/A	2,003	2,082	2,017	2,013	2,344	2,144	12,603[e]
Total Value of Recommendations	N/A	$3,084	$3,227	$3,483	$2,375	$3,050	$3,163	$18,382[e]
No. of Approved Recommendations	N/A	743	848	1,057	1,017	969	914	5,548[e]
Value of Approved Recommendations	$540	$770	$846	$1,128	$865	$1,043	$1,016	$6,208
Return on Investment	106:1	117:1	113:1	145:1	119:1	116:1	120:1	120:1

Source: *Annual Federal-Aid Value Engineering Summary Reports* (*11*).
Notes: Amounts shown in millions of dollars. N/A = not available.
[a]52 agencies reported in fiscal year (50 states, District of Columbia, and Puerto Rico).
[b]53 agencies reported in fiscal year (50 states, District of Columbia, Puerto Rico, and Virgin Islands).
[c]53 agencies reported in fiscal year (50 states, District of Columbia, Puerto Rico, and FLH).
[d]50 agencies reported in fiscal year (47 states, District of Columbia, Puerto Rico, and FLH); Kentucky, Louisiana, and New Hampshire did not report results.
[e]Totals do not include results from FY 1997, which were unavailable.

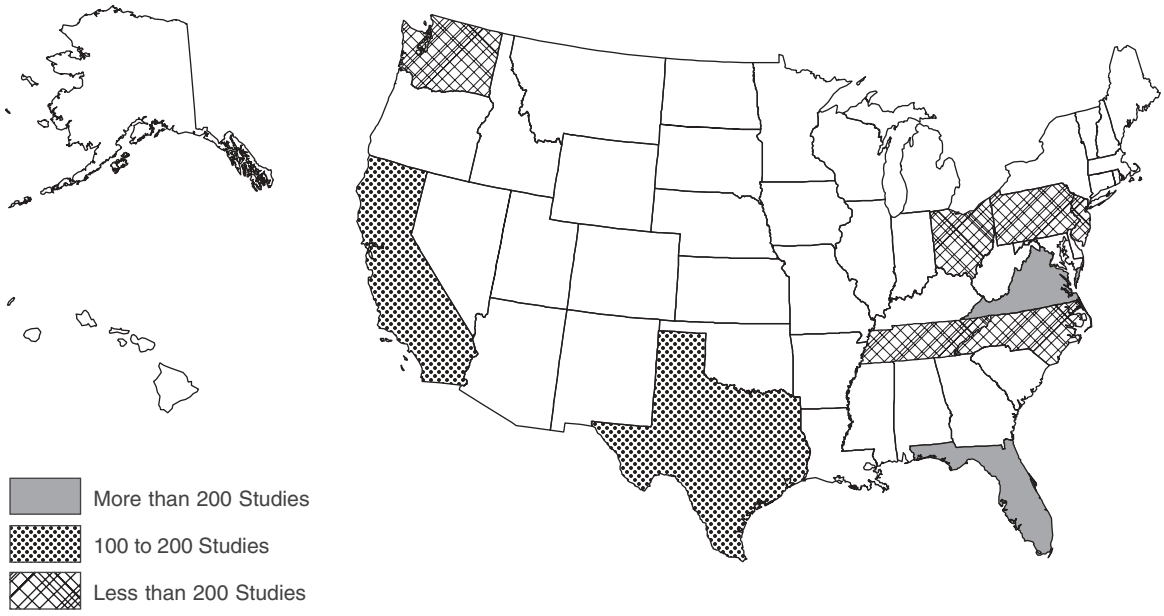


FIGURE 1 Ten most active STAs performing VE studies, 1999–2003 (*11*).

Also consider that some STAs might use in-house expertise for their studies, whereas other agencies might use external consultant team leaders and specialists. The total cost of a person-hour is generally understood to be the aggregate cost of salary, benefits, and corporate overhead. Additional project costs, pertaining to other expenses such as printing and travel, should also be considered. For consultants, the costs associated with external VE study participants are usually readily apparent and traceable because the expertise has been acquired through some form of contractual agreement. However, in-house costs are typically more difficult to track because many agencies are generally not able to fully consider the total cost of staff time or to reflect the true value of the expertise to the project.

The FHWA "racing form" (*11*) is primarily a financial reporting tool to satisfy the legislation requirements regarding VE. The tabular format permits easy comparison between two or more STAs in a global sense and likely creates competitive interest between agencies.

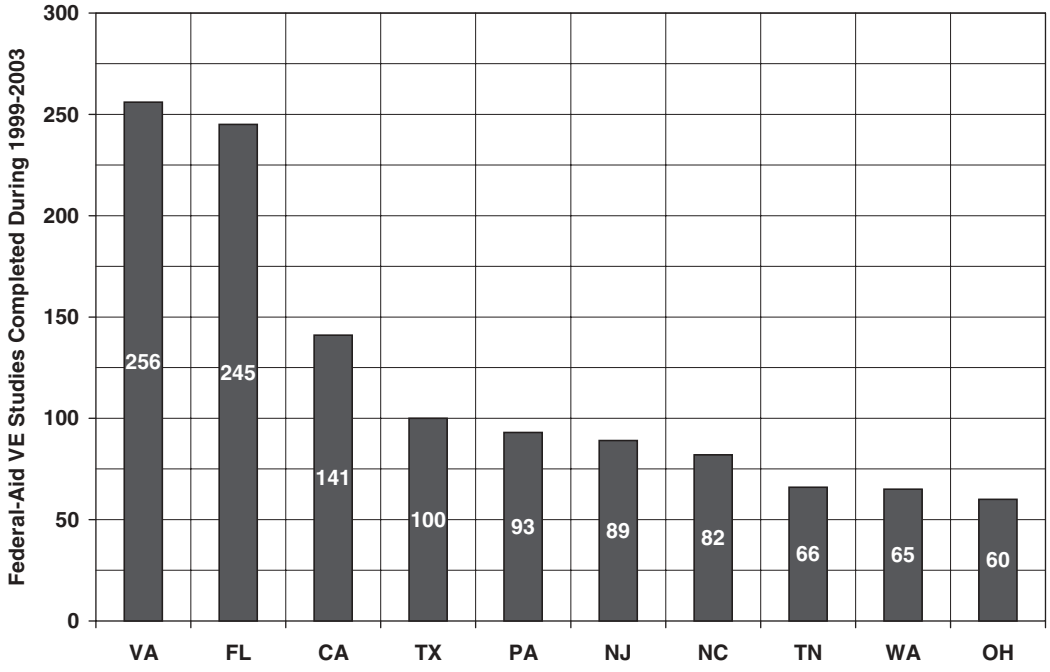


FIGURE 2 Most federal-aid VE studies by state completed during 1999–2003 (*11*).

TABLE 2
FEDERAL-AID VALUE ENGINEERING STUDY COSTS FOR 10 MOST ACTIVE STAs PERFORMING VE ESTIMATES, 1999–2003

STA	No. of Federal-Aid VE Studies			Cost of Federal-Aid VE Studies			Average Cost per Study
	In-house	Consultant	Total	In-house	Consultant	Total	
Virginia	255	1	256	$4.01	$0.01	$4.03	$15,700
Florida	88	157	245	$1.68	$3.61	$5.28	$21,600
California	12	129	141	$2.66	$5.80	$8.46	$60,000
Texas	0	100	100	$0.00	$1.10	$1.11	$11,100
Pennsylvania	83	10	93	$0.22	$0.26	$0.48	$5,200
New Jersey	89	0	89	$1.10	$0.00	$1.10	$12,400
North Carolina	82	0	82	$0.21	$0.00	$0.21	$2,600
Tennessee	57	9	66	$0.27	$0.05	$0.32	$4,800
Washington	52	13	65	$0.43	$0.32	$0.76	$11,700
Ohio	17	43	60	$0.03	$0.62	$0.65	$10,800
Total	735	462	1,197	$10.61	$11.77	$22.40	$18,700*

Source: *Annual Federal-Aid Value Engineering Summary Reports* (*11*).
Note: Cost values in millions of dollars, except for Average Cost per Study.
*Average study costs for the 10 most active STAs.

Many STAs now have VE websites that are used to disseminate information internally or to consultants. This information typically includes applicable policy, procedure, and guideline documents. VE workshop forms and agency success stories may also be accessible on-line.

SAVE INTERNATIONAL INITIATIVES

SAVE International, the U.S.-based professional society promoting worldwide VM, has traditionally taken a supportive role regarding the application of VE in transportation. The society, originally named the Society of American Value Engineers, was formed in 1959 to promote the education and experiences of the value community in the United States. As interest in VE extended to other countries, so did SAVE's focus. Today, it enjoys strong working relationships with affiliates and other value societies around the world.

SAVE has forged ties with the AASHTO VE Technical Committee as well. A member of the Technical Committee typically leads a transportation-focused forum at the annual SAVE conference.

The society's primary role with respect to VE in transportation is in the education and certification areas. SAVE is the governing body responsible for the certification of value specialists. Approximately 60% of the transportation agencies surveyed indicated that the VE team leader "always" or "often" had to be a Certified Value Specialist. As such, the continued ability of SAVE through its certification program to ensure that certified VE team leaders are available to lead highway VE studies remains a critical role.

MILES VALUE FOUNDATION

The MVF was established as "a non-profit public foundation dedicated to the advancement of the state-of-the-art of VM through planning, research, and education." MVF is focused on

- Creating and promoting teaching of the VM courses at the university level,
- Promoting public awareness, and
- Encouraging research and development through scholarships and grant programs.

The foundation does not specifically have an influence on VE applications in transportation. However, MVF is an excellent resource to value practitioners, academics, and researchers. In addition, educational ties have been forged with several universities aimed at strengthening the value industry with the introduction of "entry level" value practitioners.

CHAPTER THREE

CURRENT PRACTICES IN VALUE ENGINEERING

This section presents an overview of the current practices in VE in transportation in the United States and Canada. The overview is primarily based on observed activities and discussions with practitioners during the literature search and the survey responses from the agencies.

CHARACTERISTICS OF VALUE ENGINEERING PROGRAMS

As discussed earlier, all STAs are required to develop and maintain a VE program in accordance with the FHWA regulation. That said, there is a wide range of VE activity across the United States. This is the result, in part, of the wide range of projects, size of the STA capital construction program, and the relative complexity of the projects. However, some variation may be related to how the individual VE programs function and where the program responsibility is assigned, as well.

In the article, "Measuring Performance of a VM Program" (*12*), Bethany suggested that value programs need to provide three functions: corporate level leadership for implementation, a cohesive approach to VE initiation and integration, and centralized accountability. This requires

- Preparing policies and procedures,
- Training staff,
- Creating program visibility and awareness,
- Developing proposals for identified project opportunities,
- Reporting the efforts of the program,
- Quantifying the results and benefits, and
- Recognizing successes.

To achieve this, the VE program must be capable of preparing for, promoting, implementing, and documenting its activities. This is necessary not only to meet mandated requirements but to sustain corporate interest in the program. Corporate commitment is an essential element required for a successful VE program. The VE program needs to be able to confirm to the key decision makers that it is worth the effort (*12*). Senior management must be involved and fully engaged in the VE program, not only in its initiation, but in implementing its solutions (*13*).

An essential ingredient for program success is the VE champion. This is typically an individual or team of individuals that can bridge the technical and management aspects of the program, and who can enthusiastically promote, individually or collectively, the use and successes of the VE program.

The functional elements of the VE program and their interrelationships are illustrated in Figure 3.

Level of Activity

The annual federal-aid program VE study reports prepared by FHWA (*11*) highlight the wide range of VE activity, measured in studies performed per year, for the 53 STAs. For example, during the period from 1997 to 2003, California, Florida, and Virginia (6% of the total number of STAs) collectively performed more than 40% of all federal-aid VE studies (937 of 2,303). During this same period, an average of 16 STAs (31% of the total) did not perform any of the studies on federal-aid projects.

There is no universal benchmark to define what constitutes an active program at this time. In his article, Borkenhagan (*5*) suggested that STAs performing five or more VE studies per year should be considered as active agencies. This is likely a good starting point. However, states with more modest transportation programs will likely have fewer opportunities than larger states. This would suggest that a sliding scale or ratio-based benchmark might be more appropriate.

Although FHWA has been successful in promoting the use of VE, more can be achieved. In his presentation, "Improving the Effectiveness of Value Engineering Programs Within State DOTs" (*14*), Robinson compared the results of federal-aid VE studies with typical results achieved in other sectors and by other public agencies. The benchmark data were obtained from SAVE and various government agencies. Applying the same review approach to more recent information presented in Table 1 suggests that additional opportunities to improve performance and to lower expenditures should be expected. This comparison is presented in Table 3.

Organizational Structure and Mandate

The VE program focus and thresholds are also influenced by how the program is integrated into the agency. In most cases, the VE program is associated with the design branch, as either a quality assurance or design enhancement function.

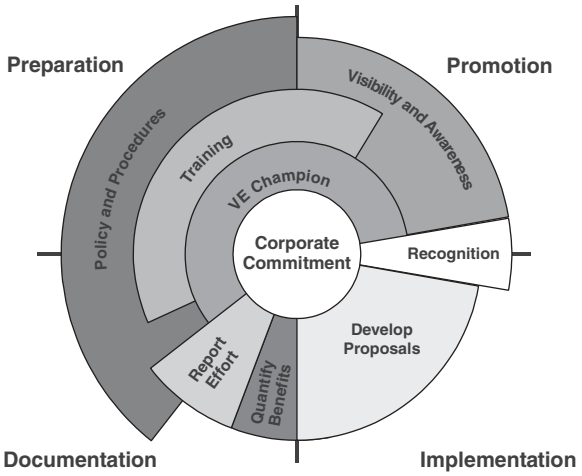


FIGURE 3 Functional elements of a VE program.

Examples where the VE program reported to the design function include Colorado, Connecticut, Kentucky, Louisiana, Michigan, and Ontario. In Arizona, the VE functional activity is attached to the construction branch. A third reporting relationship observed the financial or audit function being responsible for the VE group. The organizational separation of the VE and design functions increases the level of autonomy for the VE program. This third reporting relationship was observed in New Hampshire, New York City, and Virginia.

Several VE programs are now focused on improving the quality and cost-effectiveness of the STA's projects and are reflected in the program's mandate. For example, Virginia's VE program mission is

> To assist VDOT [Virginia DOT] management in obtaining optimum value from transportation funds through the VE process by improving project quality, eliminating unnecessary costs, and reducing overall life-cycle costs (*15*).

However, not all agencies share this broader interpretation of VE. Consider the following definition of VE presented in an agency's consultant reporting form:

> VE is a cost savings tool that, per federal requirements, is to be used on design projects that have a total estimated cost of $25 million or more as defined in the environmental document. Projects estimated at less than $25 million can use VE, but it is not required (*16*).

Variations in how agencies view VE should be expected, considering the variation in maturity of VE programs across the country. The AASHTO VE Technical Committee observed that agencies with more mature VE programs tended to apply VE earlier in the development of the project (*17*). Typically, this means that relatively more emphasis would be placed on defining the project scope than if the VE study had been undertaken later in the development cycle.

Virginia's VE program benefits from a VE Advisory Committee. This committee, which includes field and engineering division senior managers, provides oversight, guidance, and direction for the VE program. The committee provides key input into the VE strategic plan, training needs, advice related to the needs for special studies, and the operations of the VE program (*15*).

TABLE 3
COMPARISON OF FEDERAL-AID VALUE ENGINEERING PROGRAMS TO INDUSTRY BENCHMARKS

VE Program Metrics	Federal-Aid	Benchmark[a]
% Savings (value of approved recommendations/ estimated capital cost of projects studied)	5%	+10%[b]
Acceptance of VE Proposals (no. of approved recommendations)	44%	60%–80%
Acceptance of VE Proposals (value of approved recommendations)	31%	
No. of Approved Recommendations per VE Study	5.3	20–40
Average VE Study Costs	$20,000	$40,000–80,000[c]

[a]Industry benchmarks are taken from Robinson's paper presented in 1999 (*14*).
[b]Some agencies involved in capital projects realize up to 20% (*14*).
[c]Some complex VE studies can exceed $100,000 (*14*).

Promoting Interest

The earliest interest in applying VE in transportation came in the form of Value Engineering Change Proposals (VECP) in the mid-1960s (*1*) as knowledge of VM spread through U.S. government agencies. The opportunity to realize potential cost savings during construction was apparent to the STAs, and these proposals were subsequently incorporated into their contracts. However, it was not until VM was applied to projects at the planning and design level that it became apparent that VE could significantly influence the cost and performance of projects, products, and processes.

In 1969, Caltrans became aware of VE through its dealings with the U.S. Army Corps of Engineers. As such, the Corps served as an early promoter and supporter of VE in transportation (*18*). This interest spread to other STAs on an informal basis.

FHWA's increasing involvement with VE during the 1970s was premised on promoting interest. For 20 years, FHWA encouraged STAs to use VE before the formal introduction of federal legislation (*5*). AASHTO has worked with FHWA to promote VE at the national level through the sponsorship of biannual AASHTO VE conferences. The AASHTO

VE Technical Committee also actively promotes VE internationally. For example, AASHTO has recently invited representatives from one Canadian province to participate on the VE Technical Committee. AASHTO also works closely with SAVE to promote VE in transportation during SAVE's annual conference. In 1997, FHWA and AASHTO initiated an award program to recognize agency achievements in VE.

There are now four regularly scheduled value industry conferences held in North America. SAVE's annual, AASHTO's biannual, and the CSVA's annual conferences provide excellent opportunities to exchange ideas, concepts, and successes in VE. A separate one-day government VE conference is held annually in association with the SAVE conference.

As Bethany noted (*12*), VE programs also need internal promotion and recognition. This is necessary to generate more interest in applying VE (i.e., create a broader customer base for the VE program) and to confirm to senior management the benefits of applying VE. In addition, many STAs use internal staff as their technical specialists. Promoting VE also helps to attract potential team members.

Several transportation agencies have recently worked together to promote VE beyond their borders, drawing on personal (staff) and corporate level contacts to develop a unique working bond. For example, VDOT has worked with several other states, including Colorado, Indiana, Maine, and New Jersey, to undertake VE studies and promote awareness of the methodology. California and Ontario have also collaborated on out-of-state training sessions.

Education and Awareness

Training in VE is available from private consultants, at SAVE annual conferences, and through the National Highway Institute. Many of the policy documents reviewed cited some form of training requirement. However, 72% of the responding agencies do not have a formal policy on training for their organizations. Alaska noted that extensive training had been completed in the early 1990s, but current budget constraints have limited training initiatives in recent years.

Twenty-two agencies with training programs in place reported that the programs had operated more than 5 years. Caltrans has trained 1,200 staff since the early 1980s. Virginia has trained more than 2,300 staff (approximately 1,500 are still working at VDOT), whereas Florida has trained almost 500 people. New Jersey, Ontario, and Washington State have trained approximately 350 staff each. Other VE programs have focused on selected training of VE managers and senior project personnel. Examples include Arizona, Michigan, New York City, and North Carolina, where fewer than 20 individuals have been trained.

These wide variations in trained personnel reflect the size and makeup of the transportation organizations. More than 40% of the respondents reported that VE-trained staff constituted up to 10% of their entire complement. This training has not typically resulted in extensive numbers of certified staff (Certified Value Specialists, Associate Value Specialists, and Value Methodology Practitioners) at the agencies. Many of the agencies noted that they did not have any certified staff.

The approach to training varies and this may partially explain why so few STA staff have been certified. However, a more likely reason for the limited number of value-certified staff is that employment duties and experience may actually be a barrier to certification. Certification candidates need to be in a position where performing VE represents a large percentage of their daily activities. VE coordinators have the most potential to become certification candidates simply because they are typically the most involved in VE within the STA. However, many VE coordinators have other duties beyond those associated with the VE program. As such, they may not have sufficient opportunity to develop to the certification level. Potential limitations, financial or otherwise, regarding access to advanced training courses or having the time to regularly participate in VE studies may also contribute to the situation.

Training programs based on SAVE International's Module I course and FHWA/National Highway Institute's similar course were the most frequently mentioned when respondents were asked how training was provided. Several states, including California and Virginia, use in-house training programs. Caltrans' training program is a Module I course certified by SAVE. Both Washington State and Florida training programs use SAVE's Module I and Module II courses. Team members in Minnesota receive a brief introduction to VE by the VE team leader. Ontario noted that training beyond the Module I/II level, such as risk management and project performance measurement, is sought at conferences. Project managers and technical staff often receive the VE training at the transportation agencies. In some cases, agency training initiatives may include consultants, staff from other agencies, and municipalities.

Training budgets varied between agencies, with 40% reporting that VE training costs were less than $25,000 per year.

Strengths, Weaknesses, Opportunities, and Threats

The survey included a number of questions that focused on the strengths, weaknesses, opportunities, and threats (SWOT) of VE programs. The responses highlighted below provide a good cross section of how the STAs view their programs. In some cases, issues were cited in more than one category.

Strengths

Strengths of VE programs included the following:

- There are a number of good VE team leaders available to lead VE studies—both internally and externally (consultants),
- VE procedures processes are well-established and well-understood,
- Performing VE early in the development of a project can significantly influence the project scope,
- There is upper management support for VE, and
- There is the ability to bring the best talent to the project.

Weaknesses

Weaknesses of VE programs cited were:

- Lack of training or trained staff,
- Finding VE team members in-house,
- Sharing knowledge gained or results derived during VE studies,
- Buying into the VE process or even the need to perform VE studies,
- Need for better follow-up (implementation),
- Length of time to complete a VE study,
- Agency reluctance to conduct VE studies on non-NHS projects,
- A threshold of $25 million is not suitable for all STAs,
- Scheduling of VE studies is often disrupted by the availability of information,
- Lack of full-time resources, and
- Measuring and reporting the success of the program.

Opportunities

Opportunities for VE programs included the following:

- Focus on non-NHS projects;
- Promote public confidence that agencies are providing best value;
- Acceptance of alternative methods and products;
- Expand beyond the traditional planning, design, and construction areas to other business streams;
- Improve integration of VE with other initiatives such as road safety, context-sensitive solutions, and asset management; and
- Improve working relationships with other agencies or internal departments.

Threats

Threats to VE programs cited were:

- Inadequate training (funding and time);
- Lack of understanding of, or apathy toward, VE by technical staff;
- Funding of transportation programs in general;
- Maintaining a VE champion;
- Program would be weakened without the federal mandate;
- Lack of dedicated staff resources; and
- Threats from other initiatives, including asset management, road safety, accelerated construction techniques, and context-sensitive solutions.

Future Needs of VE Programs

The responding agencies indicated that, from their perspective, the value community will be able to deliver the VE services needed. This is an important consideration that probably warrants monitoring, given the changing demographics in the value community. The number of experienced VE team leaders will likely be affected over the next few years, owing to retirements, promotions, and the influx of new but inexperienced value practitioners.

In addition, one agency indicated that value consultants needed to continue to develop their skills. It was suggested that Module I and II training courses also receive regular updating to reflect current training approaches.

Other future needs identified were:

- Consider a revised mandate, which could revisit the $25 million threshold or expand to non-NHS projects;
- Define best practices in VE, including the best time to undertake a VE study;
- Consider shorter training sessions;
- Develop project performance measures;
- Consider ways to confirm compliance with *OMB Circular A-131*;
- Consider how user costs and road safety could be incorporated; and
- Determine what types of studies best benefit from VE.

POLICIES AND PROCEDURES

Policies and procedures for several STAs were reviewed during the literature search activity. In general, the two primary applications of VE in transportation, at the planning and design and construction phases, are dealt with separately and uniquely. Many of these policies and procedures were similar, suggesting that STAs have freely shared and/or adopted approaches to leverage the success of others. The federal VE regulation and policy also served as primary building blocks for the state agencies.

In the United States, the FHWA VE regulation mandates the use of VE on major NHS projects. Approximately two-thirds of the responding agencies reported that VE policy was provided by the federal government (FHWA). In addition, many reported that the transportation agency had developed

accompanying policies and procedures to augment the federal policies. About half of the responding agencies indicated that VE guidelines are also sourced from the federal level.

The respondent agencies identified the following three basic policy and guideline development sources:

- Adopt federal policies and guidelines,
- Adopt other agency's policies and guidelines, and
- Develop policies and guidelines internally.

FHWA has prepared policy, guidelines, and procedures to support the VE programs at the STAs (*19–22*). AASHTO has also produced similar guideline documents. The FHWA and AASHTO documents have been adopted directly and/or modified as required by many STAs to serve as state policy and procedures.

In some cases, STAs have developed policies and processes to control their VE activities. For example, Florida has recently prepared a number of process control system charts to help manage their business units at the corporate and department levels (*23*). An example process control system chart used to select VE projects is presented in Figure 4. Florida's process control system establishes the interrelationships of the state and district value engineers, identifies key activities, and defines the quality assurance and quality control responsibilities. At the time of the survey, Nevada was just finalizing its draft VE policy (*24*). The draft policy, using a decision chart that establishes the functions and responsibilities of staff associated with the VE program, is presented in Figure 5.

A number of transportation agencies have also developed VE manuals or procedures. Several manuals were reviewed as part of the literature work, including submissions from California, Florida, New Mexico, New York, Ontario, and Washington State. The documents prepared by Florida, New Mexico, New York, Ontario, and Washington State are generally similarly sized and provide selective VE background and concepts, in addition to their respective VE procedures, reporting formats, and anticipated meeting and scheduling expectations. The New York State DOT provides VE program guidance in their design manual.

To date, of all STAs contacted, Caltrans has developed the most extensive suite of VA documents. It has prepared a broad range of VA policy and guideline documents for use in its VA program, similar to those discussed earlier, including a draft VA chapter included in the *Project Development Procedures Manual*. However, what sets Caltrans apart from the other STAs is its companion VA team and report guides (*25,26*).

In the paper, "Lessons Learned from the California Department of Transportation's Value Engineering Experience in the Transportation Sector" (*27*), Hunter acknowledged that the two manuals were written to create a consistent set of operating instructions to conduct and document VE studies. Experience has proven this to be a worthwhile investment, because Caltrans has been able to establish a minimum study performance standard and reduce the learning curve for new participants. The manuals have also been used to showcase the Caltrans-developed project performance measurements approach. The agency's website makes these documents readily available. This has motivated other agencies to incorporate elements of the Caltrans VA process.

Most transportation projects in the United States are subject to the requirements of the National Environmental Policy Act (NEPA) and/or other state-based environmental legislation. Similar environmental acts exist in Canada and govern transportation projects there. In most cases, the VE procedures for the STAs identify optimal times during project development when VE studies should be done. This may vary with project complexity and/or project value (*28,29*).

STAs typically present the project planning and design process separately from the VE process and show the potential linkage points between the two work streams. Smith (*29*) suggested in his presentation, "Using Value Analysis to Scope Projects," that the VE process could be integrated into the NEPA process. Ohio took this a step further. In 2003, the Ohio DOT (ODOT) developed its "Strategic Initiative Six: ODOT Will Improve the Quality of Its Construction Plans" (*30*). It accomplished this by merging the nine-step NEPA process with the five-step planning process, design process, VE, and constructability reviews into a unified/integrated project development process (*31*). ODOT's project development process for major projects is presented in Figure 6.

SELECTING SUITABLE PROJECTS

Most transportation VE studies done in the United States are being undertaken because the projects under review are on the NHS or cost more than $25 million, as required by regulation. The $25 million project cost threshold was identified most often as a key statutory trigger to warrant a study. Of the responding agencies, 66% identified the statutory requirement as the primary motive to complete the study. Nevada reported that they plan to lower the threshold from $25 million to $10 million when their draft VE policy is enacted. Florida, Pennsylvania, and Ohio reported cost thresholds of $20 million. New Hampshire indicated that their cost threshold was $50 million, whereas Virginia and Alaska use $5 million and $4 million thresholds, respectively.

In her thesis, *Value Engineering for Small Projects* (*32*), Clarke presented a selection methodology for VE studies of small transportation projects. She defines small projects as being federally or state funded, non-transit projects with costs of less that $10 million. Suggested factors include cost, complexity, and impacts.

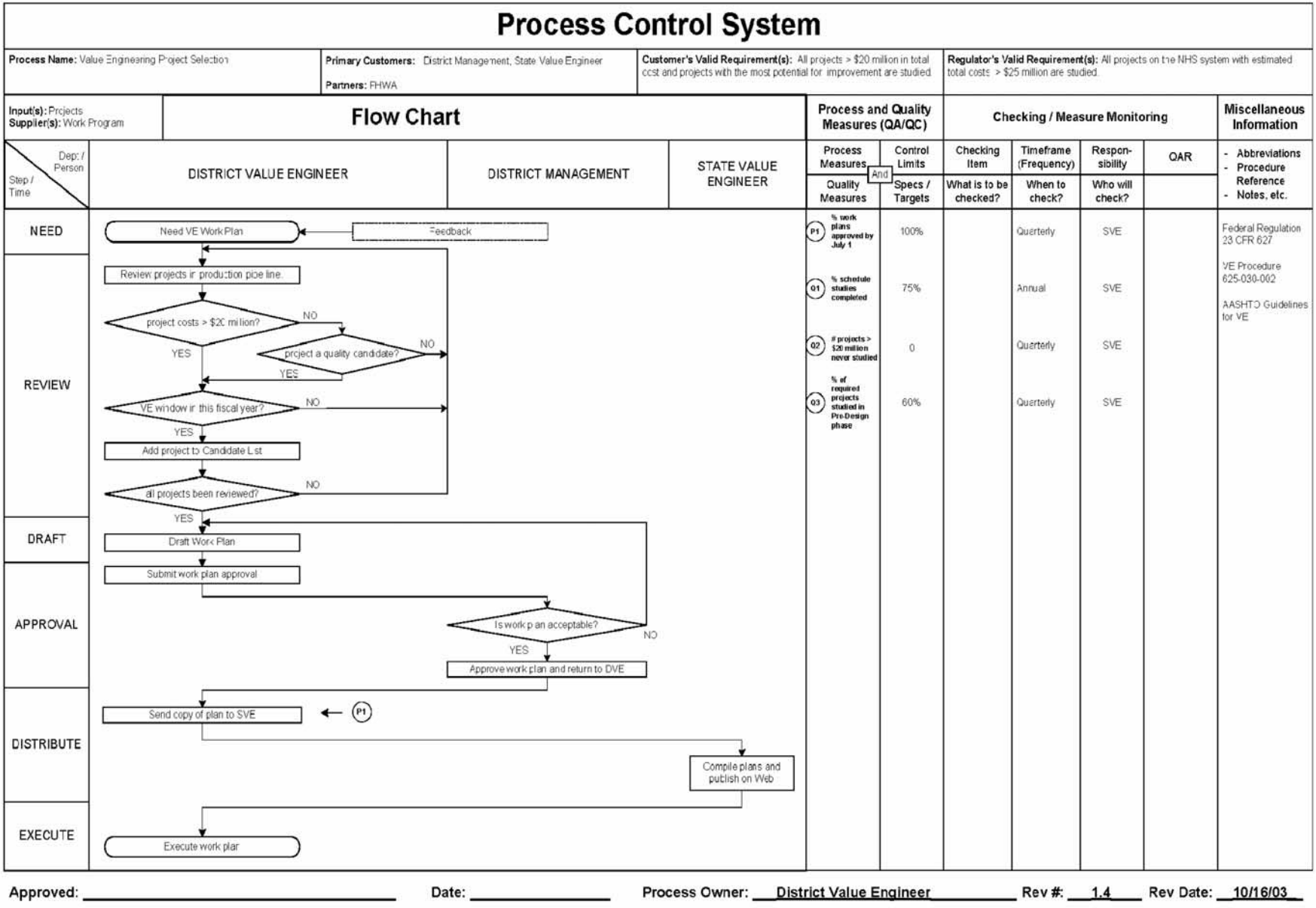


FIGURE 4 Florida DOT VE project selection process (*23*).

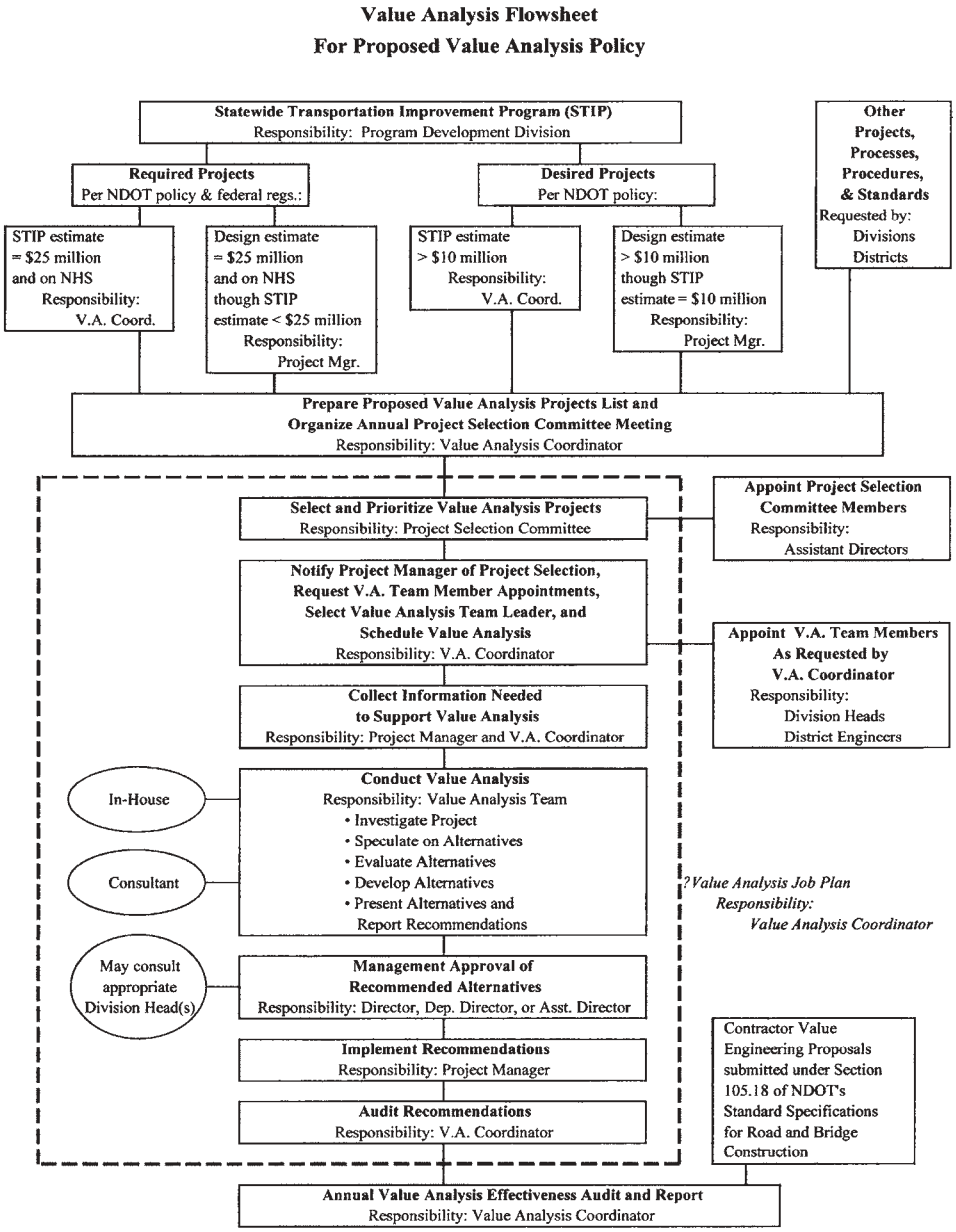


FIGURE 5 Value analysis policy development in Nevada (*24*).

The selection criteria are presented in Table 4 and are similar to criteria used by New Jersey. Clarke developed this criteria based on suggestions from a variety of sources. A review of 51 VE studies in Hungary by Fodor (*33*) revealed a somewhat similar list of possible value targets.

Robinson (*14*) noted that one way for STAs to increase the number of VE studies performed was to focus on projects that do not receive federal-aid or have costs of less than $25 million. However, currently, the agencies rarely embrace this strategy.

According to many of the agencies responding to the survey, the application of VE on small projects is rarely or never done. Although there is nothing precluding VE on small projects, transportation agency resources are likely limited or might be better deployed on large projects. Not only are they usually mandated to do so, it also might be a better use of skilled resources. This is because larger projects typically have more potential for improvement owing to the larger scope and expenditure threshold. However, in some cases, it may be appropriate to apply VE to a smaller project when the agency is unsure of the scope or to build consensus with stakeholders.

The situation is much different for the Ontario Ministry of Transportation (MTO). In Canada, transportation funding is generally dealt with at the provincial level. As such, the

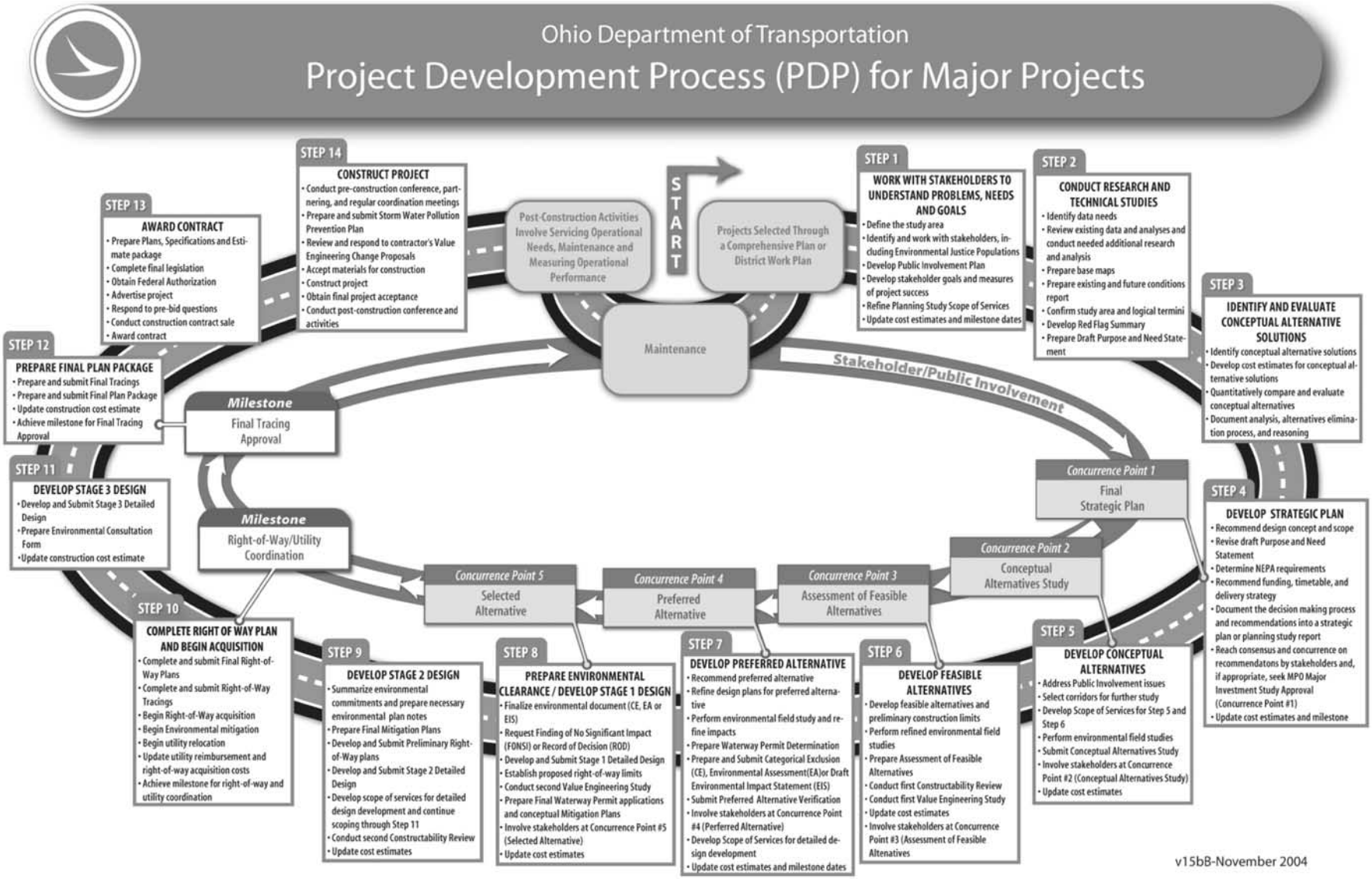


FIGURE 6 Example project development process integrating VE (*31*).

TABLE 4
SUGGESTED SELECTION CRITERIA FOR SMALL PROJECTS (*32*)

Factor	Criteria
Cost	Roadway work over 25% of total project cost
	Bridge work over 25% of total project cost
	Right-of-way impacts over 10% of total project cost
	Utility cost over 10% of total project cost
	Project costs that exceed the budget
Complexity	Major changes to existing structures such as new alignment of roadway, bridge(s), or by-pass sections; widening existing highways for capacity improvements; adding or altering interchanges on multilane facilities; or major reconstruction of existing highways
	Expensive solutions such as a component or material that is critical, exotic, hard-to-get, or expensive; overly long material haul (excessive borrowing, excessive waste); long foundation piles; excessive reinforcement; cofferdam de-watering; architectural embellishment; curbs, gutters, and sidewalks (rural); non-standard items; sole-source materials or equipment; highly skilled or time-consuming labor; or difficult materials requirements or inferior material sources
	Accelerated design (tight design schedule)
	Expensive construction traffic control
	Multiple construction stages
	Night work construction required
Impacts	Statewide or districtwide impact
	Wetland mitigation
	Hazardous waste cleanup
	Extensive/expensive environmental or geotechnical requirements

federal–state relationship between FHWA and the DOTs that governs the technical and financial aspects of most projects simply does not exist. MTO does not have a mandatory externally imposed VE program requirement. Nevertheless, MTO's VE program is viewed as being successful by many transportation agencies: SAVE, CSVA, and AASHTO. MTO implements a flexible policy to support its noncompulsory VE program:

> Value Engineering is to be applied to suitable projects to the maximum extent that time and resources will allow. Regions should provide an annual plan that outlines which projects are suitable for VE studies in their Region based on [defined] selection criteria and their project specific knowledge (*34*).

It is generally desirable to perform VE studies as early as possible and this is often cited in value-oriented documents. This is because "the [planning and] design phase accounts for 80% to 90% of the impact on [project] quality and cost" (*35*). This is illustrated in Figure 7. The rationale for this relates to how design decisions are made throughout a project. Typically, an initial concept is developed, or emerges as a modification of a previous design, to satisfy what the designer initially believes to be the expectations of the stakeholders (this usually includes the owner). Resistance to the initial design concept is generally overcome in time by introducing incremental changes that address individual stakeholder concerns throughout the design phase. Each modification accepted increases the design team's resistance to changing (or reverting to earlier) designs. Consequently, the opportunity to change the project diminishes rapidly as the project is developed through the policy and standards, planning and design, construction, and operations phases (see Figure 8).

Other aspects of a project may trigger an STA to initiate a VE study. For example, reducing or avoiding cost and improving safety were often cited as key reasons to initiate a VE study. Improving project performance, which was interpreted to mean improving transportation operations, reducing impacts, increasing durability, or other measures, was also highly rated.

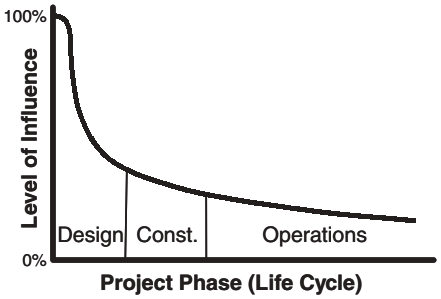


FIGURE 7 Level of influence on cost throughout project development (*35*).

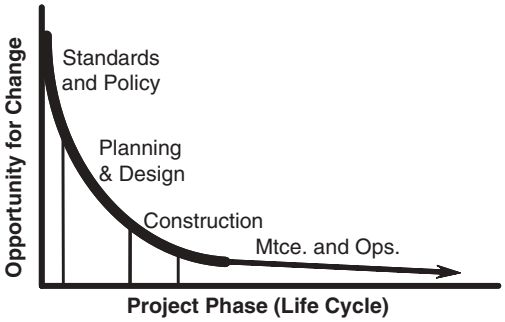


FIGURE 8 Opportunity to implement change throughout project development.

Arizona and Ontario suggested in their responses that VE studies are often undertaken to build consensus among stakeholders. Arizona noted the use of VE with external stakeholders, whereas Ontario has had experience building consensus between internal department organizations. Washington State and Ontario also advised that VE is used to resolve or validate scope issues.

In 1981, *NCHRP Synthesis of Highway Practice 78* (*1*) reported that most of the initial VE programs at the STAs were focused on standard drawings and specifications. In 2004, it would appear that many agencies have shifted to focus more on specific construction projects. More than 70% of the responding transportation agencies indicated that they rarely or never apply VE to technical standards, specifications, and drawings. As indicated in Figures 7 and 8, however, the broadest influence on a project occurs when the VE team focuses on its design standards.

As an example, two recent VE studies for the Ontario MTO (*36,37*) focused on the development of new typical cross-section standards. These studies tackled the cross-section topic in two separate components—lane and shoulder widths and the roadside—using very large multidisciplinary specialist teams. In both cases, the VE teams brought together a unique blend of traditional practitioner (road design, drainage, construction, traffic, and environment) and academic expertise, including road safety and human factors specialists. The study of the design standards had far-reaching consequences and prompted an update of geometric and roadside design requirements to embrace new cost-effective design approaches. MTO will realize the benefits of these updated design standards, when implemented, on many projects.

ENGAGING STAKEHOLDERS

VE, from its earliest applications in transportation, has been used by transportation agencies to control cost. After all, VE was originally introduced to government agencies as a management tool for project and program expenditures. Although cost continues to be the primary motivation for its use (this includes the federal mandate), several transportation agencies have started to pursue the broader benefits of VE. VE is being used to engage stakeholders to:

- Establish project scope,
- Fast track project development,
- Improve interagency communications,
- Bridge institutional borders,
- Define a better balance between the needs of road users and those of the community or the environment, and
- Reach consensus on difficult issues.

VM is often referred to as a powerful decision-making process. This is because the suite of activities that make up the Job Plan guides the team to supportable decisions. However, VM is effective because the language of functions enables the multidisciplinary team to communicate more effectively.

Transportation projects are subject to extensive public scrutiny during the course of their development. NEPA and other similar laws require STAs to fully engage the public and stakeholders in the project. In many instances, the traditional approach to transportation planning is used. This approach requires that the public and stakeholders review plans and concepts and share their reactions with STA staff.

In the past few years, a greater emphasis has been placed on involving the public and stakeholders earlier in the project development cycle. VE can be used to enhance communications between the STA, the public, and stakeholders. In addition, VE tools can be used to define project team actions to ensure compliance with federal requirements (*38*).

The application of VE very early in project development also streamlines the development of alternatives and selection of the right project, instead of trying to optimize the design later on. Using VE at an initial stage permits the project team to quickly define the project concept. In addition, the team can take advantage of having the stakeholders actively involved from the start to promote early buy in, which will reduce the overall time to reach an optimal solution (*39*).

VM can also be used directly with agencies to improve interdepartmental communications or to bridge institutional borders. For example, a new concept standard for commercial vehicle inspection facilities was recently being considered to replace 25-year-old designs (*40*). The VE team used VE and business process modeling to define the operational expectations for the new sites, working directly with the stakeholders in the workshop. Although the key stakeholders had no real previous experience working together, they had well-defined expectations. As Holmes noted (*41*), "the staff involved in the study seldom have opportunities to collaborate. The VE process [resulted in] exceedingly functional and innovative concepts."

The opportunity to include knowledgeable and engaged participants on a VE team should be encouraged. Recalling his early experiences with the Caltrans VE program, Spartz (*18*) observed that:

> A unique aspect of the team makeup was the participation of one or more outsiders, which could include a city or county engineer, a member of the U.S. Coast Guard, an individual from the U.S. Forest Service, the mayor of a city, or a private party who has an active interest in the project.

In some cases, it might be better to take the workshop results to the stakeholders. A Florida DOT (FDOT) VE study (*42*) recently included the use of virtual reality software to present and demonstrate the VE alternative. What made this so interesting was that the VE team developed an interactive

Function Analysis System Technique (FAST) diagram. This permitted the stakeholders to visually observe how the VE team had delivered the various functions of the project.

JOB PLAN

The Job Plan is the defined sequence of study activities that sets VE apart from other improvement programs. Many of the VE workshop activities, such as gathering information, brainstorming, evaluating and selecting ideas, refining or developing concepts, and making presentations, are also performed on other types of reviews. However, the study of functions is unique to VE.

The concept of the Job Plan has existed for almost 60 years. It is reasonable to expect that some minor variations might have emerged over time. However, with the exception of the naming convention, the job plans reviewed during this literature search were essentially consistent.

The SAVE Job Plan consists of three work streams that are performed sequentially:

- Pre-workshop stage,
- Workshop stage, and
- Post-workshop stage.

The workshop stage has six sequential phases (note that the phases are named in accordance with the SAVE Value Methodology Standard and may differ slightly from those used by some agencies) (*3*).

- Information phase—review of project information to gain an appreciation of the issues, concerns, and opportunities. This typically includes developing data models that will highlight high-cost or poor-performing aspects of the project.
- Function analysis phase—determination and classification of functions that the project, product, or process being studied must deliver.
- Creativity phase—generation of a broad range of ideas to achieve functional performance. This is typically completed using brainstorming techniques.
- Evaluation phase—review and selection of the best VE ideas by the VE team.
- Development phase—preparation of VE proposals based on one or more ideas. Each proposal provides an overview of how the idea is anticipated to work, a balanced assessment of its characteristics, and usually includes some measure of cost impacts (first or life-cycle costs).
- Presentation phase—VE team's presentation of its recommendations to the key decision makers.

Some agencies use a five-phase workshop, with the function analysis phase incorporated into the information phase. California has enhanced its Job Plan to include additional phases during the workshop (*43*). The six basic workshop phases are augmented to include the following (occurring between the development and presentation phases):

- Critique alternatives—VE team reviews the VE proposals and groups them into VE alternatives. The team confirms technical viability.
- Resolve alternatives—review of how the decision makers have decided to proceed with the VE alternatives (i.e., accept, accept with modifications, reject).

Additional phases are also included for team presentations and external review assessment activities. The Caltrans Value Analysis Activity Chart is presented in Figure 9.

WORKSHOP DURATION

The Job Plan defines how much time will be allocated to each phase during the workshop stage. In the early days of VE, studies were scheduled that lasted 2 to 3 weeks, especially where dedicated teams were used. However, VE workshops for construction projects have traditionally been much shorter, with 3- to 5-day durations being the most common.

VM is essentially a recipe for success that requires minimum time durations for specific activities. The multidisciplinary team must quickly develop synergy to truly be effective and this takes time. The team has to first understand the problem or opportunity, and then generate and evaluate ideas to permit the development of the preferred ideas. However, the VE team rarely has the luxury of an extensive development or evaluation process owing to time constraints.

The challenge with longer studies is getting the commitment of senior staff. The challenge with compressed study times is trying to successfully get through all of the VE activities (*14*). It is important to recognize the potential consequences of trying to schedule shorter studies, because study duration can often influence the quality of the VE study results. This is because the VE team has less time to develop cohesively, has limited opportunity to perform in-depth project analyses, and has less time to develop and/or document the ideas. On occasion, VE studies are undertaken in two or more parts to work around scheduling conflicts or to improve access to senior staff. However, segmenting the Job Plan may affect the VE team's ability to develop the needed synergy and possibly its effectiveness and/or might introduce unnecessary delay into the study schedule.

Evaluation processes can consist of quantitative or qualitative processes, or even a combination of the two. The survey revealed a reliance on both types of evaluation processes by the responding transportation agencies. However, given

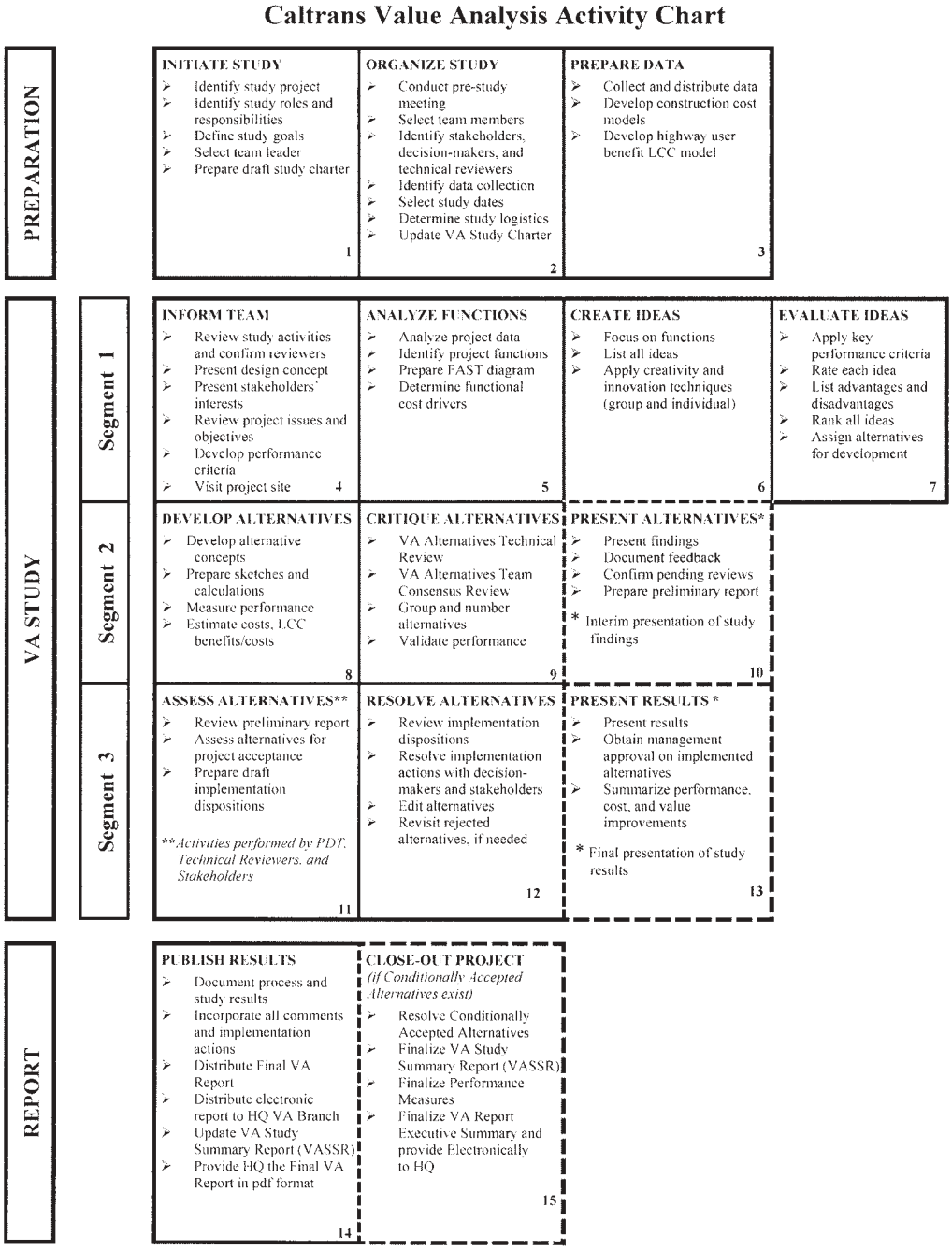


FIGURE 9 Caltrans Value Analysis Activity Chart (*43*).

some of the comments received, it is possible that the question was not clear enough to the agencies.

The challenge of the VE team is to find a balance between the time required for due diligence and the time needed to prepare an effective communication strategy. VE teams rarely have the time to do both. The use of computers in the workshop is becoming more common for engineering work, calculations, and visualization of the solution. The use of hand sketches and manual calculations is still prevalent with most agencies, even though they represent a less precise approach to confirming the details. However, sketches and hand calculations are typically faster and VE teams may willingly trade off future refinements in favor of extra time during the workshop.

Hunter and Kelly's "Is One Day Enough? The Argument for Shorter VM/VE Studies" (*44*) summarized a study of workshop durations, including the results of an international survey of the value community. They noted that VE work-

shops in the United Kingdom were typically one day long, whereas workshops in the United Stated tended to be longer—in the 3- to 5-day range. Responses to their survey suggest that this may highlight differences in how VE has evolved in the two countries. In the United Kingdom, all team members are involved in workshopping each issue. In the United States, certain activities in the workshop, specifically the development phase, are primarily performed in an individual setting.

A similar suggestion that VE studies could be shortened was also discussed by Meyers in "Getting Value Engineering Out of the Box" (*45*). Shorter workshops make senior management and unique or specialized expertise more accessible. Shorter workshops force VE team leaders and owners to quickly narrow the scope of the problem. Meyers also suggests that there may be less reluctance to conduct VE studies if the net scheduling impact is reduced.

One way to reduce the workshop time is to segregate out study components. For example, Meyers suggests that short-duration workshops only focus on the information, function analysis, and creativity phases (i.e., the first three phases of the traditional workshop). Hunter and Kelly noted that the city of New York requires the VE team to prepare Issue Memos following the site meeting (held in advance of the workshop) to identify potential VE workshop targets.

VALUE ENGINEERING TEAM

The success of any VE study is influenced by the qualities of the VE team, including the VE team leader, and the technical specialists.

Team Leaders

Approximately half of the responding agencies indicated that the VE team leaders were required to be Certified Value Specialists. The other team leaders with credentials, an Associate Value Specialist and the Value Method Practitioners, are generally not permitted to lead VE studies.

The majority of respondents indicated that the VE team leader was required to be a professional engineer (PE). It is interesting to note that selected agencies made it clear that VE team leaders do not perform engineering work, when facilitating. Nevada includes the phrase "post use of the term 'Value Engineering' has resulted in an impression that VE is an engineering discipline only and that a team of engineers is required to conduct the studies . . . NDOT now uses the term 'Value Analysis'" in its draft policy to address the VE/VA issue (*9*).

It is preferable that the VE team leader have the appropriate technical expertise, beyond the required team facilitator skills. In addition, many responding agencies noted that the VE team leader has had similar VE project experience. These attributes appear to be most sought after, beyond the Certified Value Specialist and PE designations.

Technical Specialists

The survey did not explicitly explore the qualifications of the technical specialists. However, some insight can be gained from the literature search work. For example, the survey undertaken during the preparation of *NCHRP Report 349: Maintenance Considerations in Highway Design* (*46*) noted that half of the responding agencies indicated that maintenance staff was routinely included in VE teams. For the remaining agencies, it was noted that maintenance staff was being consulted regularly on VE studies. This is interesting, given that the survey was conducted in 1991, 2 years before *OMB Circular A-131* came into effect.

Many STAs use either consultant or in-house VE teams, depending on the project. Virginia exclusively uses in-house team members, whereas California primarily uses consultants. FDOT's experiences with hybrid VE team strategies were highlighted in "Mixing Consultant Value Engineering Services with In-House Services—A Value Added Combination" (*47*). It was suggested that the mix of in-house staff and consultants ensured that new ideas were being introduced into FDOT. In addition, in-house staff continued to develop as a result of their exposure to external technical expertise. Finally, the insight into the inner workings and expectations of FDOT gained by the consultants helped to streamline activities and to develop a better working relationship with each other.

WORKSHOP TOOLS AND TECHNIQUES

VM is a process of defined phases. However, when working in a specific phase, the VE team leader generally has a great deal of flexibility in selecting the "tools" that will be used. The selection of a particular tool is influenced by the nature of the product, project, or process under study. The most popular tools identified by the survey respondents included:

- Cost model—typically a tabulated matrix of project costs. In some cases, this information may be further analyzed to identify high-cost elements of the project, unnecessary costs, and high-worth components.
- Evaluation matrix—a numerical model usually incorporating factors, criteria, weightings, and rating scores.
- FAST diagram—a graphic model that details the interrelationships between project functions.

More that three-quarters of the responding agencies confirmed that they "always" or "often" use cost models. Seventy percent of the respondents reported using evaluation matrices during the workshop. Fifty-six percent indicated

that FAST diagrams were used "always" or "often" during the workshop.

It should be noted that just under half of the agencies responding indicated that they were using performance measures "always" or "often" during VE studies. However, based on conversations with AASHTO VE Technical Committee members, this level of usage appears to be overrepresented in the survey. This may reflect a misunderstanding on the part of some of the respondents regarding the meaning of performance measures.

Traffic models were reported being used "often" by only about one-third of the agencies. There was no elaboration of the format and content of the traffic models.

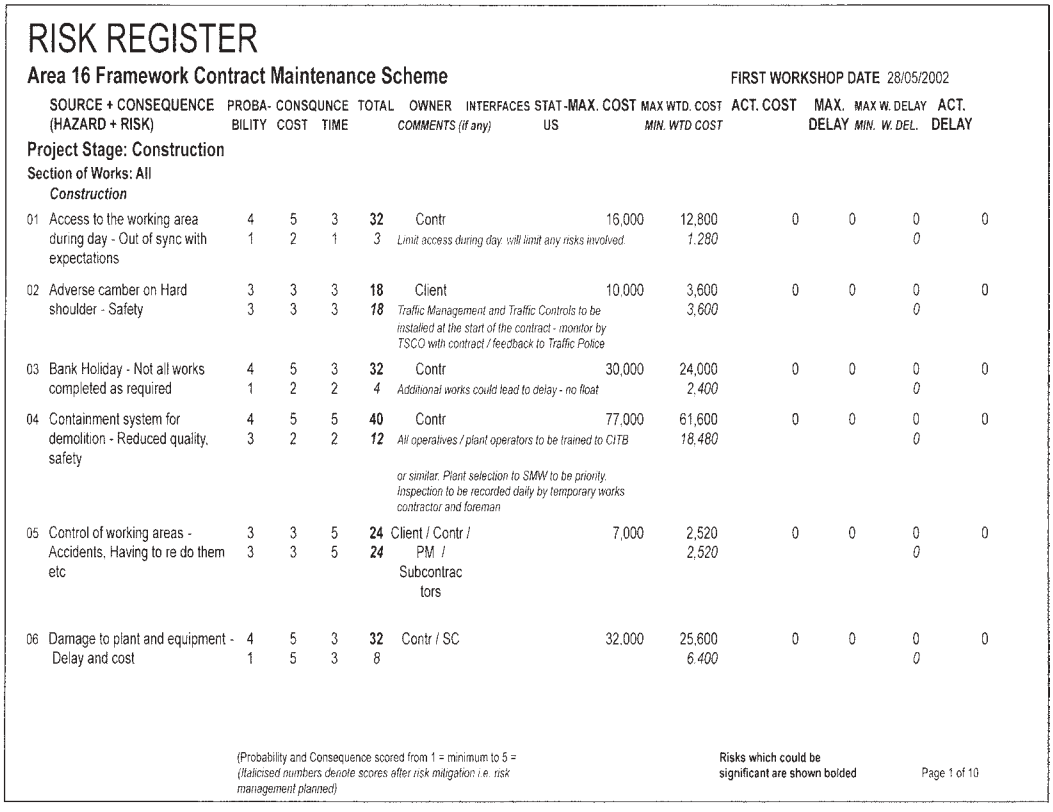
Economic analysis of the baseline project and VE alternatives has traditionally been limited to first (capital) costs. In some cases, annual operating costs have been calculated. Several have suggested that user costs, consisting of operational, work zone, maintenance, and delay costs should also be considered (*46,48*). Until recently, many of these costs could not be determined appropriately. However, New Jersey has recently developed an approach to determine delay and work zone cost impacts for road users (*48*).

In the paper, "Economic Analyses—How to Choose What to Use During Evaluations" (*49*), it was suggested that it was inappropriate for many public agencies to use life-cycle cost in VE studies, because STAs are not permitted to bank deferred expenditures. Banking deferred expenditures is the basis for life-cycle cost.

The use of risk registers in the United Kingdom is fairly prevalent. However, although the register documents all potential challenges, the majority of respondents "rarely" use it at this time. The risk register defines areas of concern, the probability of the risk occurring, and the consequences if the situation does develop. The VE (or a separate risk) team typically works interactively to create the risk register, taking advantage of multiple perspectives to flush out the details. A sample risk register for a highway project in the United Kingdom is presented in Figure 10.

In recent years there has been a great deal of interest in project performance measures (PPMs) (*50,51*). PPMs were developed in California from 1995 to 2000 to

- Identify key project (scope and delivery) performance criteria for the project,
- Establish the hierarchy and impact of these criteria on the project,
- Determine the baseline performance of the original concept,
- Determine the performance of one or more competing VE alternatives, and



RISK REGISTER

Area 16 Framework Contract Maintenance Scheme FIRST WORKSHOP DATE 28/05/2002

	SOURCE + CONSEQUENCE (HAZARD + RISK)	PROBA-BILITY	CONSQUNCE COST	CONSQUNCE TIME	TOTAL	OWNER / COMMENTS (if any)	INTERFACES STAT-US	MAX. COST / MIN. WTD COST	MAX WTD. COST / MIN. WTD COST	ACT. COST	MAX. DELAY / MIN. DELAY	MAX W. DELAY / MIN. W. DEL.	ACT. DELAY
Project Stage: Construction													
Section of Works: All													
	Construction												
01	Access to the working area during day - Out of sync with expectations	4 1	5 2	3 1	**32** *3*	Contr *Limit access during day will limit any risks involved*		16,000	12,800 *1,280*	0	0	0 *0*	0
02	Adverse camber on Hard shoulder - Safety	3 3	3 3	3 3	**18** *18*	Client *Traffic Management and Traffic Controls to be installed at the start of the contract - monitor by TSCO with contract / feedback to Traffic Police*		10,000	3,600 *3,600*	0	0	0 *0*	0
03	Bank Holiday - Not all works completed as required	4 1	5 2	3 2	**32** *4*	Contr *Additional works could lead to delay - no float*		30,000	24,000 *2,400*	0	0	0 *0*	0
04	Containment system for demolition - Reduced quality, safety	4 3	5 2	5 2	**40** *12*	Contr *All operatives / plant operators to be trained to CITB or similar. Plant selection to SMW to be priority. Inspection to be recorded daily by temporary works contractor and foreman*		77,000	61,600 *18,480*	0	0	0 *0*	0
05	Control of working areas - Accidents, Having to re do them etc	3 3	3 3	5 5	**24** *24*	Client / Contr / PM / Subcontractors		7,000	2,520 *2,520*	0	0	0 *0*	0
06	Damage to plant and equipment - Delay and cost	4 1	5 5	3 3	**32** *8*	Contr / SC		32,000	25,600 *6,400*	0	0	0 *0*	0

(Probability and Consequence scored from 1 = minimum to 5 = (Italicised numbers denote scores after risk mitigation i.e. risk management planned)

Risks which could be significant are shown bolded

Page 1 of 10

FIGURE 10 Risk register for a transportation project (*Courtesy*: M. Thompson).

- Measure the aggregate difference in performance between the baseline and competitive VE alternatives.

Performance measures are being used to illustrate to decision makers the effect that the VE alternatives are expected to have on the project in terms of key functionality and cost. This has helped VE teams respond to management inquiries such as "How much better will it work?" and "What trade-offs must we accept to realize the project savings identified?"

The selection and definition of the performance criteria is completed by the stakeholders. Caltrans typically targets for four to eight criteria. A key aspect of the PPM process is the level of discussion with the stakeholders to ensure that the criteria definitions are well understood up front. A weighting exercise confirms the relative importance of the criteria in terms of the project being studied. A sample PPM summary matrix (*25*) is presented in Figure 11.

Other STAs, associations, and international agencies have become aware of the PPM approach (*17*), including:

- AASHTO VE Technical Committee,
- Brazilian Ministry of Transportation,
- Korean Construction Industry,
- CSVA,
- Hungarian Society of Value Analysis,
- Japanese Society of Value Engineers,
- Missouri DOT, and
- Ontario MTO.

Other STAs, including New Mexico, Virginia, and Washington State have developed other forms of performance measure assessment (*17*). Interest in performance measures is expected to grow as the AASHTO VE Technical Committee continues to revise it (*17,52*).

PERFORMANCE RATING MATRIX - Proposed Alternatives — **Caltrans**

Example Project

Criteria	Criteria Weight	Concept	Performance Rating 1	2	3	4	5	6	7	8	9	10	Total Performance
Mainline Traffic Operations	24	Original Concept								8			192
		VA Set 1									9		216
		VA Set 2									9		216
Highway User Safety	29	Original Concept						6					174
		VA Set 1									9		261
		VA Set 2									9		261
Access	19	Original Concept							7				133
		VA Set 1								8			152
		VA Set 2								8			152
Local Traffic Operations	10	Original Concept							7				70
		VA Set 1								8			80
		VA Set 2								8			80
Constructibility	2	Original Concept							7				14
		VA Set 1								8			16
		VA Set 2								8			16
Environmental Impacts	14	Original Concept						6					84
		VA Set 1								8			112
		VA Set 2							7				98
Right-of-Way Impacts	2	Original Concept					5						10
		VA Set 1								8			16
		VA Set 2							7				14

OVERALL PERFORMANCE	Total Performance	% Perf. Improve.	Total Cost	Value Index (Performance / Cost)	% Value Improvement
Original Concept	677		235.6	2.87	
VA Set 1 (Alternatives 1.2, 2.1, 3.0, 4.1, 5.0, 6.2, 7.0, 8.0)	853	26%	195.3	4.37	52%
VA Set 2 (Alternatives 1.2, 2.1, 3.0, 4.2, 5.0, 6.2, 7.0, 8.0)	837	24%	191.8	4.36	52%

FIGURE 11 Sample Caltrans performance rating matrix (*25*).

Choosing by Advantages (CBA) was developed by the U.S. Forest Service in the early 1980s to assist decision makers in making informed choices on program expenditures (*53*). CBA differs from other decision-making systems, such as weighing advantages and disadvantages, pros and cons, weighting/rating/calculating, and even PPM, because it concentrates only on the differences between advantages of alternatives being compared.

In the CBA vocabulary:

- Factor—has two definitions: (1) it is an element or a component of a decision and (2) it is a container for criteria, attributes, advantages, and other types of data;
- Attribute—is a characteristic or consequence of one alternative; and
- Advantage—is a difference between two alternatives.

The CBA approach involves summarizing the attributes of each alternative, deciding the advantages of each alternative, deciding the relative importance of each advantage, and developing incremental costs and incremental advantages.

In recent years, value practitioners have developed an interest in CBA. In support of the interests of its membership, SAVE has arranged for CBA training at its annual conference since 2003. It is expected that interest in CBA will continue to grow as more in the value community become aware of it.

SELECTING SHORT-LISTED IDEAS

The selection of ideas for development must be accomplished in a relatively short period of time. Several approaches were identified in the survey responses, such as the use of evaluation matrices, performance criteria, and paired-comparison. Ninety percent of the responding agencies indicated that reaching group consensus through an open discussion during the VE workshops was used "always" or "often." Considering the ability to sell the ideas to upper management was also cited. Several key issues typically require consideration during the VE workshop, including:

- Project cost,
- Right-of-way acquisition,
- Constructability,
- Road safety,
- Traffic staging, and
- Schedule impacts.

In many cases, the responding agencies reported that these issues served as evaluation criteria when assessing ideas. Future flexibility, stakeholder expectations, and aesthetics are also routinely considered. New Hampshire noted that its agency also reviews the VE ideas against its standards. Although Ontario typically develops collision costs, where possible, the agency does not routinely develop user and travel delay costs for its studies.

VALUE ENGINEERING REPORTS

The format of the VE report appears to be very important to some of the responding agencies, whereas others expressed less interest. Several agencies have established report templates to control the level of variance between VE teams, whereas others rely on the format that a VE consultant may use. Agencies in Arizona, California, Florida, Ontario, Texas, Virginia, Washington State, and West Virginia outlined their VE report content expectations. In addition, Virginia uses a unique database format to control the report format and enhance its VE idea retrieval capabilities. The study data are entered by the regional VE manager to automatically produce the report in the standard format.

INTEGRATING WITH OTHER INITIATIVES

Transportation agencies are focused on several design-related initiatives that can be integrated with VE. Road safety and context-sensitive solutions are two such initiatives.

Road Safety

The relationship between VE and road safety has long been questioned, and possibly been misunderstood, by transportation agency decision makers. This is likely because of previous suggestions that VE can diminish road safety or that VE and road safety initiatives cannot coexist. Although these suggestions might hold true in specific situations, there is enough recent experience to counter these arguments (*54*).

In the mid-1990s, a confrontational battle between the police and the government regarding a new highway (Highway 407) in Ontario ultimately led to a detailed safety review of the yet unopened highway. At issue was the inference that a VE review, and other subsequent design choices, had diminished safety (*55*). The VE review, as it was later observed, was a scoping exercise to meet budget targets. The approach taken by the D/B proponents did not follow VM.

Although no substantial geometric design changes were subsequently implemented before the opening of the highway, a key message emerged—using standards does not guarantee safety. In the words Arthur Scott, one of the Highway 407 Safety Review panel members, "It's false security to say that if you've met the standard you know it will be a safe feature. In many cases, it is not. This is not the fault of the standards per se, but the application of them" (*56*).

The Highway 407 Safety Review suggests that road safety be considered explicitly. Road safety research performed in the United States and other countries during the last four decades has resulted in a much better understanding of how to predict road safety impacts associated with geometric design or other changes. Prediction models now exist for many geometric conditions. An example is FHWA's *Inter-*

active Highway Safety Design Model—IHSDM (*57*), which is currently under development. The *Roadside Safety Analysis Program* (*58*) has been used to assess the safety benefits associated with changes in roadside geometrics during VE studies (*37*).

Road Safety Audits

Transportation agencies in the United Kingdom first began to perform road safety audits (RSAs) more than 20 years ago. RSAs are independent safety performance reviews of a road transportation project. The use of RSAs has spread to other countries and has recently been introduced in North America. The *Canadian Road Safety Audit Guide* (*59*) highlights several ways for VE and RSA initiatives to integrate:

- Include road safety specialists on VE teams (this could also include human factors specialists if appropriate),
- Conduct the VE study and RSA concurrently and ensure interactive linkages between the two workstreams, or
- Conduct the RSA after the VE study to assess the VE proposals.

A recent pilot study (*60*) suggested that RSAs and VE could be integrated.

Context-Sensitive Design

Another key initiative in transportation is context-sensitive design (CSD). Neuman et al. (*61*) wrote that "CSD is among the most significant concepts to emerge in highway planning, design, and construction in recent years." This is because project development, under CSD, fully considers not only the needs of the road users, but also the needs of the community.

VE can align well with the principles of CSD, provided that the right perspective is considered. As with road safety, there is the potential for VE and CSD to be at odds. *NCHRP Report 480* cautioned that:

> It is common practice in many agencies to perform value engineering (VE) studies prior to construction or bidding. Such practices, although well-intentioned, can lead to unforeseen adverse decisions. In [one state], it was noted that an unintended result of VE studies was the removal of items from the project that represented commitments to stakeholders in the effort to maintain economy (*61*).

This situation appears to reflect more of a breakdown in the application of VE than of the inability to integrate VE and CSD. VE can be used to identify the needed functions of the project during the VE study. Typically, the functions identified for a CSD-focused project can be organized into two primary groups: functions related to the road user and functions related to stakeholder expectations and needs. The evaluation criteria used for the VE proposals should consider stakeholder interests. To accomplish this, VE teams should include members of, or those who can speak for, key stakeholders. These stakeholders might include community groups, elected officials, environmental agencies, and other government agencies. An example of a FAST diagram for a recent CSD-focused value planning study is presented in Figure 12.

VALUE OPPORTUNITIES DURING CONSTRUCTION

VE was originally introduced into construction projects in the form of VECPs in the 1960s. The intent of the VECP process is to encourage innovation with the hope that cost savings will be realized. The VECP remains an element of construction contracts and most states use a similar form. The VECP process rarely uses the formal VE.

The basic process for VECPs follows:

- Contractor must submit a VECP for ideas to reduce the project cost (note that some states also permit time savings).
- Agency reviews the merit of the VECP to determine its feasibility to support the agency's decision-making process.
- Agency makes decision on acceptance or rejection.
- If accepted, the contractor and the STA will split the identified savings to the contract 50%/50%.

The impact of VECPs on the overall cost of the federal-aid projects is very small when compared with the approved project savings associated with the VE proposals developed during the planning and design phases of project development. For fiscal years 1997 to 2003, total accepted VECPs averaged $46.7 million per year compared with $900 million per year for VE proposals (*11*). On average, VECPs account for approximately 5% of the total federal-aid project cost savings generated by VE.

ALTERNATIVE DELIVERY METHODS

Several alternative and innovative project delivery and/or contracting methods have emerged in North America within the last two decades, including D/B, Accelerated Construction, and Best Value Contracting.

Design–Build

VE in D/B has been applied for some time. One of the key benefits to the STA is the level of innovation inherent in the D/B proposal development process. D/B proponents may or may not use the formal VM when developing their alternative approaches to the compliant (base) bid.

The motivation to use VE is typically twofold. First, cost is a major consideration in the selection process and con-

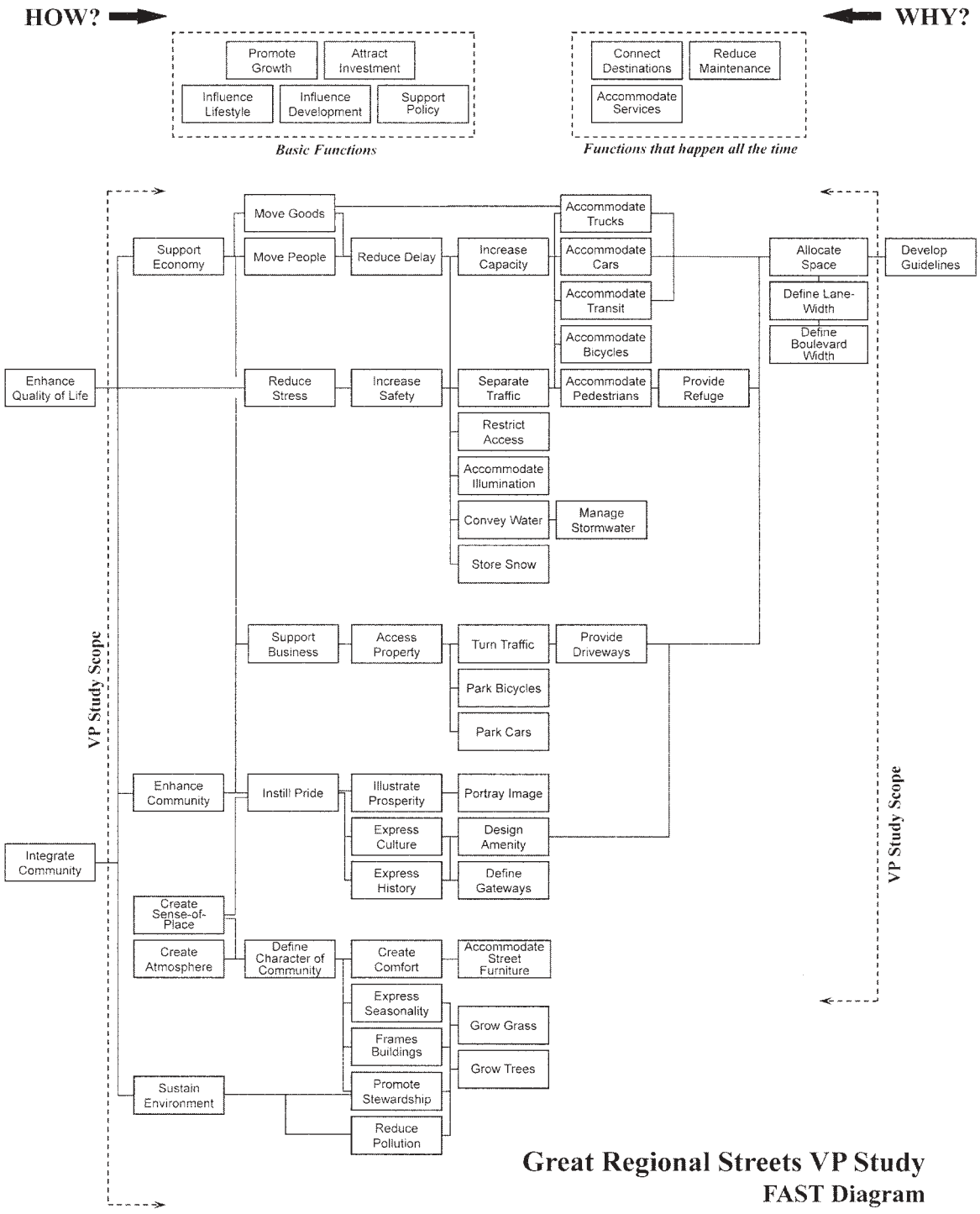


FIGURE 12 Sample CSD-type FAST diagram (*62*).

tractors will look extensively into ways in which their costs can be lowered. Second, STAs typically have elaborate evaluation processes for D/B projects. The evaluation criteria usually include consideration of innovative procedures and designs. As such, proponents are also motivated to achieve the highest proposal ratings.

The STAs do not directly share in any cost savings with the contractor derived from alternatives developed during the proposal stage. However, the agency will be able to benefit from generally lower costs and risk with D/B. The agency must still decide on the merits of accepting any alternative concepts proposed by the D/B proponent.

Recent experience in the city of New York on a D/B project suggests that STAs can benefit from incorporating VE into the D/B procurement and project development processes. The New York State DOT requested that New York City's OMB manage two VE studies of the Belt Parkway Bridge Over Ocean Parkway project that was being delivered using D/B. The first VE study was undertaken after the preferred D/B proponent had been selected, but before finalizing the contract and issuing the Notice to Proceed. The initial VE study identified construction staging modifications that could reduce the overall cost and schedule of the project. The city was able to renegotiate the contract to take advantage of these benefits. The second VE study, performed during the design phase, identified additional modifications to improve project performance by reducing the disruption of the community and road users (J. Woller, New York City Office of Management and Budget, personal communication, May 2, 2005).

In 2002, a final rule regarding VE on D/B projects was published in the *Federal Register* (*10*). The final rule requires STAs to undertake a VE study on D/B projects before the release of the RFP document. This is considered the minimum requirement for VE on federal-aid NHS D/B projects costing $25 million or more. However, the rule does not preclude additional VE studies if desired at other milestones in project development.

Accelerated Construction

Highway projects are becoming increasingly complex and expensive in many corridors across the country. Impacts to road users are often severe or protracted because of the limited space available to create usable and safe work zones. These impacts influence the mobility and safety needs of the traveling public and the economy. This is especially true for urban highway renewal projects in highly congested corridors (*63*). One initiative, Accelerated Construction, is geared to advancing the pace of construction to reduce the impact on the traveling public.

TRB's Task Force on Accelerating Innovation in the Highway Industry (Committee A5T60) sponsored a series of three workshops in late 2000 and again twice in early 2002. The focus of the workshops was to identify ways to accelerate construction on the nation's highways (*35*). Several suggestions pertinent to VE were reported:

- DOTs should consider increasing the contractor's share of the approved VECP;
- DOTs should also permit time-saving VECPs;
- Consideration should be given to educating contractors on how VE can contribute to time savings; and
- Consideration should be given developing a process to collect and disseminate the creative techniques used by the DOTs and contractors.

Best Value Contracting

Best Value Contracting considers both cost and technical merit (*64*) and is used by agencies to reduce project risk. The contractor is required to submit an extensive technical proposal that elaborates on:

- Methodology and approach,
- Management capability,
- Past performance, and
- Team qualifications.

The Best Value Contracting approach requires both the STA and the contractor to do more work up front. The agency needs to clearly define its expectations (scope and requirements). The contractor will need to invest more effort to prepare the submission bid. However, like the D/B process, it is anticipated that the contractor will be motivated to focus more on improved constructability and reliability.

CHAPTER FOUR

IMPLEMENTATION AND MONITORING

IMPLEMENTATION

The VE Job Plan establishes a sequence of activities that have been proven to successfully improve a product, project, or process. However, no similar sequence of activities has been uniformly adopted to implement the proposed VE ideas. The different team roles—design and VE—have traditionally (and in some jurisdictions legally) required a complete separation of the design and value activities. This can lead to a potentially adversarial relationship if human relations are not respected during the VE study (*2*).

Miles (*4*) first cautioned during his first VA training workshop group in 1952 that this segregation of roles could lead to the "competitor instinct." It is common practice to have the designer complete the initial review of the VE proposals and advise the STA of how they should be addressed (i.e., accept, modify and accept, or reject).

The majority (almost 60%) of the responding transportation agencies indicated that some form of defined implementation strategy was in place for their VE programs. In many cases, an implementation or design review meeting is held following the VE workshop to consider the proposed VE ideas. For example, Michigan convenes a meeting immediately following the workshop with the VE and design teams. The combined group considers the disposition of each idea by deciding on one of three outcomes:

- Accept for implementation into design,
- Accept for further study, or
- Reject and list specific reasons.

New York State used a similar process; however, it permits the regional VE office to conditionally accept the recommendation for further study, but defer the final decision to the main office.

The implementation process must confirm who is responsible to make the decision, define a response time frame, and manage stakeholder and political expectations as well as sensitivities. The process may necessitate different implementation team compositions to suit the idea being evaluated. For instance, the design branch would likely defer to the construction branch of the agency if the VE idea was a construction idea.

Virginia noted that the agency also uses an appeals process. The VE report is forwarded to all of the discipline managers that will be affected if the recommendation is accepted. All comments are synthesized by the regional VE manager and forwarded to the chief engineer for program development. The chief engineer has the final authority, but may consider an appeal supported by the appropriate justification materials.

California's process includes three steps—(1) review VE alternatives, (2) resolve alternatives, and (3) present results. The entire VE team is involved in the meeting. A written record regarding resolution (some agencies refer to this as disposition) of the VE alternatives identifies whether the VE proposal was accepted, modified and accepted, or rejected. Resolution of each idea is based on the validation of the accepted results.

MONITORING VALUE ENGINEERING IDEA IMPLEMENTATION

Implementation of the VE proposals is the only way to truly determine the total impacts and costs. The initial effort made during the development phase of the Job Plan is intended to refine and confirm the cost estimates. Monitoring idea implementation can promote a greater understanding of the impacts.

There are two aspects of monitoring that must be considered:

- Confirming that the idea was included in the design and
- Developing a better understanding of the true impacts and costs.

As discussed earlier in this report, FHWA is required to report the VE activities on an annual basis. STAs must provide supporting information on the VE proposals in terms of cost.

MONITORING VALUE ENGINEERING PROGRAM PERFORMANCE

Monitoring VE program performance ensures that expenditures and effort to deliver the program are well understood. Sixty-four percent of the responding STAs monitor program expenditures and avoided costs to develop a Return-

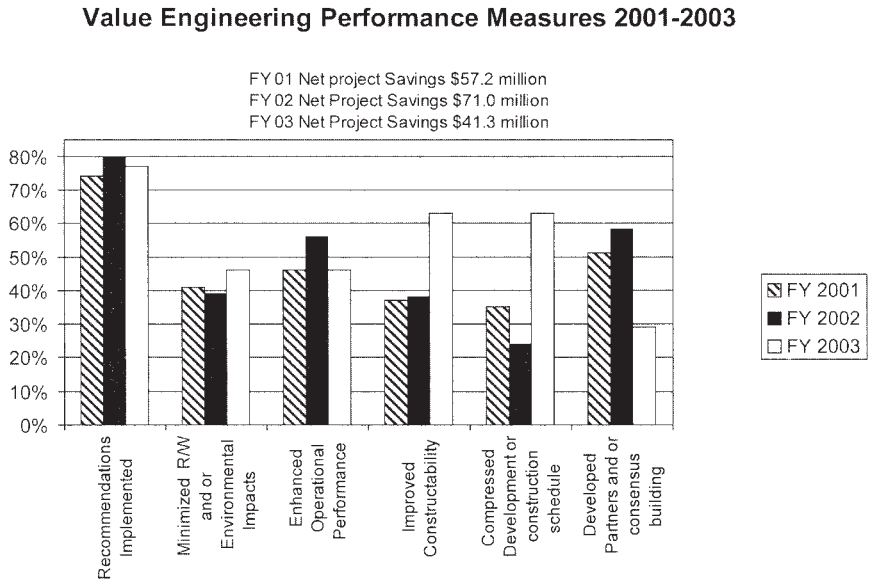
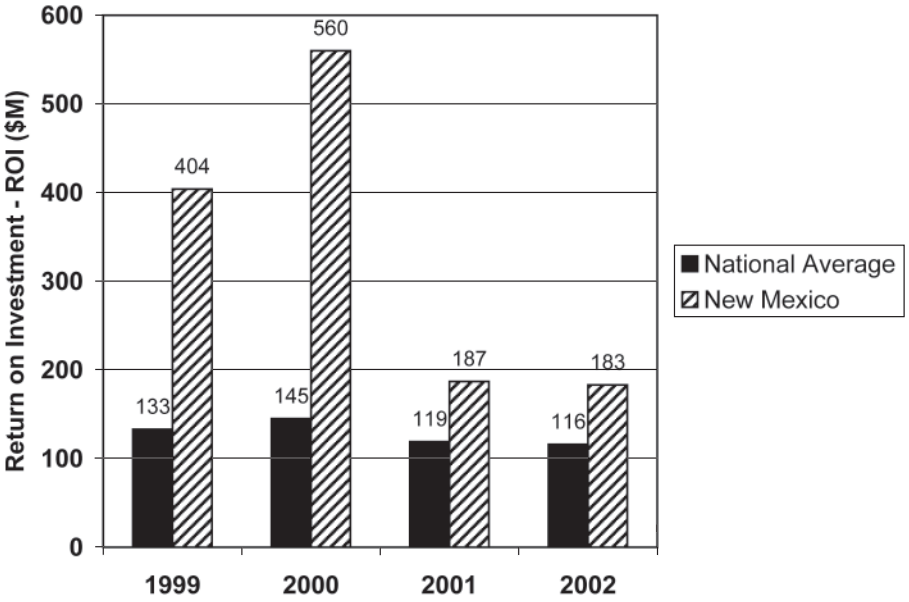


FIGURE 13 Sample VE program performance measures summary report for Washington State DOT (*65*).



Return on Investment (ROI) for Value Engineering Projects
(Performance Based Budget Measures)

The Return on Investment (ROI) is an index based on the cost of conducting a value engineering (VE) study on a project and the cost savings resulting from implementing the VE recmmendations. The ROI translates into the amount of cost savings produced on a design project for every dollar the State spent on doing a VE study.

FIGURE 14 Sample return on investment summary report for New Mexico (*66*).

on-Investment (ROI) report. This report is only one of the metrics measured. Other measurements include:

- Number of VE studies performed,
- Cost of the VE studies,
- Estimated project costs,
- Number of VE recommendations,
- Value of VE recommendations,
- Number of approved recommendations,
- Value of approved recommendations, and
- VE change proposals.

These are the program metrics that must be submitted to FHWA.

In addition to the FHWA-required program results, several transportation agencies, including California, Missouri, New Mexico, Virginia, and Washington State, have now begun to measure nonmonetary results. Figures 13 and 14 present the program results for Washington State (VE performance measure for 2001–2003) and New Mexico (performance-based budget measure), respectively.

In Florida, program performance is measured as a percentage of the annual VE work plan. Ontario follows up with VE workshop participants after a workshop to obtain timely feedback. Arizona develops a benefit-cost ratio for its program.

CHAPTER FIVE

CONCLUSIONS

This synthesis summarizes current value engineering (VE) practices in highway transportation agencies (STAs) in the United States and Canada. It builds on the findings of NCHRP's initial look at VE in transportation (*NCHRP Synthesis of Highway Practice 78*) in 1989 and highlights the results of a comprehensive survey of STAs and an extensive literature search.

Although there was considerable variation in the programs and experiences of transportation agencies some common ground was noted. The following list presents some of the general conclusions reached for this report.

- The VE process and procedures are generally well-defined and well-understood at most levels within an STA, including senior management. VE is recognized as an effective way to improve the performance of a project and/or reduce unnecessary capital and operating costs.
- The quality (qualifications and experience) of the team leader and specialists is a key ingredient to the success of the VE program.
- VE is more effective and influential on the performance, quality, and cost of a project when done relatively early in the project schedule.
- The $25 million cost threshold trigger for federal-aid projects serves as both motivation and as a limitation for some STAs. Some modest-size STAs with projects falling below the threshold rarely do VE, whereas some larger transportation agencies rarely consider VE on state-funded or lower-cost federal-aid projects.
- A commonly defined and understood approach to measure implementation benefits (improved performance and/or lower life-cycle costs) of VE studies and VE program success needs to be developed.
- Training is necessary to maintain VE programs and the corporate enthusiasm to allocate resources to VE. However, training initiatives are typically influenced more by the overall funding of transportation programs.
- VE can effectively be integrated with or into other technical or management improvement approaches, such as asset management, road safety audits, context-sensitive design, and accelerated construction technology team.

The detailed survey for this synthesis report provided insight into the current application of VE in the transportation industry. The following topics emerged as areas of interest for future study.

- Education
  Transportation agencies have undertaken staff training, which ranges from selective training for a few employees to the large-scale training programs involving hundreds of employees. Although this commitment to continual education is commendable, the lasting value of the initiatives comes into question over time. Many of the agencies that invested in training programs did so several years ago as interest in VE heightened. However, many agencies have reported that this investment needs to be renewed, because trained staff have either advanced, left, or retired from the organization. The challenge is finding the needed resources and interested staff to make this investment worthwhile.

  SAVE International developed its Module I and II courses some time ago. The Module I course serves as the genesis for most in-house programs. However, the context requirements and time commitments for the rudimentary courses have not been substantially updated in more than a decade. These courses are the primary building blocks of the certification process. Very little time is permitted within the context of these training courses to introduce new or VE-compatible materials. There exists the possibility that the value community will eventually deplete itself of current thinking and new innovative approaches.

  Survey responses indicate that consideration might be given to developing new training initiatives for STAs that provide basic level VE training. This could take the form of 1- or 2-day sessions, which can provide the formal lecture content equivalent to that found currently in the Module I workshop.

- Project Scope and Selection
  Many transportation agencies are primarily applying VE to federal-aid National Highway System projects costing more than $25 million, as required by regulation. However, the benefits of VE have been clearly demonstrated. Furthermore, the research and experience of other agencies suggests that VE can successfully be applied to projects that cost less than $25 million or are not on the National Highway System.

Survey responses indicate that consideration could be given to developing a framework to select non-mandated projects for VE studies.

Experience has shown that an STA can realize substantial benefits by undertaking VE studies as early as possible in the life cycle of the project, including standards and specifications. Stakeholder involvement and buy-in can be improved in their perspective if proactively considered during the early planning work.

Survey responses indicate that consideration might be given to developing a consistent project development process that integrates National Environmental Policy Act and VE processes.

- Measuring Program Performance
  The mandated FHWA reporting protocol is intended to meet FHWA's reporting needs. However, many agencies have yet to develop their own reports to quantify the productivity of their programs. A tracking program could yield additional insight regarding preferred VE approaches, serving as a central repository for data and supporting a stronger appreciation for the program.

  Survey responses indicate that consideration could be given to developing a VE program reporting template to provide program reporting information additional to that already generated for FHWA.

- Measuring Project Performance
  VE teams must be able to effectively communicate the full range of performance characteristics of the VE proposal to gain acceptance from the decision makers. Quantification of these characteristics is beneficial, because it permits a ready comparison of one or more alternatives.

- Integrating Road Safety into VE Studies
  Road safety is typically considered implicitly during VE studies. However, road safety can be explicitly considered as part of VE studies by using crash prediction models or tables to generate the safety benefits associated with proposed geometric or operational changes.

  Survey responses indicate that VE teams could include road safety and human factors specialists to provide real-time input into the VE studies.

- Integrating VE with Context-Sensitive Design
  The benefits of VE can be realized in the early planning stages. An emerging area, context-sensitive design, which permits road designers to better integrate the road into the community or the environment, can incorporate the value methodology. Stakeholder communications and input can be managed using VE.

- Developing a National VE Database for Transportation Projects
  Transportation agencies across the country undertake hundreds of VE studies each year. These studies often target similar issues and it is not unreasonable to expect that, collectively, the agencies might be paying for the same VE proposal over and over. A fully accessible database could permit the transportation agencies to better focus its VE study resources by reviewing and adapting the results of previously studied but similar issues from other areas of the country. VE teams would be able to prioritize their time toward resolving new issues. Creating such a database should be studied.

VE applications have evolved since NCHRP last reviewed the process in 1981. Federal requirements have changed and now mandate VE on major federally funded projects. More agencies are now experienced with the decision-making tool and many have developed successful programs. However, the status quo will diminish the results if left unchecked. Key areas to focus on include improving the training processes to maintain a knowledgeable workforce and expanding the focus of agency VE programs to consider non-NHS projects. New approaches such as project performance measures, enhanced evaluation methods, and building stronger linkages to other assessment tools, may serve as new development targets for VE applications in transportation.

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GLOSSARY

This glossary of value engineering is adapted from SAVE International.

Cost—The expenditure necessary to produce a product, service, process, or structure.

Cost, Design to—A procedure that establishes an estimated cost objective for each project, then designs to that cost objective to produce a reliable product or service.

Cost, Life-Cycle—The sum of all acquisition, production, operation, maintenance, use, and disposal costs for a product or project over a specified period of time.

Cost Model—A diagramming technique used to illustrate the total cost of families of systems or parts within a total complex system or structure.

Cost/Worth Ratio—The ratio used to determine the maximum opportunity for value improvement.

Function—The natural or characteristic action performed by a product or service.

Function, Basic—The primary purpose or most important action performed by a product or service. The basic function must always exist, although methods or designs to achieve it may vary.

Function, Secondary—A function that supports the basic functions and results from the specific design approach to achieve the basic function. As methods or design approaches to achieve the basic function are changed, secondary functions may also change. There are four kinds of secondary functions:

1. Required—A secondary function that is essential to support the performance of the basic function under the current design approach.
2. Aesthetic—A secondary function describing esteem value.
3. Unwanted—A negative function caused by the method used to achieve the basic function such as the heat generated from lighting, which must be cooled.
4. Sell—A function that provides primarily esteem value. For marketing studies it may be the basic function.

Function Models—A graphical depiction of the relationships of the functions within a project. There are two commonly used styles:

1. Hierarchy—A vertical "tree" chart of functions. Recent practice has been to include within one branch user-oriented functions such as assure convenience, assure dependability, assure safety, and attract user. Some practitioners prefer to lay out this model horizontally and refer to it as "user FAST."
2. Function Analysis System Technique (FAST)—A horizontal chart depicting functions within a project, with the following rules:
   a. The sequence of functions on the critical path proceeding from left to right answer the question "How is the function to its immediate left performed?"
   b. The sequence of functions on the critical path proceeding from right to left answer the question "Why is the next function performed?"
   c. Functions occurring at the same time or caused by functions on the critical path appear vertically below the critical path function.
   d. The basic functions of the study are always farthest to the left of the diagram of all functions within the scope of the study.
   e. Two other functions are classified:
      i. Highest order—The reason or purpose that the basic function exists. It answers the "why" question of the basic function, and is depicted immediately outside the study scope to the left.
      ii. Lowest order—The function that is required to initiate the project and is depicted farthest to the right, outside the study scope. For example, if the value study concerns an electrical device, the "supply power" function at the electrical connection would be the lowest order function.

Job Plan—A structured discipline to carry out a value study.

Performance—The physical characteristics required to meet the users needs. Factors such as reliability, maintainability, quality, and appearance are typical.

Price—A fixed sum of money expended by the user/customer to purchase the product under study.

Product—For the purposes of value studies, a product is the subject of the study. It may be a physical product such as a manufactured item, or a structure, system, procedure, or an organization.

Scope—The portion of the overall project that is selected for the value study. The analysis accepts everything within the defined scope in order to focus attention on the functions within those limits.

Value—The lowest cost to reliably provide the required functions at the desired time and place with the essential quality and other performance factors to meet user requirements.

Value, Monetary—There are four classes of monetary value:

1. Use value—The monetary measure of the functional properties of the product or service that reliably accomplish a user's needs.
2. Esteem value—The monetary measure of the properties of a product or service that contribute to its desirability or salability. Commonly answers the question "How much do I want something?"
3. Cost value—The monetary sum of labor, material, burden, and other elements of cost required to produce a product or service.
4. Exchange value—The monetary sum at which a product or service can be freely traded in the marketplace.

Value Methodology (VM)—The systematic application of recognized techniques that identify the functions of the product or service, establish the worth of those functions, and provide the necessary functions to meet the required performance at the lowest overall cost.

Value Methodology Proposal—A proposal by the value study team to its management to provide one or more functions for financial and/or performance improvements that is within the current terms and conditions of the contract.

Value Methodology Training—There are two levels of SAVE International-approved training specifically designed to provide the minimum knowledge of VM practice. It is expected that VM professionals, as in all professional fields, will continue to keep themselves current through seminars, conferences, and associated educational opportunities.

1. Value methodology workshop—The objective is to provide VM education to the degree that participants will be able to successfully participate in future value studies under the guidance of a qualified Value Specialist with minimum additional training. This is called the Module I program.
2. Value methodology advanced seminar—The objective of this seminar is to extend the knowledge base of those wishing to become professionals in the VM field. Topics include both advanced methodology and areas of management. This seminar is referred to as the Module II program. The seminar requires a minimum of 24 class hours. Module I is a prerequisite, and it is expected attendees will have enough practical experience in VM to contribute to the seminar.

Value Analyst—Synonymous with Value Specialist.

Value Engineer—Synonymous with Value Specialist.

Value Engineering Change Proposal (VECP)—A formal proposal submitted to the customer/user that requires their approval before implementing the Value Analysis change. The result will be a modification to the submitter's contract.

Value Specialist—One who applies the VM to study and search for value improvement.

Value Study—The application of the value methodology using the VM Job Plan and people previously trained in VM workshops.

Worth—The lowest overall cost to perform a function without regard to criteria or codes.

APPENDIX A

Relevant Federal Value Engineering Requirements

This appendix includes the following items:

1. *Circular A-131: Value Engineering,* Office of Management and Budget, Washington, D.C., May 21, 1993.
2. "23 CFR Parts 627, Value Engineering; Final Rule," *Federal Register,* Vol. 62, No. 31, Feb. 14, 1997, pp. 6866–6869.
3. "23 CFR Parts 627 et al., Design–Build Contracting; Final Rule," *Federal Register*, Vol. 67, No. 237, Dec. 10, 2002, pp. 75905–75906.

Office of Management and Budget

Circular No. A-131

May 21, 1993

TO THE HEADS OF EXECUTIVE DEPARTMENTS AND ESTABLISHMENTS

SUBJECT: Value Engineering

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1. **Purpose**. This Circular requires Federal Departments and Agencies to use value engineering (VE) as a management tool, where appropriate, to reduce program and acquisition costs.

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2. **Supersession Information**. This Circular supersedes and cancels OMB Circular No. A-131, **Value Engineering**, dated January 26, 1988.

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3. **Authority**. This Circular is issued pursuant to 31 U.S.C. [[section]]1111.

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4. **Background**. For the purposes of this Circular, value analysis, value management, and value control are considered synonymous with VE. VE is an effective technique for reducing costs, increasing productivity, and improving quality. It can be applied to hardware and software; development, production, and

manufacturing; specifications, standards, contract requirements, and other acquisition program documentation; facilities design and construction. It may be successfully introduced at any point in the life-cycle of products, systems, or procedures. VE is a technique directed toward analyzing the functions of an item or process to determine "best value," or the best relationship between worth and cost. In other words, "best value" is represented by an item or process that consistently performs the required basic function and has the lowest total cost. In this context, the application of VE in facilities construction can yield a better value when construction is approached in a manner that incorporates environmentally-sound and energy-efficient practices and materials.

VE originated in the industrial community, and it has spread to the Federal Government due to its potential for yielding a large return on investment. VE has long been recognized as an effective technique to lower the Government's cost while maintaining necessary quality levels. Its most extensive use has been in Federal acquisition programs.

An August 1991 recent audit of VE in the Federal Government by the President's Council on Integrity and Efficiency concluded that more can and should be done by Federal agencies to realize the benefits of VE. Reports issued by the General Accounting Office and agency Inspectors General have also consistently concluded that greater use of this technique would result in additional savings to the Government.

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5. **Relationship to other management improvement processes**. VE is a management tool that can be used alone or with other management techniques and methodologies to improve operations and reduce costs. For example, the total quality management process can include VE and other cost cutting-techniques, such as life-cycle costing, concurrent engineering, and design-to-cost, approaches, by using these techniques as analytical tools in process and product improvement.

VE contributes to the overall management objectives of streamlining operations, improving quality, reducing costs, and can result in the increased use of environmentally-sound and energy-efficient practices and materials. The complementary relationship between VE and other management techniques increases the likelihood that overall management objectives are achieved.

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6. **Definitions**.

a. **Agency**. As used in this Circular, the term "agency" means an Executive department or an independent establishment within the meaning of sections 101 and 104(1), respectively, of Title 5, United States Code.

b. **Life-cycle cost**. The total cost of a system, building, or other product,

computed over its useful life. It includes all relevant costs involved in acquiring, owning, operating, maintaining, and disposing of the system or product over a specified period of time, including environmental and energy costs.

c. **Cost savings**. A reduction in actual expenditures below the projected level of costs to achieve a specific objective.

d. **Cost avoidance**. An action taken in the immediate time frame that will decrease costs in the future. For example, an engineering improvement that increases the mean time between failures and thereby decreases operation and maintenance costs is a cost avoidance action.

e. **In-house savings**. Net life-cycle cost savings achieved by in-house agency staff using VE techniques.

f. **Contracted savings**. Net life-cycle cost savings realized by contracting for the performance of a VE study or by a Value Engineering Change Proposal submitted by a contractor.

g. **Total Quality Management (TQM)**. A customer-based management philosophy for improving the quality of products and increasing customer satisfaction by restructuring traditional management practices. An integral part of TQM is continuous process improvement, which is achieved by using analytical techniques to determine the causes of problems. The goal is not just to fix problems but to improve processes so that the problems do not recur. Value engineering can be used as an analytical technique in the TQM process.

h. **Value Engineering**. An organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. These organized efforts can be performed by both in-house agency personnel and by contractor personnel.

i. **Value Engineering Change Proposal (VECP)**. A proposal submitted by a contractor under the VE provisions of the Federal Acquisition Regulations (FAR) that, through a change in a project's plans, designs, or specifications as defined in the contract, would lower the project's life-cycle cost to the Government.

j. **Value Engineering Proposal (VEP)**. An in-house agency-developed proposal, or a proposal developed by a contractor under contract to provide VE services, to provide VE studies for a Government project/program.

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7. **Policy**. Federal agencies shall use VE as a management tool, where appropriate, to ensure realistic budgets, identify and remove nonessential capital and operating costs, and improve and maintain optimum quality of program and acquisition functions. Senior management will establish and maintain VE programs, procedures and processes to provide for the aggressive, systematic

development and maintenance of the most effective, efficient, and economical and environmentally-sound arrangements for conducting the work of agencies, and to provide a sound basis for identifying and reporting accomplishments.

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8. **Agency responsibilities**. To ensure that systemic VE improvements are achieved, agencies shall, at a minimum:

a. Designate a senior management official to monitor and coordinate agency VE efforts.

b. Develop criteria and guidelines for both in-house personnel and contractors to identify programs/projects with the most potential to yield savings from the application of VE techniques. The criteria and guidelines should recognize that the potential savings are greatest during the planning, design, and other early phases of project/program/system/product development. Agency guidelines will include:

1. Measuring the net life-cycle cost savings from value engineering. The net life-cycle cost savings from value engineering is determined by subtracting the Government's cost of performing the value engineering function over the life of the program from the value of the total saving generated by the value engineering function.

2. Dollar amount thresholds for projects/programs requiring the application of VE. The minimum threshold for agency projects and programs which require the application of VE is $1 million. Lower thresholds may be established at agency discretion for projects having a major impact on agency operations.

3. Criteria for granting waivers to the requirement to conduct VE studies, in accordance with the FAR 48.201(a).

4. Guidance to ensure that the application of VE to construction projects/programs and other projects/programs, will include consideration of environmentally-sound and energy efficient considerations to arrive at environmentally-sound and energy efficient results.

c. Assign responsibility to the senior management official designated pursuant to [[section]]8a above, to grant waivers of the requirement to conduct VE studies on certain programs and projects. This responsibility may be delegated to other appropriate officials.

d. Provide training in VE techniques to agency staff responsible for coordinating and monitoring VE efforts and for staff responsible for developing, reviewing, analyzing, and carrying out VE proposals, change proposals, and evaluations.

e. Ensure that funds necessary for conducting agency VE efforts are included in

annual budget requests to OMB.

f. Maintain files on projects/programs/systems/products that meet agency criteria for requiring the use of VE techniques. Documentation should include reasons for granting waivers of VE studies on projects/programs which met agency criteria. Reasons for not implementing recommendations made in VE proposals should also be documented.

g. Adhere to the acquisition requirements of the FAR, including the use of VE clauses set forth in Parts 48 and 52.

h. Develop annual plans for using VE in the agency. At a minimum, the plans should identify both the in-house and contractor projects, programs, systems, products, etc., to which VE techniques will be applied in the next fiscal year, and the estimated costs of these projects. These projects should be listed by category, as required in the agency's annual report to OMB. VEP's and VECP's should be included under the appropriate category. Annual plans will be made available for OMB review upon request.

i. Report annually to OMB on VE activities, as outlined below.

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9. **Reports to OMB**. Each agency shall report the Fiscal Year results of using VE annually to OMB, except those agencies whose total budget is under $10 million or whose total procurement obligations do not exceed $10 million in a given fiscal year. The reports are due to OMB by December 31st of the calendar year, and should include the current name, address, and telephone number of the agency's VE manager.

The report format is provided in the Attachment.

Part I of the report asks for net life-cycle cost savings achieved through VE. In addition, it requires agencies to show the project/program dollar amount thresholds the agency has established for requiring the use of VE if greater than $1 million. If thresholds vary by category, show the thresholds for all categories. Savings resulting from VE proposals and VE change proposals should be included under the appropriate categories.

Part II asks for a description of the top 20 fiscal year VE projects (or all projects if there are fewer than 20). List the projects by title and show the net life-cycle cost savings and quality improvements achieved through application of VE.

Part III requires agencies to submit a detailed schedule of year-by-year cost savings, cost avoidances and cost sharing with contractors for each program/project for which the agency is reporting cost savings or cost avoidances. The aggregate total of all schedules shall equal the totals reported in Part I.A. of the annual report.

10. **Inspectors General audits**. Two years after the issuance of this revised Circular, Agency Heads shall ask the Inspectors General (IGs) to audit agency value engineering programs to (1) validate the accuracy of agency reported value engineering savings and (2) assess the adequacy of agency value engineering policies, procedures and implementation of this revised Circular. Periodically thereafter, agency IGs shall audit agency reported VE savings as the need arises.

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11. **Related Guidance**. In general, value engineering investments should have positive net present value when discounted with the appropriate interest rate, as described in OMB Circular No. A-94, section 8.c. For detailed guidance on value engineering, refer to the appropriate sections of the Federal Acquisition Regulations.

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12. **Effective date and Implementation**. This Circular takes effect within 30 days of its publication in the **Federal Register**. Heads of departments and agencies are responsible for taking all necessary actions to assure effective implementation of these policies, such as disseminating this Circular to appropriate program and other staff, developing implementation strategies and initiating staff training. Since these policies must be implemented in the Federal Acquisition Regulation (FAR), agencies should not duplicate the development of implementing procurement regulations being undertaken by the Federal Acquisition Regulatory Councils. However, implementation of these policies in the FAR must be accomplished within the time period specified below, with inclusion in agency solicitations and resulting contracts, as appropriate, to occur immediately thereafter.

Pursuant to subsections 6(a) of the Office of Federal Procurement Policy Act, as amended, (41 U.S.C. 401 **et seq.**), the Federal Acquisition Regulatory Councils shall ensure that the policies established herein are incorporated in the FAR within 180 days from the date this Circular is published in final form in the **Federal Register**. Promulgation of final FAR regulations within that 180 day period shall be considered issuance in a "timely manner" as prescribed in 41 USC 405(b)."

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13. **Sunset review**. The policies contained in this Circular will be reviewed by OMB five years from the date of issuance.

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14. **Inquiries**. Further information about this Circular may be obtained from the Office of Management and Budget (OMB), 725 17th Street, NW, Washington,

DC 20503, Telephone (202) 395-6803.

Leon Panetta
Director

Issued in Jamaica, New York on February 6, 1997.

James K. Buckles,

ActingManager, AirTrafficDivision,Eastern Region.

[FR Doc. 97–3753 Filed 2–13–97; 8:45 am]

BILLING CODE 4910–13–M

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

21 CFR Part 341

Cold, Cough, Allergy, Bronchodilator, and Antiasthmatic Drug Products for Over–the–Counter Human Use

CFR Correction

In title 21 of the Code of Federal Regulations, parts 300 to 499, revised as of April 1, 1996, on page 247, in § 341.12, paragraph (h) should read:

§ 341.12 Antihistamine active ingredients.

* * * * *

(h) Doxylamine succinate.

* * * * *

[FR Doc. 97–55501 Filed 2-13-97; 8:45 am]

BILLING CODE 1505-01-D

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

23 CFR Part 627

[FHWA Docket No. 94–12]

RIN 2125–AD33

Value Engineering

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Final rule.

SUMMARY: The FHWA is establishing a program requiring the application of a value engineering (VE) analysis for all Federal-aid highway projects on the National Highway System (NHS) with an estimated cost of $25 million or more. The regulation also provides State highway agencies (SHA) with information and guidance on performing VE reviews. This final rule also implements the VE provisions of section 303(b) of the National Highway System Designation Act of 1995.

EFFECTIVE DATE: March 17, 1997.

FOR FURTHER INFORMATION CONTACT: Keith Borkenhagen, Office of Engineering, 202–366–4630, or David Sett, Office of Chief Counsel, 202–366–0780, Federal Highway Administration, 400 Seventh Street, SW., Washington, DC 20590. Office hours are from 7:45 a.m. to 4:15 p.m., e.t., Monday through Friday, except Federal holidays.

SUPPLEMENTARY INFORMATION: The FHWA recognizes that VE, when applied in the development of highway projects, is an effective and proven technique for improving quality, fostering innovation, reducing project costs, and eliminating unnecessary and costly design elements. An FHWA study has confirmed the effectiveness of VE in States with active VE programs and concluded that a significant improvement in program effectiveness would result if all States had active programs. As a result of this study, the FHWA published a notice of proposed rulemaking (NPRM) on November 16, 1994, seeking comments on a proposal to require all States to apply VE to selected Federal-aid highway projects.

In the NPRM, the FHWA proposed to require States to establish, administer, and monitor VE programs; develop written procedures for implementing VE programs; and provide a trained staff or hire a qualified consultant to conduct studies on projects representing 50 percent of the dollar value of their Federal-aid highway program. In addition, the FHWA proposed to allow States to exempt certain categories of projects from reviews and be required to report the yearly results achieved through the application of VE to projects financed with Federal-aid highway funds.

Comments were received from 39 SHAs, 22 consultant/contractor firms, 8 associations/agencies, 14 individuals, and the American Association of State Highway and Transportation Officials'' VE task force. The following discussion summarizes the major comments.

Eighteen States and thirty-eight organizations, firms, and/or individuals provided comments supporting VE. Sixteen States and two organizations provided comments opposing a Federal VE mandate. Three firms/individuals suggested that FHWA's projected additional VE savings under the proposed rule of $100 million could approach $500 million. Twenty-one States requested clarification of the type and amounts of Federal-aid highway funds involved in determining the 50 percent dollar value while fourteen States, five organizations and four individuals suggested replacing this requirement with a dollar threshold or lower percentage. Two firms thought the 50 percent value was excellent because it gave States great flexibility in selecting projects while four individuals suggested that all projects should receive a VE analysis. Six States suggested that additional staff might be required to conduct all of the studies necessary to represent 50 percent of their Federal-aid program. Six States requested that VE change proposals and VE studies of standards be used to help meet the 50 percent dollar value, and five States requested that they be allowed to deduct the dollar value of exempted programs from the 50 percent requirement. Each of these comments concerns the threshold for application of Federal VE requirements. Because the National Highway System (NHS) Designation Act mandates a threshold of $25 million for projects on the NHS, the agency has virtually no discretion in the area.

Eight comments suggested various changes to the training guidelines to require specific VE certification of team leaders and training workshops. All training requirements have been eliminated from the rule text

One firm suggested that a VE team leader be a Certified Value Specialist (CVS), as approved by the Society of American Value Engineers and a Professional Engineer (PE) while another firm suggested that a team leader be a CVS when leading studies of projects larger than a specific dollar threshold. The FHWA did not include these suggested requirements into the final rule because the States have the responsibility for establishing any certification and training requirements (e.g., CVS, PE) for their VE personnel.

While the FHWA was in the process of analyzing these comments, the National Highway System Designation Act of 1995 (NHS Act) (Pub. L. 104–59, 109 Stat. 568) was enacted on November 28, 1995. Section 303(b) of the NHS Act directs the Secretary of Transportation to establish a program to require States to carry out a VE analysis for all projects on the NHS with an estimated total cost of $25 million or more. The Conference Report accompanying the NHS Act explains that this provision prohibits the Secretary from requiring VE on other projects, though ''[a] State remains free to choose to undertake such analyses on additional projects at a State's discretion.'' The report also prohibits DOT from being prescriptive as to the form of VE analysis a State must undertake to satisfy the requirement. H.R. Conf. Rep. No. 345, 104th Cong., 1st Sess. 80 (1995).

Based on this mandate, as well as the public comments made as part of the rulemaking process, the final rule has been revised substantially from the NPRM. The threshold for application of the VE requirement has been modified to be consistent with the statute. The

rule has also been significantly shortened, focusing on minimum programmatic needs to ensure proper VE studies are conducted and utilized by the States on qualifying projects. Beyond these minimum needs, the goal is to provide maximum flexibility to the States to conduct VE programs consistent with the rest of their transportation programs.

Specific provisions that were included in the NPRM, but have been eliminated from the final rule due to the NHS Act requirement and in response to the comments received on the NPRM, include: The State reporting requirement; specific language describing the VE process; written procedural requirements; suggested project selection criteria; VE change proposal requirements; and VE training requirements. All of these changes give States greater authority to determine their own program requirements.

Consistent with the Conference Report language, the rule text no longer contains any prescription regarding the form of VE a State must undertake on a specific qualifying project. The final rule does not provide for FHWA oversight of each VE study, instead focusing FHWA's efforts on State implementation of VE programs. Because the method of conducting a VE study has become standardized and widely recognized in the field, study-by-study review is unnecessary. Instead, the final rule makes reference to the widely recognized process of VE studies.

The statutory definition of VE is clarified. The end product of the study is described in greater detail in the rule's definition of value engineering and, in § 627.5(a)(2), examples of the components of a multi-disciplined team are provided. Both of these additions are based on the widely-recognized VE study process.

In order to provide States time to establish VE programs, States need not delay project approvals and letting schedules when establishing or changing VE programs to comply with these requirements. Many States already employ techniques that will meet these VE requirements, however, States should review all projects being designed, without delaying projects expected to be available for letting during the current fiscal year, to identify those needing a VE analysis.

Any State choosing to use an innovative design/build concept to expedite the completion of an applicable NHS project must still comply with the requirement to perform a VE analysis on the project. In most cases the VE analysis should be performed prior to awarding the design/build contract. The FHWA's division offices will have program oversight responsibility.

Rulemaking Analyses and Notices

Executive Order 12866 (Regulatory Planning and Review) and DOT Regulatory Policies and Procedures

The FHWA has determined that this action is not a significant regulatory action within the meaning of Executive Order 12866 or significant within the meaning of Department of Transportation regulatory policies and procedures. This regulation requires States to carry out a VE analysis for all projects on the NHS with an estimated total cost of $25 million or more.

The threshold triggering the requirement to conduct a VE analysis under this regulation—projects on the NHS with an estimated total cost of $25 million or more—will greatly limit the economic impact of this final rule because the total number of federally-funded projects requiring VE analysis each year under this standard will be small. It is estimated that States use a substantial portion of their Federal-aid highway funds, approximately 59 percent, on non-NHS routes. In addition, the FHWA has found that States with VE programs, usually States with medium and large Federal-aid programs, already include these high cost NHS projects in their selection process and should not have to adjust their programs to comply with this regulation. The FHWA contends that States with small Federal-aid highway programs will not encounter NHS projects large enough to meet the dollar threshold requiring a VE analysis on a yearly basis and the regulation's impact on these States will be limited. Therefore, the FHWA anticipates that the economic impacts of this rulemaking will be minimal, and has determined that a full regulatory evaluation is not required.

The regulation may affect staffing levels in States that do not currently utilize VE. Establishing programs to assure that VE studies are performed on all applicable NHS projects will require each SHA to assign staff to carry out specific VE functions. The FHWA contends that the staff assignments needed to perform the functions required by this regulation will be minimal due to the limited number of projects that require an analysis and the fact that States may choose to hire consultants to perform the studies, thereby reducing the regulation's impact on SHA staff. In addition, States with existing programs probably already have adequate staff assigned to carry out the VE functions of this rule. In either case, the study costs are eligible for reimbursement with Federal-aid highway funds at the appropriate pro-rata share for the type of project studied.

Historically, any additional costs due to the need to hire or reassign staff to manage the VE program have been more than offset by the overall monetary savings resulting from the application of VE studies to highway projects. States with active VE programs report a return on investments of between 30 to 1 and 50 to 1. The opportunity for substantial overall savings exists. In 1994, California, Florida, and Massachusetts reported savings in excess of $100 million as a result of VE study recommendations.

Since this regulation only requires a VE analysis of large ($25 million or greater) NHS projects, most local agencies' projects will not fall into the category of projects requiring a VE analysis. Some local agencies, however, that receive large amounts of Federal-aid highway funds may find that they occasionally have a large NHS project that requires a VE analysis. When this occurs, the local agency, in the same manner as an SHA, may choose to conduct the study itself or hire a VE consultant to perform the study. As stated above, the cost of performing VE studies is project-related and is, therefore, eligible for reimbursement with Federal-aid highway funds.

Regulatory Flexibility Act

In compliance with the Regulatory Flexibility Act (5 U.S.C. 601–612), the FHWA has evaluated the effects of this rule on small entities. Based on the evaluation, the FHWA hereby certifies that this action will not have a significant economic impact on a substantial number of small entities. The FHWA has determined that most small entities (which generally receive small amounts of Federal-aid highway funds) will not have to perform VE studies because their projects are small and are not expected to fit the project selection criteria set forth in this regulation for performing VE studies.

Executive Order 12372 (Intergovernmental Review)

Catalog of Federal Domestic Assistance Program Number 20.205, Highway Planning and Construction. The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities apply to this program.

Executive Order 12612 (Federalism Assessment)

This action has been analyzed in accordance with the principles and criteria contained in Executive Order 12612. Under the Federal-aid highway program, the FHWA reimburses States for costs incurred in highway construction projects. This regulation would simply provide that, as a condition of receiving such grants, States must carry out a value engineering (VE) analysis for all projects on the National Highway System (NHS) with an estimated cost of $25 million or more. This regulation recognizes the role of the States in employing VE and gives States wide latitude in establishing, administering, and monitoring their VE programs. Therefore, the FHWA has determined that this action does not have sufficient federalism implications to warrant the preparation of a separate federalism assessment.

Paperwork Reduction Act

This action does not require the collection of information for the purpose of the Paperwork Reduction Act of 1995, 44 U.S.C. 3501–3520.

National Environmental Policy Act

The agency has analyzed this action for the purpose of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and has determined that this action would not have any effect on the quality of the environment.

Regulation Identification Number

A regulation identification number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross reference this action with the Unified Agenda.

List of Subjects in 23 CFR Part 627

Government procurement, Grant programs—transportation, Highways and roads.

In consideration of the foregoing, the FHWA hereby adds part 627 to Chapter I of title 23, Code of Federal Regulations, as set forth below.

Issued on: February 4, 1997.

Rodney E. Slater,

Federal Highway Administrator.

The FHWA amends 23 CFR to add Part 627 to read as follows:

PART 627—VALUE ENGINEERING

Sec.

Authority: 23 U.S.C. 106(d), 106(f), 302, 307, and 315; 49 CFR 18.

§ 627.1 Purpose and applicability.

(a) This regulation will establish a program to improve project quality, reduce project costs, foster innovation, eliminate unnecessary and costly design elements, and ensure efficient investments by requiring the application of value engineering (VE) to all Federal-aid highway projects on the National Highway System (NHS) with an estimated cost of $25 million or more.

(b) In accordance with the Federal-State relationship established under the Federal-aid highway program, State highway agencies (SHA) shall assure that a VE analysis has been performed on all applicable projects and that all resulting, approved recommendations are incorporated into the plans, specifications and estimate.

§ 627.3 Definitions.

Project. A portion of a highway that a State proposes to construct, reconstruct, or improve as described in the preliminary design report or applicable environmental document. A project may consist of several contracts or phases over several years.

Value engineering. The systematic application of recognized techniques by a multi-disciplined team to identify the function of a product or service, establish a worth for that function, generate alternatives through the use of creative thinking, and provide the needed functions to accomplish the original purpose of the project, reliably, and at the lowest life-cycle cost without sacrificing safety, necessary quality, and environmental attributes of the project.

§ 627.5 General principles and procedures.

(a) *State VE programs.* State highway agencies must establish programs to assure that VE studies are performed on all Federal-aid highway projects on the NHS with an estimated cost of $25 million or more. Program procedures should provide for the identification of candidate projects for VE studies early in the development of the State's multi-year Statewide Transportation Improvement Program.

(1) *Project selection.* The program may, at the State's discretion, establish specific criteria and guidelines for selecting other highway projects for VE studies.

(2) *Studies.* Value engineering studies shall follow the widely recognized systematic problem-solving analysis process that is used throughout private industry and governmental agencies. Studies must be performed using multi-disciplined teams of individuals not personally involved in the design of the project. Study teams should consist of a team leader and individuals from different speciality areas, such as design, construction, environment, planning, maintenance, right-of-way, and other areas depending upon the type of project being reviewed. Individuals from the public and other agencies may also be included on the team when their inclusion is found to be in the public interest.

(i) Each team leader should be trained and knowledgeable in VE techniques and be able to serve as the coordinator and facilitator of the team.

(ii) Studies should be employed as early as possible in the project development or design process so that accepted VE recommendations can be implemented without delaying the progress of the project.

(iii) Studies should conclude with a formal report outlining the study team's recommendations for improving the project and reducing its overall cost.

(3) *Recommendations.* The program should include procedures to approve or reject recommendations and ensure the prompt review of VE recommendations by staff offices whose speciality areas are implicated in proposed changes and by offices responsible for implementing accepted recommendations. Reviews by these offices should be performed promptly to minimize delays to the project.

(4) *Incentives.* The program may include a VE or cost reduction incentive clause in an SHA's standard specifications or project special provisions that allows construction contractors to submit change proposals and share the resulting cost savings with the SHA.

(5) *Monitoring.* The program should include procedures for monitoring the implementation of VE study team recommendations and VE change proposal recommendations submitted by construction contractors.

(b) *State VE coordinators.* Individuals knowledgeable in VE shall be assigned responsibilities to coordinate and monitor the SHA's program and be actively involved in all phases of the program.

(c) *Use of consultants.* Consultants or firms with experience in VE may be retained by SHAs to conduct the studies of Federal-aid highway projects or elements of Federal-aid highway

projects required under § 627.1(a) of this part. Consultants or firms should not be retained to conduct studies of their own designs unless they maintain separate and distinct organizational separation of their VE and design sections.

(d) *Funding eligibility.* The cost of performing VE studies is project related and is, therefore, eligible for reimbursement with Federal-aid highway funds at the appropriate pro-rata share for the project studied.

[FR Doc. 97–3758 Filed 2–13–97; 8:45 am]

BILLING CODE 4910–22–P

23 CFR Parts 630, 635, and 771

[FHWA Docket No. 96–3]

RIN 2125–AD58

Federal-Aid Project Agreement

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Final rule.

SUMMARY: The FHWA is amending its regulation on project agreements. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 modified the requirement that preliminary engineering and right-of-way projects must be advanced to the construction stage within certain time limits. Changes to the agreement provisions reflect these adjustments. The new procedures provide more flexibility in the format of the agreement document and permit the development of a single document to serve as both the project authorization and project agreement document. Other changes were made to shorten the agreement document and to add clarity to the process.

EFFECTIVE DATE: This final rule is effective March 17, 1997.

FOR FURTHER INFORMATION CONTACT: Jack Wasley, Office of Engineering, 202–366–0450, or Wilbert Baccus, Office of the Chief Counsel, 202–366–0780, FHWA, 400 Seventh Street, SW., Washington, DC 20590. Office hours are from 7:45 a.m. to 4:15 p.m., e.t., Monday through Friday except Federal holidays.

SUPPLEMENTARY INFORMATION: The amendments in this final rule are based primarily on the notice of proposed rulemaking (NPRM) published in the January 30, 1996, **Federal Register** at 61 FR 2973 (FHWA Docket No. 96–3). All comments received in response to this NPRM have been considered in adopting these amendments.

Under the provisions of 23 U.S.C. 110, a formal agreement between the State highway agency and the FHWA is required for Federal-aid highway projects. This agreement, referred to as the ''project agreement,'' is in essence a written contract between the State and the Federal government defining the extent of the work to be undertaken and commitments made concerning the project.

Requirements covering project agreements are contained in this final rule. This final rule updates and modifies the existing Federal-aid project agreement regulation to incorporate changes mandated by the ISTEA, Pub. L. 102–240, 105 Stat. 1914, to streamline the project agreement form and provisions, and to allow more versatility in its use. This final rule amends the existing regulation in the following manner and for the reasons indicated below.

Section 630.301 Purpose

The statement of purpose is revised with minor changes for clarity.

Section 630.303 Preparation of Agreement

This section no longer requires the use of a specific form. Instead, a State has the flexibility to use whatever format is suitable to provide the information required for a project agreement document.

Section 630.305 Modification of Original Agreement

A State is still required to prepare a modification to a project agreement as changes occur. However, this section no longer requires the use of a specific form. Instead, a State is allowed to develop its own form for modification of the project agreement, provided it contains necessary information as identified by the regulation.

Section 630.307 Agreement Provisions

This section identifies the provisions that must be a part of each agreement. The project agreement has been simplified by eliminating all the boilerplate provisions that are not required from the agreement itself. The provisions that are necessary have been included in this section of the regulation. The simplified project agreement would incorporate, by reference to this section, these provisions into each agreement. The following discussion covers each of the required provisions.

Section 630.307(a) is a general provision under which the State agrees to comply with title 23, United States Code (U.S.C.), the regulations implementing title 23, and the policies and procedures established by the FHWA. In addition, States must also comply with all other applicable Federal laws and regulations. This general provision is broad in scope and there is little need for other provisions which cover only a limited feature of title 23, U.S.C.

Section 630.307(b) represents an acknowledgment by the State that it has a financial obligation for the non-Federal share of the cost of the project.

Sections 630.307(c)(1) and (c)(2) contain provisions that implement statutory requirements concerning a State's payback of Federal funds it has received for right-of-way acquisition or preliminary engineering should the project not be advanced within the designated statutory time frames. Paragraph (c)(1), Project for Acquisition of Rights-of-Way, implements the requirement in 23 U.S.C. 108(a) that the agreement between the State and the FHWA for right-of-way acquisition projects shall include a provision that construction shall begin within 20 years. This reflects an amendment to 23 U.S.C. 108(a) resulting from passage of section 1017(a) of the ISTEA.

With regard to paragraph (c)(2), Preliminary engineering project, prior to passage of the ISTEA, an administrative decision by the FHWA required repayment of Federal-aid highway funds authorized for preliminary engineering if right-of-way acquisition or actual construction had not begun within 5 years after authorization of the preliminary engineering. The general concept of this provision is now found in the statute; section 1016(a) of the ISTEA incorporated this provision into 23 U.S.C. 102(b). One significant difference between the statutory provision and the existing FHWA practice is that 10 years instead of 5 years must pass before payback is required. Paragraph (c)(2) reflects the 10-year payback period.

Sections 630.307(c)(3), (c)(4) and (c)(5) contain provisions for a drug-free workplace, suspension/debarment, and lobbying required by 49 CFR 29.630, 49 CFR 29.510 and 49 CFR 20.110, respectively.

According to 49 CFR 29.630(c), a State is allowed to make one yearly certification for the drug-free workplace certification. Although the FHWA has used annual or quarterly program certifications for the others in the past, it was determined that these certifications do not fully comply with the provisions of previously cited requirements in 49 CFR 29.510 and 49 CFR 20.110. Placing language in the project agreement as part of the general provisions provides the separate certification action required for every project. Project-by-project certifications are deemed to fully satisfy the requirements in title 49, CFR, and

knowledge, the Florida DOT study is the best comprehensive comparison of a limited number of transportation projects that is currently available. The FHWA will consider all of the issues that have been identified in the comment period during the development of the Report to Congress.

Simplification of SEP–14

Several commenters recommended that the SEP–14 be simplified. Others expressed an appreciation for the availability of this technique to proceed with projects that did not meet the statutory definition of a qualified project. Still others felt that it was appropriate for the FHWA to delegate approval authority to the Division Offices as proposed in the NPRM.

We agree with these comments. The NPRM described several proposed methods to simplify the SEP–14 approval process. In addition, given the statutory definition for ''qualified projects,'' it will be necessary to maintain the SEP–14 program and make it available for non-qualified projects and other innovative contracting techniques. See the discussion for § 636.107 for additional details.

Miscellaneous

Two private individuals representing construction companies did not provide specific recommendations but expressed their concern regarding the use of design-build in the Federal-aid highway program. Generally, these commenters indicated the following concerns: (1) Design-build will limit competition and overall prices will increase; (2) the proposal process is too expensive except for the largest of firms; (3) quality and safety will suffer because design-build provides no incentive for either; (4) some contracting agencies might be biased in the evaluation process against firms that have a claim on a previous project; and (5) the benefits of faster project delivery have been improperly addressed by some in the industry. One commenter believed that the actual inconvenience to the public during construction is no shorter for design-build than it is for the traditional design-bid-build delivery system and this should be a primary consideration in selecting a project delivery method.

The TCA provided specific recommendations to revise FHWA policy in 23 CFR 645.109, 23 CFR 645.113, and 23 CFR 645.115 to utilize design-build terminology.

The FHWA recognizes this concern; however, we note that some sections of 23 CFR use terms that relate to the traditional design-bid-build process (*i.e.*, plans, specifications, estimates, bids, etc.) and do not include terms that relate to the design-build process (*i.e.*, Request for Proposal document, proposals, offerors, etc.). We did not propose to revise all sections of 23 CFR with this rulemaking. Such revisions are beyond the scope of this rulemaking action and will be considered in future rulemakings by the appropriate FHWA program office.

Section-by-Section Analysis

Part 627—Value Engineering

Section 627.5 General Principles and Procedures

The ACEC and the Design Professionals Coalition (DPC) were generally in agreement with the proposed value engineering provisions and the flexibility provided in the NPRM.

The AASHTO, the DBIA, the Virginia DOT and the TCA suggested replacing the word ''shall'' with ''may'' in § 627.5(e) to allow for additional flexibility.

The Associated General Contractors of America (AGC) and the American Road and Transportation Builders Association (ARTBA) generally supported the proposed value engineering language in the NPRM and recommended against the use of value engineering as part of the design-build proposal process.

While the FHWA agrees with the commenters who suggested clarification of the NPRM language, we disagree with the suggestion that the use of the word ''may'' in lieu of ''shall'' would provide sufficient clarification. We agree that the final rule must explain how contracting agencies can meet the value engineering analysis requirement for design-build projects.

Several commenters suggested that the final sentence of § 627.5(e)(2) be deleted as the existing value engineering regulation does not address value engineering change proposals during construction. The FHWA agrees with these commenters. This issue is not addressed in the existing value engineering regulation. Therefore, we have removed that sentence from the regulation.

The AGC believed that including value engineering proposals as part of the proposal process only tends to add more subjective variables to the selection process. The ARTBA took a different viewpoint from the AGC. It suggested that the FHWA should consider the use of alternate technical concepts as a means of allowing the STDs to fulfill the value engineering analysis requirements.

The Washington State DOT indicated that design-build proposers should have the widest possible range of expertise at their disposal when developing a proposal in a competitive environment. It suggested that the FHWA should provide flexibility to allow value engineering proposals developed by a design-build proposer to fulfill the value engineering analysis requirement.

The TCA suggested that it had received a number of significant value engineering proposals under contract provisions and it is inappropriate for the FHWA to discourage such provisions.

The DBIA suggested that while it is possible to request value engineering ideas during the procurement process and post-award, the fruitfulness of this process is highly questionable and very unlikely to yield measurable results. It concurred with the NPRM provisions that stated that ''value engineering reviews are generally not recommended as part of the design-build proposal process.''

The FHWA recognizes the differing viewpoints concerning the use of value engineering reviews conducted during the procurement process and post award. While such reviews may be useful in meeting a contracting agency's project objectives, they do not necessarily meet the objectives of FHWA's value engineering analysis requirement.

The ARTBA, the TCA, the Colorado DOT and the Texas DOT suggested that the FHWA allow the use of alternate technical concepts during the proposal development process. These entities suggested that the alternate technical proposal process is similar to value engineering and may be even more thorough than any formal value engineering procedure presently required. These commenters stated that the proposed alternative technical proposals are typically well developed since they incorporate both designer and contractor input. Both the proposer and the contracting agency benefit from the use of this procedure as it gives the proposer a potential means of lowering its proposal price and the contracting agency receives 100 percent of the cost saving. The Colorado DOT requested that the FHWA make it clear that alternate technical concepts be allowed in the design-build procurement process.

While the FHWA questions the overall effectiveness of a value engineering requirement during the proposal process or after contract award, several commenters provided convincing testimony that such provisions should not be prohibited. As long as the contracting agency maintains a fair and competitive process in reviewing, evaluating and recognizing

alternate technical concepts, the FHWA has no objection to the use of alternate technical concepts. For this reason, we have modified the language in § 636.209 to allow the use of the alternate technical proposal concept as long as such alternate concepts do not change the assumptions used in the environmental decision making process. However, contracting agencies must not rely solely on an alternate technical concept requirement to fulfill the FHWA's value engineering analysis requirement.

SAVE International, a value engineering society, proposed a revision to this section that would require STDs to perform a value engineering analysis prior to the procurement process and allow other value engineering studies during the procurement process and during the life of the design-build contract at the discretion of the STD. This association stated that the greatest opportunity for savings exists prior to the initiation of the design-build procurement process, and therefore, recommended that the FHWA require a value engineering analysis at this point and allow additional value engineering studies afterwards.

The FHWA agrees with the concept of requiring a value engineering analysis prior to the release of the Request for Proposal (RFP) document. SAVE International suggested two additional value engineering reviews but recommended that these two be discretionary; therefore, we did not feel it was necessary to include these provisions in the regulation.

The AASHTO and the DBIA suggested that value engineering is inherent in the design-build process but also suggested that this section needs further clarification. The AASHTO questioned why the FHWA was modifying the existing value engineering regulation and several STDs (Florida, Utah, New Jersey and Washington) recommended no changes to the existing value engineering regulation. They indicated that the existing regulation applies to any Federal-aid highway project on the National Highway System greater than $25 million, regardless of whether is it a design-build or a design-bid-build project. These commenters suggested that the proposed modifications are not necessary.

Still other commenters suggested several modifications to the NPRM language to clarify requirements. The TCA suggested that contracting agencies should be given the flexibility to determine which project procedures or contract requirements could be used to fulfill the value engineering analysis required by the FHWA.

While the FHWA agrees with the commenters who suggested that value engineering concepts may be inherent in the design-build process, we disagree with the commenters who suggested that all design-build projects would fulfill the FHWA's value engineering analysis requirement. The use of the design-build project delivery method does not fulfill the congressional mandate for a value engineering analysis on National Highway System projects greater than $25 million.

In consideration of all of these comments, the FHWA believes that it is necessary to amend the NPRM language to clarify the minimum requirements for fulfilling the value engineering analysis requirement on design-build projects. For the purpose of clarification, we revised the language to require a value engineering analysis prior to the release of the RFP document. The NPRM provisions of paragraph (e)(2) have been deleted. The final rule clearly states that a value engineering analysis is required prior to the release of the RFP document. This will be the only requirement for fulfilling the value engineering analysis requirement for design-build projects on the National Highway System greater than $25 million. This does not preclude further value engineering reviews or studies at subsequent points in the procurement process or even after contract award. However, subsequent value engineering reviews will not be acceptable for the purposes of fulfilling the value engineering analysis requirement.

Part 630—Preconstruction Procedures

Section 630.203 Applicability

The TCA suggested that this section be modified to provide an exception for design-build projects such that contracting agencies would not be subject to the FHWA's requirements for the preparation, submission and approval of plans, specifications, estimates and supporting documents on Federal-aid projects.

The FHWA disagrees with this comment. The FHWA's requirements for reviewing and approving design-build RFP documents are contained in 23 CFR 635.112. Therefore, it is not necessary to modify § 630.203.

Section 630.1010 Contents of the Agency Procedures

The TCA suggested that a revision be made to the FHWA's policies in Subpart J, Traffic Safety in Highway and Street Work Zones, to accommodate design-build projects. This commenter suggested that the existing regulations be modified to indicate that, for design-build projects, the design-builder would develop the traffic control plan. It was also suggested that the responsible person be an employee of the design-builder or a subcontractor.

The FHWA disagrees with this comment. We did not modify this section and traffic control plans are beyond the scope of this rulemaking action. The FHWA will consider appropriate revisions to its policy in this area in a future rulemaking.

Part 633—Required Contract Provisions

Section 633.102 Applicability

The TCA suggested that this section be modified to allow contracting agencies to strike or modify Section VII of Form FHWA–1273, Required Contract Provisions, that concerns minimum contracting responsibilities of the prime contractor. A similar recommendation was provided for Appendix B, Section VIII(4) for Appalachian projects.

The FHWA disagrees with this comment. Although the FHWA proposed to change the contracting requirements of § 635.116 for design-build contracts in the NPRM, such a change would best be implemented with a modification to Form FHWA 1273, Required Contract Provisions and Attachment A for Appalachia projects. These changes are beyond the scope of this rulemaking.

Part 635—Construction and Maintenance

Section 635.102 Definitions

The ACEC indicated the proposed modifications were acceptable. The TCA suggested that the FHWA add a definition for the term ''contracting agency'' (or cross-reference the definition in part 636), revise the definition of ''design-build project,'' revise the definition of ''incentive/disincentive for early completion,'' and use the term ''contracting agency'' instead of ''STD'' in many sections within part 635. The TCA also suggested that the current definition of ''design-build project'' might preclude the STD from entering into multiple contracts relating to a single project.

The FHWA agrees with the comment concerning the definition of a design-build project. We have modified the definition to read as follows: ''Design-build project means a project to be developed using one or more design-build contracts.'' The other suggested revisions are either beyond the scope of this rulemaking or are not appropriate.

APPENDIX B

Survey Questionnaire

Questionnaire
for
NCHRP Synthesis Topic 35-04
Project 20-5

INTRODUCTION

The purpose of this synthesis is to summarize and detail Value Engineering (VE) practices currently utilized by transportation agencies in the United States and Canada. VE is a proven management tool that can play an important role in effective decision making for transportation projects by increasing value through balancing project objectives with costs. While VE practices were initially introduced to many transportation agencies for cost avoidance/containment purposes, VE has also been successfully used to manage the expectations of the interested public and key stakeholders, meet environmental commitments, improve road safety, address schedule concerns, develop new specifications and standards, and, of course, deal with budget challenges. The use of VE in transportation continues to grow and will be further enhanced by sharing information on the application and management of current VE practices and programs.

The goal of this synthesis is to study and to report the best/current VE practices of transportation agencies in the United States and Canada. The synthesis will identify the key strengths and challenges of current VE study processes and may serve as a guide to those agencies interested in applying VE and/or improving the effectiveness of VE on their projects and programs.

RESPONDING AGENCY INFORMATION

Please assist us by providing this information to help process this questionnaire:

Agency/company:

Address:

City:

State/province:

Zip/postal code:

Questionnaire completed by:

Current position/title:

Date:

Telephone:

Fax:

E-mail:

Agency/company contact (if different from above):

Telephone:

E-mail:

PLEASE RETURN THE COMPLETED QUESTIONNAIRE BY MARCH 26, 2004

SUBMIT COMPLETED QUESTIONNAIRE TO:

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Vice President
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Please contact David directly if you have questions.

OBJECTIVES

This synthesis will identify and document the best/current VE practices of transportation agencies in the United States and Canada.

SCOPE OF THIS SYNTHESIS

The scope of this synthesis deals with the VE practices of transportation agencies in the United States and Canada. A broader perspective will be gained by considering the practices of selected large municipalities and metropolitan areas, transit agencies, turnpike/toll and port authorities, federal agencies, and value practitioners.

INSTRUCTIONS

Please be concise with your answers. Follow-up telephone and/or e-mail interviews may be required to expand/confirm your answers to enhance our understanding of your response. Please identify to us a contact person if you will not be available to respond directly, in the event that this is necessary. Please forward copies of any agency-specific documents that you feel are relevant to the answers that you have provided in the questionnaire. This may include, but not be limited to:

- VE policies, directives, standards;
- VE manuals (study guides, report instructions, training needs);
- Electronic and/or hard copy website details on agency intranet VE sites;
- Project performance measurement methods; and/or
- Any other documents you feel would assist us during the study.

Please advise if we are to return these documents back to you at the conclusion of the study.

THANK YOU IN ADVANCE FOR YOUR ASSISTANCE AND COOPERATION WITH THIS IMPORTANT PROJECT

SURVEY OVERVIEW

This survey has several modules, which present thematically linked questions:

- Policy, Guidelines, and Project Selection
- Education and Awareness
- Application
- Implementation
- Monitoring
- Future Needs

Many questions utilize a multiple choice format. All questions permit the inclusion of additional comments and we encourage you do so.

Part 1—Policy, Guidelines, and Project Selection

1. Does your agency utilize VE in the development of its projects, processes, and products?

   ☐ Always
   ☐ Often
   ☐ Rarely
   ☐ Never

   Comments:

2. What is the primary motivation for your agency to use VE?

	Always	Often	Rarely	Never
Statutory requirement	☐	☐	☐	☐
Required to obtain funding	☐	☐	☐	☐
Improve project performance	☐	☐	☐	☐
Reduce/avoid cost	☐	☐	☐	☐
Reduce/avoid maintenance	☐	☐	☐	☐
Improve safety	☐	☐	☐	☐
Meet schedule	☐	☐	☐	☐
Other	☐	☐	☐	☐

   Comments:

3. Does your agency have any defined policies, procedures, and/or guidelines for VE?

   ☐ Yes
   ☐ No
   ☐ Do Not Know

   Comments:

4. If so, where do the policies, guidelines, and/or procedures governing the use of VE in your agency come from?

	Policies[a]	Guidelines[b]	Procedures[c]
Federal agency	☐	☐	☐
State/provincial agency	☐	☐	☐
Other agency	☐	☐	☐
Value community[d]	☐	☐	☐
Other (please specify)	☐	☐	☐
Do not know	☐	☐	☐

Notes:
[a] Policies that govern the application of VE in your agency.
[b] Guidelines and warrants that influence when and/or how VE procedures are used on a project, product, and/or process. Includes selection of team members, workshop format, reporting format, and presentation requirements.
[c] Procedures used during a VE study.
[d] The value community consists of practitioners and academics in agencies, educational institutions, not-for-profit societies that promote the value methodology (such as SAVE International, Canadian Society of Value Analysis, Miles Value Foundation), and the consulting industry specializing in VE.

Comments:

5. How are projects selected for VE studies?

	Always	Often	Rarely	Never
Statutory requirement	☐	☐	☐	☐
Agency cost threshold	☐	☐	☐	☐
Project complexity	☐	☐	☐	☐
Stakeholder involvement	☐	☐	☐	☐
VE program quota	☐	☐	☐	☐
Improve safety	☐	☐	☐	☐
Meet schedule	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Comments:

6. What percentage of the VE studies performed by your agency is on the National Highway System?

☐ >90%
☐ 81 to 90%
☐ 51 to 80%
☐ 31 to 50%
☐ 11 to 30%
☐ <10%
☐ N/A

Comments:

7. Who has the responsibility to select the VE team members?

	Always	Often	Rarely	Never
Senior management	☐	☐	☐	☐
Line manager	☐	☐	☐	☐
VE manager/coordinator	☐	☐	☐	☐
Technical staff	☐	☐	☐	☐
Consultant—Design team	☐	☐	☐	☐
Consultant—VE team	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Comments:

8. How are the VE team members selected?

	Always	Often	Rarely	Never
They have specific project knowledge	☐	☐	☐	☐
They are independent of the project	☐	☐	☐	☐
They have specific technical expertise	☐	☐	☐	☐
They are available in-house staff	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Comments:

9. What credentials are required for the VE team facilitator?

	Always	Often	Rarely	Never
Certified value specialist (CVS)	☐	☐	☐	☐
Associate value specialist (AVS)	☐	☐	☐	☐
Value methodology practitioner (VMP)	☐	☐	☐	☐
Professional engineer	☐	☐	☐	☐
Technical expertise required for study	☐	☐	☐	☐
Similar project experience	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Comments:

10. What credentials are required for the VE team members?

	Always	Often	Rarely	Never
Technical specialist	☐	☐	☐	☐
Professional engineer	☐	☐	☐	☐
Have minimum of MOD I training[a]	☐	☐	☐	☐
Have FHWA-sponsored training[b]	☐	☐	☐	☐
Have other formal VE training[c]	☐	☐	☐	☐
Previous experience in VE	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Notes:
[a] SAVE International Module I approved 40 hour VE training course led by an internal or external instructor.
[b] FHWA/National Highway Institute State 32 hour VE training course sponsored by a state agency.
[c] Other formal training in VE includes universities, colleges, the Miles Value Foundation, and VE training courses offered outside North America.

Comments:

11. How many VE studies have been performed by your agency in the last 5 years?

☐ >100
☐ 91 to 100
☐ 81 to 90
☐ 51 to 80
☐ 31 to 50
☐ 11 to 30
☐ <10
☐ Do not know
☐ N/A

Comments:

12. Who does the VE program manager (if the position exists) report to?

☐ Director or commissioner
☐ Senior manager
☐ Technical staff
☐ External agency
☐ Other (please specify)
☐ Do not know
☐ N/A

Comments:

Part 2—Education and Awareness

13. Does your agency have a formal policy on VE training?

☐ Yes
☐ No
☐ Do not know
☐ N/A

Comments:

14. How long has a training initiative been in place?

☐ >10 years
☐ 5 to <10 years
☐ 3 to <5 years
☐ 1 to <3 years
☐ <1 year
☐ Do not know
☐ N/A

Comments:

15. How many of your agency's current technical and management staff have received VE training?

☐ ≥1000
☐ 500 to 999
☐ 400 to 499
☐ 300 to 399
☐ 200 to 299
☐ 100 to 199
☐ 50 to 99
☐ 25 to 49
☐ 10 to 24
☐ <10
☐ N/A

Please provide the actual/approximate number of trained staff in the comment box below.

Comments:

16. What percentage of your agency's technical and management staff does the number of VE trained staff identified in Question 15 represent?

☐ >90%
☐ 81 to 90%
☐ 51 to 80%
☐ 31 to 50%
☐ 11 to 30%
☐ ≤10%
☐ N/A

Comments:

17. What percentage of your agency's VE trained staff identified in Question 15 is certified[a]?

☐ >90%
☐ 81 to 90%
☐ 51 to 80%
☐ 31 to 50%
☐ 11 to 30%
☐ ≤10%
☐ N/A

Notes:
[a] SAVE International certification levels—Certified Value Specialist (CVS), Associate Value Specialist (AVS), and Value Methodology Practitioner (VMP).

Comments:

18. To what level is agency staff being trained in VE?

	Always	Often	Rarely	Never
VE methodology overview	☐	☐	☐	☐
National Highway Institute (32 hours)	☐	☐	☐	☐
SAVE approved MOD I (40 hours)	☐	☐	☐	☐
SAVE approved MOD II (24 hours)	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Comments:

19. Who is being trained in VE?

	Always	Often	Rarely	Never
Senior management	☐	☐	☐	☐
Project management staff	☐	☐	☐	☐
Technical staff	☐	☐	☐	☐
Consultants	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Comments:

20. Who is training the agency staff in VE?

	Always	Often	Rarely	Never
VE program manager	☐	☐	☐	☐
In-house project management staff	☐	☐	☐	☐
In-house technical staff	☐	☐	☐	☐
Consultants	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Comments:

21. What is the annual budget allocated to training agency staff in VE?

☐ >$100,000
☐ $75,000 to $100,000
☐ $50,000 to $74,000
☐ $25,000 to $49,000
☐ <$25,000
☐ Do not know
☐ N/A

Comments:

22. How would you describe the level of Senior Management support of VE within your agency?

☐ Very supportive
☐ Supportive
☐ Indifferent
☐ Not supportive
☐ Do not know
☐ N/A

Comments:

23. How would you describe Senior Management's familiarity with the VE program within your agency?

☐ Excellent
☐ Good
☐ Fair
☐ Poor
☐ Do not know
☐ N/A

Comments:

Part 3—Application

24. Does your agency utilize the SAVE International Value Methodology Standard (October 1998)[a] as the basis for the VE Job Plan?

☐ Yes
☐ Similar, but modified
☐ No
☐ Do not know
☐ N/A

Notes:
[a] The SAVE International Value Methodology Standard utilizes six phases in the workshop—Information, Function Analysis, Creativity, Evaluation, Development, and Presentation. The Standard can be reviewed by visiting the SAVE International website (http://www.value-eng.org/pdf_docs/monographs/vmstd.pdf).

Please elaborate on any differences in the comment box below.

Comments:

25. In your opinion, does VE contribute to innovation within your agency?

☐ Always
☐ Often
☐ Rarely
☐ Never

Comments:

26. Which VE and related tools are typically utilized during a VE study for your agency?

	Always	Often	Rarely	Never
Cost model[a]	☐	☐	☐	☐
Space model[a]	☐	☐	☐	☐
Traffic and/or safety model[a]	☐	☐	☐	☐
Quality model[b]	☐	☐	☐	☐
Risk model[b]	☐	☐	☐	☐
Business process model[c]	☐	☐	☐	☐
Cause and effect analysis[c]	☐	☐	☐	☐
FAST diagram[c]	☐	☐	☐	☐
Evaluation matrix	☐	☐	☐	☐
Criteria matrix	☐	☐	☐	☐
Performance measures[d]	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Please elaborate on any additional VE related tools in the comment box below.

Notes:

[a] These models typically present project information in a tabular or graphical form to highlight unique and/or high value project components. The cost model typically provides project component costs using a form of work breakdown structure (WBS) and may include graphs or charts with the costs sorted in a descending value format. Space, traffic, and safety models similarly present project-specific data to highlight the variances (i.e., what project component carries the most traffic, requires the most space, and/or has the highest crash rate?).

[b] These models typically present analysis information in a tabular or graphical form. A quality model graphically presents the relative sensitivities and expectations that the VE team members place on key aspects of the project (i.e., for success on a project, what is the relative importance of community impacts relative to environmental impacts?). A risk model (or risk register) identifies risk aspects and documents the probability and consequences.

[c] These models present the interrelationships of business processes, causes and effects, and project functions graphically. All models, including the FAST (Function Analysis System Technique) diagram, can be dimensioned to include costs, time, and/or responsibilities.

[d] Performance measures consist of criteria definitions and measurement scales that can be used to evaluate alternatives.

Comments:

27. How is project performance/quality established and/or measured?

	Always	Often	Rarely	Never
Quantitatively	☐	☐	☐	☐
Qualitatively	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Comments:

28. To what level does your agency develop the shortlisted ideas within the time allotted for the workshop?

	Always	Often	Rarely	Never
Hand drawn/photocopy sketches	☐	☐	☐	☐
CADD drawings	☐	☐	☐	☐
Manual calculations	☐	☐	☐	☐
Spreadsheet calculations	☐	☐	☐	☐
Computer modeling and simulation[a]	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Notes:
[a] Includes traffic modeling (i.e., capacity software, operational and queue/delay simulations, signal timing), engineering design (i.e., structural, drainage, noise, grading, and pavement), and 3-dimensional visualization/rendering.

Comments:

29. To what level does your agency calculate/determine the following project costs within the time allotted for the workshop?

	Always	Often	Rarely	Never
Life-cycle costs	☐	☐	☐	☐
Collision/crash costs/societal benefits	☐	☐	☐	☐
Travel delay costs	☐	☐	☐	☐
Recurring costs	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Comments:

30. How are the shortlisted ideas selected for development during the workshop?

	Always	Often	Rarely	Never
Gut feel	☐	☐	☐	☐
Paired comparison	☐	☐	☐	☐
Quality/performance criteria	☐	☐	☐	☐
Evaluation matrix	☐	☐	☐	☐
Salability of the idea to senior management	☐	☐	☐	☐
Champion emerges	☐	☐	☐	☐
Group consensus through discussion	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Please elaborate on any additional selection/evaluation methods in the comment box below.

Comments:

31. Does your agency typically address these issues during the workshop?

	Always	Often	Rarely	Never
Road safety	☐	☐	☐	☐
Constructability	☐	☐	☐	☐
Traffic staging	☐	☐	☐	☐
Environmental impacts	☐	☐	☐	☐
Stakeholder expectations/issues	☐	☐	☐	☐
Driver expectations/human factors	☐	☐	☐	☐
Aesthetics	☐	☐	☐	☐
Schedule impacts	☐	☐	☐	☐
Flexibility for the future	☐	☐	☐	☐
Project costs[a]	☐	☐	☐	☐
User costs/benefits[b]	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Do not know	☐			

Notes:

[a] Includes project, product, and/or process costs related to construction, right-of-way (property), maintenance, staffing, stock, implementation, and delivery/assembly costs incurred by the agency.

[b] Includes costs incurred/benefits received by external parties (i.e., travel delay costs, safety benefits/societal costs).

Please elaborate on how these are addressed in the comment box below.

Comments:

32. Does your agency use VE to develop or update technical standards, specifications, and/or guidelines?

☐ Always
☐ Often
☐ Rarely
☐ Never

Comments:

33. Does your agency use VE on routine or less complex projects (such as rehabilitation and/or intersection improvement projects)?

☐ Always
☐ Often
☐ Rarely
☐ Never

Comments:

34. Does your agency have specific documentation formats for VE project reports?

☐ Yes
☐ No
☐ Do not know
☐ N/A

If yes, please elaborate on the Table of Contents in the comment box below. If no, please advise who establishes the reporting format.

Comments:

Part 4—Implementation

35. Does your agency have a defined procedure to review and assess submitted VE ideas?

☐ Yes
☐ No
☐ Do not know
☐ N/A

If yes, please elaborate on the procedure in the comment box below. If no, please advise how decisions are made regarding the disposition (acceptance, acceptance with modification, deferral, or rejection) of the VE ideas.

Comments:

36. Does your agency monitor the implementation of accepted VE ideas?

☐ Yes
☐ No
☐ Do not know
☐ N/A

If yes, please elaborate in the comment box below.

Comments:

Part 5—Monitoring

37. Does your agency monitor VE program performance?

☐ Yes
☐ No
☐ Do not know
☐ N/A

Comments:

38. If yes, how does your agency monitor VE program performance?

	Always	Often	Rarely	Never
Number of projects reviewed	☐	☐	☐	☐
Number of VE ideas accepted	☐	☐	☐	☐
Value of avoided cost/cost savings	☐	☐	☐	☐
Increase in project performance	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
N/A	☐			

Comments:

39. Does your agency compare VE study investment to capital cost savings/avoided?

☐ Yes
☐ No
☐ Do not know
☐ N/A

Comments:

40. At what level of management in the agency is the performance of the VE program measured and reported?

☐ Director or commissioner
☐ Senior manager
☐ Technical staff
☐ External agency
☐ Other (please specify)
☐ Do not know
☐ N/A

Comments:

Part 6—Future Needs

41. What aspects of your agency's VE program do you consider the strongest? Why?

Please elaborate on program strengths in the comment box below.

Comments:

42. What aspects of your agency's VE program do you consider the weakest? Why?

Please elaborate on program weaknesses in the comment box below.

Comments:

43. What opportunities exist for your agency's VE program? Why?

Please elaborate on program opportunities in the comment box below.

Comments:

44. What threats exist for your agency's VE program? Why?

Please elaborate on program threats in the comment box below.

Comments:

45. Do you or your agency have any concerns over the preparedness of the value community[a] to support your VE program?

☐ Yes
☐ No
☐ Do not know
☐ N/A

Note:
[a] The value community consists of practitioners and academics in agencies, educational institutions, not-for-profit societies that promote the value methodology (such as SAVE International, Canadian Society of Value Analysis, Miles Value Foundation), and the consulting industry specializing in VE.

Please elaborate on your concerns, if any, in the comment box below.

Comments:

46. What research needs do you feel need to be addressed in the near future? Why?

Please elaborate on possible research needs in the comment box below.

Comments:

THANK YOU AGAIN FOR YOUR ASSISTANCE AND COOPERATION WITH THIS IMPORTANT PROJECT

We look forward to receiving your input no later than March 26, 2004.

APPENDIX C

Summary Responses to Questionnaire

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 1 Does your agency utilize VE in the development of its projects, processes, and products?

Always	**8%**
Often	**49%**
Rarely	**43%**
Never	**0%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	All projects meeting certain criteria are considered for a VE study. The VE Manager and Project Manager determine if a study is warranted.
4	AR	US DOT	We utilize VE on projects $25 million dollars or more or on projects that we see a need.
6	CO	US DOT	Several VE studies and accepted VECPs (during construction) per year.
11	GA	US DOT	In project development on projects that meet the criteria.
13	ID	US DOT	We follow FHWA guidelines.
17	KS	US DOT	We use VE in our every day practice. The above answer refers to formal VE activities.
18	KY	US DOT	We currently use value engineering abiding by the FHWA requirements which is total construction costs of $25 Million and on NHS. Construction uses VE on a case by case basis.
19	LA	US DOT	First VE study conducted Jan. 2004 with schedule to conduct min. 1 study per quarter.
23	MI	US DOT	Only to satisfy FHWA $25 million rule.
25	MS	US DOT	We followed FHWA VE requirements.
29	NV	US DOT	Currently only used on large projects (>$25M). When our Policy is approved (expected soon), the threshold will be reduced to $10M.
30	NH	US DOT	VE studies are undertaken on large projects as mutually agreed upon between FHWA Division Office and NHDOT.
31	NJ	US DOT	Often for projects, rarely for processes and products.
32	NM	US DOT	Only on transportation projects. We have not performed VE on processes or products yet.
35	ND	US DOT	Projects over $25 million.
36	OH	US DOT	Our Value Engineer guidelines are included in our Project Development Process (PDP) at two different steps. The PDP is for Major and Minor projects exceeding $20 million in total project cost. VE is conducted during Preliminary Engineering and Detailed Design stages.
38	OR	US DOT	30 VE Studies 2000-2004. Most studies are performed during NHI Course.
39	PA	US DOT	We require VE to be done on all projects at or above $ threshold set by FHWA. Often times VEs are done on projects with cost thresholds below FHWA requirement as deemed necessary. Penndot's threshold is $20 million which is less than FHWA's which is $25 million.
42	SC	US DOT	It is used often in the development of projects but rarely in the development of processes and products.
43	SD	US DOT	SDDOT projects on the NHS system are generally less than the $25M threshold established, therefore we haven't internally formalized the VE process. However, we have other processes such as: (1) formalized Scope process prior to or as soon the project enters the Statewide Transportation Improvement Program which is being done for most projects, (2) Corridor Preservation studies, (3) Roadside Safety Audit reviews at 25% stage for the design performed on selected projects, and (4) other reviews as design proceeds. FOR SOME OF THE FOLLOWING QUESTIONS, RESPONSES ARE BASED ON THE SDDOT SCOPE PROCESS AS NOTED IN LIEU OF THE VE PROCESS.
44	TN	US DOT	Projects - Often, Processes and products - Rarely.
48	VA	US DOT	VE is required by state law on all highway projects with estimated costs of $5 million or more. It is also used on some smaller projects and on processes upon request.
51	WI	US DOT	Always used for projects over $25 million and encouraged for projects less than $25 million.
61	ON	CDN DOT	Primarily on engineering projects and engineering standards, with very little use of VA in non-engineering processes.
64	SK	CDN DOT	Presently investigating the introduction of Value Analysis into our Management Decision Process.
69	Fed Lands	FHWA	The VE program implemented by the CFLHD provides for the systematic review of its multiyear highway program to identify areas for VE studies. Reconstruction projects over $1 million are selected for VE.

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 2 What is the primary motivation for your agency to use VE?

	Always	Often	Rarely	Never
Statutory requirement	**51%**	**22%**	**11%**	**16%**
Required to obtain funding	**38%**	**24%**	**22%**	**22%**
Improve project performance	**29%**	**49%**	**18%**	**7%**
Reduce/avoid cost	**36%**	**56%**	**9%**	**7%**
Reduce/avoid maintenance	**16%**	**47%**	**27%**	**13%**
Improve safety	**16%**	**51%**	**20%**	**13%**
Meet schedule	**7%**	**31%**	**29%**	**33%**
Other	**2%**	**4%**	**11%**	**7%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	Other - sometimes one motivation for a VE study is to achieve a concensus amoung all stakeholders.
7	CT	US DOT	At one time I believe it was an FHWA requirement that all projects (W/FHWA funding) which exceeded $25 million in construction cost undergo a VE process. CDOT maintains this policy at the same threshold policy.
17	KS	US DOT	"Other" refers to validating project design/concept.
18	KY	US DOT	We currently use value engineering abiding by the FHWA requirements which is total construction costs of $25 Million and on NHS. Construction uses VE on a case by case basis.
30	NH	US DOT	The primary reason for completing a VE project study is to meet the requirements of FHWA. The VE Study is completed early in the final design phase, just after the NEPA/Section 404 process review. The Department benefits by having independent professionals assess the project. Throughout the final design development phase, ongoing value engineering adjustments are implemented, but not through an extensive VE study.
31	NJ	US DOT	Other-improve constructibility.
39	PA	US DOT	All noted always factor into our motivation to use VE.
44	TN	US DOT	At present we use only Value Engineering projects mandated by federal law but, on the ones that we do, we strive for the other motivations listed.
49	WA	US DOT	Often used to validate the scope of a project.
52	WY	US DOT	To get an equal or better product at a lower cost is normally the driving force.
61	ON	CDN DOT	We also use VE where we need a process to break down silos between divisions.
64	SK	CDN DOT	Looking at introduction.
69	Fed Lands	FHWA	The Federal Highway Administration recognizes VE as an effective tool for both cost reduction and product quality improvement. Areas of study are selected to achieve the greatest savings while maintaining product quality.

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 3 Does your agency have any defined policies, procedures, and/or guidelines for VE?

Yes	**84%**
No	**14%**
Do Not Know	**2%**
Did Not Respond	**0%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	All projects over $10M or are of a complicated nature will be considered for a study. All projects over $25M and are on the NHS will have a VE Study.
4	AR	US DOT	VE coordinator will conduct studies on an as-needed basis or for projects with cost of $25 million or more.
5	CA	US DOT	The VA program has policy and guidelines.
6	CO	US DOT	Small amount of guidance in Stewardship Agreement between CDOT and FHWA, Project Development manual.
7	CT	US DOT	The "Policy" is any project w/const costs over $25 million. "Procedures" are loosely defined by past practice. CDOT only does 1-3 VE Studies in a given year.
13	ID	US DOT	We use FHWA requirements.
19	LA	US DOT	Established as Engineering Directive from Chief Engineer.
23	MI	US DOT	Thin.
24	MN	US DOT	We are currently following FHWA VE guidelines and working on a Department wide VE policy. No completion date at this time.
26	MO	US DOT	Policy contained in Project Development Manual PDM Sec. 2-05, Stan. Spec's 104-6.
29	NV	US DOT	Policy approval is pending.
30	NH	US DOT	NHDOT does not have any defined policy regarding VE applications.
31	NJ	US DOT	We are part of the project planning and development process.
34	NC	US DOT	Established Policy is not followed or mandated by upper management.
35	ND	US DOT	Federal Highway Administration.
36	OH	US DOT	VE Policy and VE Procedures for Design and for Construction.
39	PA	US DOT	We follow FHWA guidelines as established in the "Federal Aid Policy Guide" dated 9/8/99, transmittal 24.
44	TN	US DOT	Currently in draft form, under development.
48	VA	US DOT	Required by state statute.
49	WA	US DOT	Design Manual Chapter 315.
51	WI	US DOT	Procedure 1-15-1 of our Facilities Development Manual details our policy. Copy is attached.
52	WY	US DOT	Very limited.
61	ON	CDN DOT	Policy memo, Project Manager Manual, Value Engineering Coordinator Manual, web site.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	Procedures are being developed and will be included in the cities project management manual for capital projects.

PART 1 **POLICY, GUIDELINES, AND PROJECT SELECTION**

Question 4 **If so, where do the policies, guidelines, and/or procedures governing the use of VE in your agency come from?**

	Policies	Guidelines	Procedures
Federal agency	**45%**	**36%**	**20%**
State/Provincial agency	**39%**	**34%**	**27%**
Other agency	**0%**	**25%**	**75%**
Value community	**9%**	**30%**	**61%**
Other (Please Specify)	**17%**	**50%**	**33%**
Do not know	**0%**		

Ref.	Agency	Category	Comments
2	AK	US DOT	As a state policy, we are to consider any project over $4 million as a candidate for VE.
11	GA	US DOT	TOPPS document 2450 contains GDOT procedures. It is attached to the email.
10	FL	US DOT	The Department's policies and procedures for VE incorporate the statutory requirements of the Federal Government.
12	HI	US DOT	All projects over $25 million are VE.
30	NH	US DOT	NHDOT relies upon FHWA's guidance in the performance of VE studies.
43	SD	US DOT	SDDOT policy, guidelines and procedures for Scope process.
49	WA	US DOT	AASHTO
52	WY	US DOT	Our's was originally basd on FHWA's NHI training.
61	ON	CDN DOT	All of our policy and guideline documents were developed by MTO or consultants working for MTO, with some advice and assistance from other agencies and consultants. Some of our procedures that we use in workshops were developed by Caltrans.
64	SK	CDN DOT	Looking at introduction.
68	New York	US CITY	By other I mean our own Agency, OMB. We establish our own guidelines and procedures for VE.
69	Fed Lands	FHWA	The Federal Lands Highway has established a VE program in compliance with the requirements found in the Office of Management and Budget's (OMB) Circular A-131 on VE and developed criteria for use in applying VE to its program in accordance with DOT Order 1395.1A on VE. VE Textbooks, FHWA-HI-88-047 and FHWA-HI-88-051 provide the guidance for development of VE Studies.

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 5 How are projects selected for VE studies?

	Always	Often	Rarely	Never
Statutory requirement	**55%**	**20%**	**7%**	**18%**
Agency cost threshold	**38%**	**34%**	**17%**	**11%**
Project complexity	**13%**	**53%**	**21%**	**13%**
Stakeholder involvement	**3%**	**29%**	**37%**	**31%**
VE program quota	**6%**	**9%**	**11%**	**74%**
Improve safety	**3%**	**36%**	**28%**	**33%**
Meet schedule	**0%**	**25%**	**36%**	**39%**
Other (Please Specify)	**11%**	**33%**	**22%**	**33%**
Do not know	**0%**			

Ref.	Agency	Category	Comments
3	AZ	US DOT	Other - on one instance a project was way over budget; the primary purpose of the VE study was to bring the project within budget.
5	CA	US DOT	Statutory requirement - NHS VE Mandate. Other - District Identified (voluntary) Study - to solve technical, budgetary or stakeholder issues.
10	FL	US DOT	Projects that meet the $25 million federal statutory requirement and the $20 million Department threshold are always selected for VE.
17	KS	US DOT	Potential value improvements - "other".
24	MN	US DOT	We selected projects that meet FHWA VE requirements.
30	NH	US DOT	Projects with construction cost of greater than $50 million are considered for VE study.
32	NM	US DOT	Projects are selected on an annual basis based on their complexity, cost and potential for improvement at all levels.
36	OH	US DOT	Also, projects are selected based on our Project Development Process and the District Office's request.
38	OR	US DOT	Requested by Project Development Team and Projects requested for NHI Training Course.
43	SD	US DOT	Projects are less than $25M therefore no formal VE study is done. Scope on projects is performed to determine timing of project, sequencing of work, limits of project, type of improvements, design parameters, cost estimates, schedule, etc.
52	WY	US DOT	Other - Management recommendation.
57	NF	CDN DOT	Federally funded projects only.
61	ON	CDN DOT	When a project has an unclear scope or there is uncertainty with the proposed design we may call for a VE study. Our criteria is to select projects that provide the highest potential for value improvement including: expansion projects, new interchanges, high complexity reconstruction, projects with complex traffic control and staging, route planning studies, projects with multiple stages, corridor studies, projects undertaken with other stakeholders, projects with extensive or expensive environmental or geotechnical requirements, projects over $10 million and policies, standards and business processes.
64	SK	CDN DOT	Looking at introduction.

PART 1 **POLICY, GUIDELINES, AND PROJECT SELECTION**

Question 6 **What percentage of the VE studies performed by your agency is on the National Highway System?**

>90%	**54%**
81 to 90%	**8%**
51 to 80%	**18%**
31 to 50%	**4%**
11 to 30%	**2%**
<10%	**6%**
N/A	**8%**

Ref.	Agency	Category	Comments
2	AK	US DOT	We have a marine highway system that often requires VE because of the federal cost thresholds.
5	CA	US DOT	Caltrans has a very large workload imposed by the NHS mandate. Note the mandate is triggered by NHS, $25 million and federal aid participation.
64	SK	CDN DOT	Looking at introduction.

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 7 Who has the responsibility to select the VE team members?

	Always	Often	Rarely	Never
Senior manager	**32%**	**32%**	**18%**	**18%**
Line manager	**16%**	**32%**	**29%**	**23%**
VE Manager/Coordinator	**38%**	**36%**	**8%**	**18%**
Technical Staff	**4%**	**14%**	**39%**	**43%**
Consultant - Design Team	**7%**	**23%**	**27%**	**43%**
Consultant - VE Team	**20%**	**26%**	**26%**	**29%**
Other (Please Specify)	**27%**	**9%**	**18%**	**45%**

Ref.	Agency	Category	Comments
2	AK	US DOT	Most studies are performed by consultants.
3	AZ	US DOT	Primarily the responsibility of the VE Manager.
5	CA	US DOT	All 3 are involved in choosing team members.
6	CO	US DOT	Usually selected by CDOT Program Engineer and Resident Engineer, in cooperation with Consultant design manager.
10	FL	US DOT	The District VE Coordinator (DVE) working with the Department Heads have the responsibility of selecting VE Team Members. DVE working with the FDOT Project Manager will ensure that the correct disciplines are on the team.
11	GA	US DOT	VE Consultant selects their Team Members. Consultant Designers select their team members. DOT team members are selected by various managers.
19	LA	US DOT	Chief Engineer w/recommendation from VE Manager.
23	MI	US DOT	100% Consultant VE.
24	MN	US DOT	Project Design Team.
26	MO	US DOT	Project Manager.
30	NH	US DOT	The VE studies completed to date by NHDOT were part of the consultant services for the final design of the project. The Consultant selected a qualified VE consultant to subcontract the VE study through and the VE consultant selected the independent team for the VE study at the concurrence of NHDOT and FHWA.
34	NC	US DOT	The VE Group Manager requests team members from the Department Unit Managers.
35	ND	US DOT	Sometimes a group effort for management approval.
36	OH	US DOT	Various District Production Administrators, and our Structural Engineer Administrator.
39	PA	US DOT	Each District has a VE Coordinator that works with Sr. Mgr. to select team members.
43	SD	US DOT	When the VE process is used, an assigned VE Coordinator would select the team members. For Scope process the line manager assigns project to technical staff to perform Scope, who in turn invites other technical staff to aid in the scope.
48	VA	US DOT	Local governments may provide team members on a project in their jurisdiction.
49	WA	US DOT	The VE Manager works with the project manager to select the team members.
51	WI	US DOT	Department has master contracts with three VE consulting firms, allowing the project manager to quickly obtain services of VE team leader and some team members. After selecting one of the firms, the project manager and the VE team leader jointly discuss project goals and anticipated expertise needed. The experts could come from the department, from interested stakeholders, or be supplied by the consultant.
57	NF	CDN DOT	Cost benefit analysis done by consultants, reviewed by senior managers.
61	ON	CDN DOT	Typically VE coordinator works with project manager, project manager's supervisor and consultant to pick team. Project managers supervisor can veto team members. Senior managers are involved when it is a special project involving several divisions. When we work with a municipality, they have a say in who is on the team.
64	SK	CDN DOT	Looking at introduction.
68	NY	US CITY	By this I assume you mean the final responsibility for selecting. Candidates for consideration are selected by the VE firm, and final selection is made by us.
69	Fed Lands	FHWA	Consultants are tasked to provide the staff and expertise necessary to conduct a successful VE study.

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 8 How are the VE team members selected?

	Always	Often	Rarely	Never
They have specific project knowledge	**11%**	**41%**	**39%**	**9%**
They are independent of the project	**33%**	**58%**	**6%**	**2%**
They have specific technical expertise	**59%**	**39%**	**2%**	**0%**
They are available in-house staff	**19%**	**63%**	**14%**	**5%**
Other (Please Specify)	**0%**	**60%**	**0%**	**40%**
Do not know	**0%**			

Ref.	Agency	Category	Comments
3	AZ	US DOT	Other: How well they did on prior studies; some express desire; working toward CVS.
10	FL	US DOT	Teams should be structured to include appropriate expertise to evaluate the major areas anticipated within the project. At a minimum, design, construction, and maintenance shall be represented on the team. In the event of specialized projects, individuals with specific expertise necessary to perform a proficient value engineering study should be included in the team makeup.
18-b	KY	US DOT	We use Transportation Cabinet personnel along with a team leader provided by the VE consultant team. This method seems to work well for the VE study procedure.
23	MI	US DOT	Selected by Consultant's CVS leader.
30	NH	US DOT	Comments: As part of the VE independent team, we provide the opportunity to have one team member from FHWA and an independent NHDOT staff member to assist and learn from the process.
35	ND	US DOT	Outside interest groups.
36	OH	US DOT	It is requested to have those qualified/experienced in specific engineering disciplines to participate as team members.
43	SD	US DOT	Done for Scope also.
51	WI	US DOT	See previous comment.
64	SK	CDN DOT	Looking at introduction.

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 9 What credentials are required for the VE team facilitator?

	Always	Often	Rarely	Never
Certified Value Specialist (CVS)	**56%**	**20%**	**7%**	**17%**
Associate Value Specialist (AVS)	**9%**	**6%**	**24%**	**62%**
Value Methodology Practitioner (VMP)	**6%**	**9%**	**18%**	**68%**
Professional Engineer	**29%**	**39%**	**10%**	**22%**
Technical expertise required for study	**36%**	**33%**	**13%**	**18%**
Similar project experience	**13%**	**51%**	**15%**	**21%**
Other (Please Specify)	**29%**	**43%**	**0%**	**29%**

Ref.	Agency	Category	Comments
2	AK	US DOT	Most studies are performed by consultants.
5	CA	US DOT	Caltrans does not require a CVS and P.E. as many other states do. In fact, a license is required for engineering plans and specifications and we do not consider VE to be that type of work. However, Caltrans use of Project Performance Measures has shown that team leaders who are familiar with the topic under study - perform significantly better.
7	CT	US DOT	Not familiar w/certification process. This should correctly indicate that we (as an agency) do not dictate a certain certification. Typically the experienced VE facilitator and team members are hired as subconsultants to the Prime. In perhaps 50% of the cases, State technical staff augment the hired team to lend a certain "this is how we do business" flavor to the process.
10	FL	US DOT	Consultant VE Team facilitator's (leaders) must have a CVS and Florida PE. In-house (FDOT employee) VE Team facilitator must have a Florida PE.
18	KY	US DOT	Division of Design will allow a CVS if the team leader is not registered in Kentucky.
24	MN	US DOT	The facilitator must be certified by SAVE International. He/She must have a minimum of two years of experience in value engineering on highway projects.
30	NH	US DOT	NHDOT required the lead VE member be certified for VE studies and to have past experiences. The team also has to consist of Professional Engineers with specific technical expertise in highway/bridge design, soils, hydraulics, construction engineering and right of way acquisition.
33	NY	US DOT	All of NYSDOT's studies are conducted by VE consultants. As such, in accordance with AASHTO guidelines, a CVS is required to facilitate studies.
35	ND	US DOT	Have experience in VE Facilitating.
36	OH	US DOT	The Value Engineer Consultant firm utilized has an extensive background in various aspects of engineering that shows expertise for the majority of the projects ODOT VEs.
48	VA	US DOT	All VE staff members in Virginia are CVS's. Certification is not required to hold the position, though the department assists in attaining and maintaining certification.
49	WA	US DOT	For consultants we require a PE and a CVS, for in-house we require a PE and training and desire to obtain a CVS.
51	WI	US DOT	VE Team Leader must be CVS, AVS, or VMP.
52	WY	US DOT	Other - Familiarity with VE process.
61	ON	CDN DOT	Require team facilitator to have a local assistant who is familiar with agency and should have VE training. This is intended to build local talent in VE.
64	SK	CDN DOT	Looking at introduction.
66	Winnipeg	CDN CITY	Other is professional facilitator/communicator.

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 10 What credentials are required for the VE team members?

	Always	Often	Rarely	Never
Technical specialist	**39%**	**59%**	**2%**	**0%**
Professional Engineer	**13%**	**56%**	**13%**	**18%**
Have minimum of MOD I training	**5%**	**17%**	**21%**	**57%**
Have FHWA sponsored training	**2%**	**36%**	**16%**	**45%**
Have other formal VE training	**5%**	**20%**	**24%**	**51%**
Previous experience in VE	**5%**	**45%**	**29%**	**21%**
Other (Please Specify)	**50%**	**25%**	**0%**	**25%**

Ref.	Agency	Category	Comments
2	AK	US DOT	Most studies are performed by consultants.
3	AZ	US DOT	The team is selected based on the type of project; i.e., a bridge project will have a structural engineer.
10	FL	US DOT	Team members who have not received formal VE training or participated on a previous value engineering study led by a CVS or DVE may participate on a team; however, there should be no more than two untrained members participating on any one team. The Departments training for team members is MOD I.
24	MN	US DOT	Individuals with different specialty areas such as construction, design, bridge, maintenance, etc.
29	NV	US DOT	NHDOT requires all team members to be lead by certified VE coordinator and all other team members to be professional engineers. We generally review past experiences in VE studies within the resumes before approving the VE team.
34	NC	US DOT	No previous experience.
35	ND	US DOT	None required.
36	OH	US DOT	No previous VE training or expertise has been required.
48	VA	US DOT	Team members are expected, though not required, to have completed VE training, which could be MOD I, FHWA, or VDOT in-house training.
61	ON	CDN DOT	VE consultant team members must be technical specialists. Agency team members do not always have to be technical specialists. We do not specifically require all team members to be trained in VE but we give preference to VE training or VE experience.
64	SK	CDN DOT	Looking at introduction.
69	Fed Lands	FHWA	The facilitator is the only VE team member whose credentials are specified. Selection of the other VE team members is left to the consultant/facilitator to select team members that complement the task.

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 11 How many VE studies have been performed by your agency in the last 5 years?

>100	**14%**
91 to 100	**2%**
81 to 90	**2%**
51 to 80	**12%**
31 to 50	**8%**
11 to 30	**30%**
<10	**26%**
Do not know	**4%**
N/A	**2%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	In the last 5 years we averaged about 7 per year.
5	CA	US DOT	We average about 45 studies per year. 38 Highway Project Studies - 5 - Voluntary and 33 - Mandatory and 7 Process Studies.
6	CO	US DOT	Ballpark estimate, based on approx. 5 per year.
10	FL	US DOT	Department completed 228 studies.
25	MS	US DOT	57
30	NH	US DOT	NHDOT has completed three VE studies within the past five years.
39	PA	US DOT	This is a guesstimate in that I only have hard numbers for the last 4 years.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	Procedures are being developed that will provide guidance on when to apply VE and capital infrastructure on projects.
68	New York	US CITY	For transportation, or for all project types? For Transportation it would be approximately 18 and for all project types it would be 81-90.
69	Fed Lands	FHWA	There have been 10 VEs completed between 2000 and the first half of 2004. This does not include the value engineering change proposals (VECP) of approximately 2 per year.

PART 1 POLICY, GUIDELINES, AND PROJECT SELECTION

Question 12 Who does the VE Program Manager (if the position exists) report to?

Director or Commissioner	**19%**
Senior Manager	**58%**
Technical Staff	**0%**
External Agency	**0%**
Other (please specify)	**6%**
Do not know	**0%**
N/A	**17%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	The VE Section is under the Construction Group. The VE Manager reports to the Construction Group Manager.
6	CO	US DOT	Among other duties, I am CDOT's statewide VE coordinator, and I report to the Project Development Branch manager.
7	CT	US DOT	Projects over $25 million are typically designed by hired consultants. As such, VE studies are likely to be done in our "Consultant Design Office" but no one person runs them.
11	GA	US DOT	The VE Program Manager has other duties as well as VE responsibilities.
12	HI	US DOT	Senior Manager - Highways Division Administrator and External Agency - FHWA.
18	KY	US DOT	Reports with findings from VE study
19	LA	US DOT	Chief Engineer.
23	MI	US DOT	Engineer of Design.
30	NH	US DOT	The in-house VE coordinator and Project Manager assigned to the project report directly to the Directors and FHWA.
32	NM	US DOT	To the Engineering Design Division Director.
34	NC	US DOT	Value Management Engineer.
36	OH	US DOT	Our VE Coordinator would be considered the same as the VE Program Manager. This person reports to the Administrator of the Office of Production.
39	PA	US DOT	VE Program Management is handled by the Chief Engineers Office specifically the "Special Assistant to the Chief Engineer".
43	SD	US DOT	If we have a project over $25M, then the SDDOT Chief Engineer would assign a VE Program Manager to assemble a team for a formal VE process.
48	VA	US DOT	The State VE Manager reports to the Management Services Division Assistant Administrator. The VE program is separate from the technical staff to allow freedom of recommendations, etc.
52	WY	US DOT	No specific VE Manager - added duty for State Highway Development Engineer.
61	ON	CDN DOT	Report to a manager who reports to the chief engineer.
64	SK	CDN DOT	Looking at introduction.

PART 2 EDUCATION AND AWARENESS

Question 13 Does your agency have a formal policy on VE training?

Yes	**24%**
No	**72%**
Do Not Know	**0%**
N/A	**4%**

Ref.	Agency	Category	Comments
2	AK	US DOT	Training was offered in early 1990's. It has not been done on a large scale since that time. We are supposed to offer training periodically, but there is no budget for VE training. Most of our VE work is done by consultants now.
3	AZ	US DOT	The VE Manager and his staff are given a budget for training. They attend most in-state training.
10	FL	US DOT	Team member training can be satisfied by participating on a team led by a CVS or the DVE or by completing team member training offered by Central Office. Central Office will also offer training in the following areas on an as needed basis: team leader training, life cycle cost analysis, and advanced value techniques.
30	NH	US DOT	NHDOT has participated in VE training, but does not have a formal policy.
31	NJ	US DOT	Annual National Highway Institute VE Training
32	NM	US DOT	MOD I is offered yearly to NMDOT employees. It's encouraged for employees to attend but it is not a formal policy.
39	PA	US DOT	We follow Federal Aid Policy Guide.
44	TN	US DOT	Not at present. We are in the process of establishing one.
51	WI	US DOT	A number of staff were trained in VE about 20 to 25 years ago.
52	WY	US DOT	Very brief.
54	BC	CDN DOT	Informal process.
61	ON	CDN DOT	We require SAVE MOD I but we do not have a policy on who gets trained.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	External consultants are used by the city for VE exercises.
69	Fed Lands	FHWA	Training is available to management and technical staff. The majority of the individuals that are in key positions to deliver the VE program have received training.

PART 2 EDUCATION AND AWARENESS

Question 14 How long has a training initiative been in place?

>10 years	**33%**
5 to <10 years	**12%**
3 to <5 years	**2%**
1 to <3 years	**0%**
<1 year	**2%**
Do not know	**0%**
N/A	**51%**
Did not respond	**0%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	Training in general has been a vision supported by management for many years at ADOT.
30	NH	US DOT	Limited training occurred with some staff members early in 1990 and supplemental training occurred over the following decade.
36	OH	US DOT	We do not have a training initiative in place.
42	SC	US DOT	We do not have a formal policy on VE training, however, twice in the last three years we have had an external instructor lead the SAVE International Module I course.
48	VA	US DOT	VDOT used FHWA training from 1987 until 1994. We began offering in-house training, equivalent to the FHWA course, in 1994.
64	SK	CDN DOT	Looking at introduction.
69	Fed Lands	FHWA	Training in FHWA began in 1975.

PART 2 EDUCATION AND AWARENESS

Question 15 How many of your agency's current technical and management staff have received VE training?

≥1000	**4%**
500 to 999	**2%**
400 to 499	**0%**
300 to 399	**10%**
200 to 299	**4%**
100 to 199	**12%**
50 to 99	**12%**
25 to 49	**16%**
10 to 24	**14%**
<10	**8%**
N/A	**18%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	Approximately 15 have had some type of VE training during their career.
4	AR	US DOT	65
5	CA	US DOT	Since 1981 over 1200 employees have been trained. How many of these are still with Caltrans is unknown.
6	CO	US DOT	This is just a guess.
10	FL	US DOT	483 current employees have been trained.
11	GA	US DOT	40
12	HI	US DOT	20 ±
23	MI	US DOT	Approximately 3-5 from early 1990's NHI class on VE.
24	MN	US DOT	We do not have exact count.
25	MS	US DOT	30
26	MO	US DOT	625 persons have been trained since 1990.
30	NH	US DOT	The actual number cannot be defined, but is estimated to be less than ten (10).
31	NJ	US DOT	348
32	NM	US DOT	Approximately 45.
33	NY	US DOT	Approximately 130 staffers have been trained from throughout the 11 Regions and the Main Office of NYSDOT.
34	NC	US DOT	2/10 (±)
35	ND	US DOT	There are less than 8 people trained that still work for ODOT.
38	OR	US DOT	150
39	PA	US DOT	Actual record during my tenure shows 120 trained, approximately another 100 minimum have been trained prior to that but the records are not available. I suspect many more than this have been trained through train the trainer.
42	SC	US DOT	60
43	SD	US DOT	20
45	TX	US DOT	Mark Marek, P.E. and Aurora (Rory) Meza, P.E.
48	VA	US DOT	2328 people have been trained; approximately 1500 are currently employed at VDOT.
49	WA	US DOT	350
50	WV	US DOT	Approximately 100.
61	ON	CDN DOT	350
64	SK	CDN DOT	Looking at introduction.
68	New York	US CITY	In addition to our Director, our VE unit currently has 5 technical VE staff managing or assisting in the management of VE studies. All of these individuals have or will receive VE training. We also train analysts within OMB and other City agencies, including the NYC DOT. Actual # not know.
69	Fed Lands	FHWA	18 staff.

PART 2 EDUCATION AND AWARENESS

Question 16 What percentage of your agency's technical and management staff does the number of VE trained staff identified in Question 15 represent?

>90%	**8%**
81 to 90%	**2%**
51 to 80%	**4%**
31 to 50%	**10%**
11 to 30%	**14%**
<10%	**45%**
N/A	**16%**

Ref.	Agency	Category	Comments
24	MN	US DOT	We do not have exact count.
30	NH	US DOT	All staff going through prior VE training consisted of technical staff.
36	OH	US DOT	Very few technical and management staff have been trained in Value Engineering. Some of those trained have either left the Department or are not participants in the VE process.
61	ON	CDN DOT	Includes Construction, Maintenance and Design Staff.
64	SK	CDN DOT	Looking at introduction.
68	New York	US CITY	Within the VE unit this number is > 90%. Considering all analysts within the agency, this number is lower, perhaps 10%.

PART 2 EDUCATION AND AWARENESS

Question 17 What percentage of your agency's VE trained staff identified in Question 15 is certified?

>90%	**0%**
81 to 90%	**0%**
51 to 80%	**0%**
31 to 50%	**4%**
11 to 30%	**2%**
≤10%	**59%**
N/A	**35%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	No one in ADOT, to my knowledge, is certified. Certified (CVS) consultants are used to facilitate the VE Study.
4	AR	US DOT	None of the staff is certified.
6	CO	US DOT	I know of no CDOT personnel that are certified. However, there could be some.
12	HI	US DOT	None.
17	KS	US DOT	None.
23	MI	US DOT	Zero.
29	NV	US DOT	We have no Certified staff.
30	NH	US DOT	NHDOT has one staff member who was trained in VE, but no certified.
31	NJ	US DOT	Approximately 5 individuals are AVS.
32	NM	US DOT	None.
33	NY	US DOT	NYSDOT has no staff certified by SAVE International.
34	NC	US DOT	None.
35	ND	US DOT	None.
42	SC	US DOT	None are certified.
44	TN	US DOT	No one in TDOT has been certified.
49	WA	US DOT	Currrently only 1 CVS working for WSDOT.
61	ON	CDN DOT	We have 1 CVS, 6 AVS.
64	SK	CDN DOT	Looking at introduction.

PART 2 EDUCATION AND AWARENESS

Question 18 To what level is agency staff being trained in VE?

	Always	Often	Rarely	Never
VE methodology overview	**24%**	**16%**	**39%**	**21%**
National Highway Insititute (32 hours)	**23%**	**26%**	**13%**	**38%**
SAVE approved MOD I (40 hours)	**19%**	**8%**	**22%**	**50%**
SAVE approved MOD II (24 hours)	**3%**	**6%**	**21%**	**71%**
Other (Please Specify)	**0%**	**11%**	**44%**	**44%**
Do not know	**8%**			

Ref.	Agency	Category	Comments
3	AZ	US DOT	The VE Manager and one of his staff have attended SAVE MOD I, and SAVE and AASHTO VE conferences.
5	CA	US DOT	We currently train, mainly in-house, the Caltrans VE methodology.
6	CO	US DOT	This is the only class that I know of that anyone at CDOT has taken.
10	FL	US DOT	Department currently offers SAVE approved MOD I, MOD II and occasionally FAST training through our VE consultants. Due to agency downsizing and the growing difficulty of getting employees away from their office for 40 hours at a time, strategic objective in place to re-evaluate the way training is delivered.
24	MN	US DOT	Selected team members (staff) is being briefed about VE methodology by VE facilitator (certified VE Consultant) during VE studies.
30	NH	US DOT	The Department generally relies on the NHI training for staff. The Department's VE Coordinator also attends AASHTO conferences.
32	NM	US DOT	Even though NHI courses are the only ones provided at the NMDOT, the NHI has provided 40 hours of training and certified by SAVE international as MOD I.
35	ND	US DOT	There is nothing defined.
48	VA	US DOT	VDOT's in-house training program is equivalent to the NHI course. In-house MOD I training is available upon request.
49	WA	US DOT	A MOD I class is offered every year and MOD II is offered every three years.
51	WI	US DOT	The only training staff receives is when they participate in a VE study as a team member.
61	ON	CDN DOT	Occasional training through conferences, also incorporating risk mangement into VE, project performance measurement and other techniques.
64	SK	CDN DOT	Looking at introduction.

PART 2 EDUCATION AND AWARENESS

Question 19 Who is being trained in VE?

	Always	Often	Rarely	Never
Senior management	**6%**	**25%**	**39%**	**31%**
Project management staff	**20%**	**56%**	**17%**	**7%**
Technical staff	**17%**	**63%**	**12%**	**7%**
Consultants	**3%**	**16%**	**38%**	**44%**
Other (Please Specify)	**10%**	**40%**	**10%**	**40%**
Do not know	**6%**			

Ref.	Agency	Category	Comments
3	AZ	US DOT	Currently only the VE staff are receiving training in VE.
5	CA	US DOT	Local agencies.
6	CO	US DOT	There is no formal VE training tracking.
10	FL	US DOT	Since VE program has been in place for over 20 years, most Senior management was trained earlier in their career. As mentioned in previous question, downsizing and increased responsibilities has made it difficult to get senior management to participate in current training program. Consultant training could increase as more outsourcing takes place.
18	KY	US DOT	Any Cabinet person who is interested in the value engineering process.
19	LA	US DOT	Other - FHWA employees.
23	MI	US DOT	We use 100% Consultant VE Team Members and Facilitators.
24	MN	US DOT	Selected team members (staff) is being briefed about VE methodology by VE facilitator (certified VE Consultant) during VE studies.
30	NH	US DOT	Past training within NHDOT has been prioritized to Project Management staff and technical staff. The Department does not coordinate Consultant training.
31	NJ	US DOT	Other- Agencies such as New Jersey Transit, New Jersey Turnpike, etc.
32	NM	US DOT	Senior management usually finds it hard to attend VE training, MOD I, because it takes too much time. Usually 5 full days (40 hours).
33	NY	US DOT	During past coursework we have provided executive staff with a 1-2 hour summary presentation on the benefits of VE.
34	NC	US DOT	VE Team Members only.
35	ND	US DOT	Nothing defined.
36	OH	US DOT	Our Value Engineer Consultant has several Certified Value Specialists and Certified Cost Engineers.
41	RI	US DOT	None.
51	WI	US DOT	Technical staff who participate in a VE study as a team member receive minimal instruction at the beginning of the study. No formal VE training is offered.
61	ON	CDN DOT	Consultants take external courses. Other includes municipal officials, and a few staff from non-technical offices. Senior staff cannot afford the time for a 5 day course.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	Not aware that any city staff are being trained in VE. Although, a number of staff are familiar with the process.
69	Fed Lands	FHWA	2 senior management, 11 project management, and 5 technical staff are trained.

PART 2 EDUCATION AND AWARENESS

Question 20 To what level is agency staff being trained in VE?

	Always	Often	Rarely	Never
VE Program Manager	**6%**	**16%**	**32%**	**45%**
In-house project management staff	**3%**	**7%**	**17%**	**73%**
In-house technical staff	**3%**	**7%**	**13%**	**77%**
Consultants	**54%**	**15%**	**13%**	**18%**
Other (Please Specify)	**46%**	**23%**	**8%**	**23%**
Do not know	**6%**			

Ref.	Agency	Category	Comments
3	AZ	US DOT	Currently it is only done by a consultant but this rarely takes place.
4	AR	US DOT	NHI Course instructor, VE Coordinator will instruct the study leader on how to facilitate the course.
10	FL	US DOT	For the past 8 years the Department has been using VE Consultants for VE training. On occasion in-house staff will provide refreshers.
17	KS	US DOT	Other - NHI Course.
23	MI	US DOT	N/A
24	MN	US DOT	No training program at this time.
30	NH	US DOT	In-house project management staff has been the greatest asset in training and making staff aware of the VE process. In addition, NHDOT encourages unbiased technical staff to participate in the VE study with the VE team to learn the process and gain an understanding as to the VE process.
31	NJ	US DOT	Other-National Highway Institute.
32	NM	US DOT	NHI.
38	OR	US DOT	NHI VE Course.
41	RI	US DOT	No training.
44	TN	US DOT	NHI courses. We are contemplating doing future training with in-house personnel.
46	UT	US DOT	NHI.
47	VT	US DOT	FHWA VE courses.
48	VA	US DOT	VE program staff conduct training. One member has an approved MOD I workshop.
49	WA	US DOT	VE Program Manager and technical staff provide supplemental information on agency specific requirements and documentation.
51	WI	US DOT	No formal training for VE in the department at this time.
61	ON	CDN DOT	Our agency is outsourced so we use consultants where possible. Consultants provide us with Mod I training. The problem is the course material is often dated and not agency specific. We sometimes augment material with agency specific examples.
64	SK	CDN DOT	Looking at introduction.
68	New York	US CITY	Do you mean formal training or informal, on-the-job training? (I answered this with respect to formal VE training.)
69	Fed Lands	FHWA	National Highway Institute (NHI), Value Engineering for Highways.

PART 2 EDUCATION AND AWARENESS

Question 21 What is the annual budget allocated to training agency staff in VE?

>$100,000	**2%**
$75,000 to $100,000	**4%**
$50,000 to $74,000	**4%**
$25,000 to $49,000	**6%**
<$25,000	**41%**
Do not know	**16%**
N/A	**27%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	VE Section has money in their budget for training; however the Section has other duties and therefore not all of it is used for VE training.
4	AR	US DOT	There is not an annual budget.
6	CO	US DOT	Not sure there is a specific amount of training funding directed to VE.
23	MI	US DOT	N/A
33	NY	US DOT	NYSDOT spends an average of $500,000 per year on consultant-run VE studies.
34	NC	US DOT	Not aware of any specific VE training budget.
35	ND	US DOT	Not specifically set aside.
44	TN	US DOT	No money is allocated. We request training on an as-needed basis and have not been denied in the past.
45	TX	US DOT	Part of the overall VE facilitator contract and VE studies conducted.
51	WI	US DOT	No formal training for VE in the department at this time.
61	ON	CDN DOT	Don't have a dedicated budget for training but do have about 2 Module I a year.
64	SK	CDN DOT	Looking at introduction
68	New York	US CITY	Not set annually. Allocate when it is determined to be necessary.
69	Fed Lands	FHWA	The budget is based on the need for training. Training is available to management and technical staff and can fluctuate.

PART 2 EDUCATION AND AWARENESS

Question 22 How would you describe the level of Senior Management support VE within your agency?

Very supportive	**14%**
Supportive	**70%**
Indifferent	**10%**
Not Supportive	**2%**
Do not know	**0%**
N/A	**4%**

Ref.	Agency	Category	Comments
2	AK	US DOT	They know the policy is there, but usually say the project will not benefit from VE.
3	AZ	US DOT	Management generally supports recommendations that don't effect schedule. They are indifferent to promoting its use.
7	CT	US DOT	As an agency, we have not found this process to be particularly valuable. We tend to believe that our projects receive a great deal of technical and cost reduction scrutiny as a result of standard agency review and oversite.
17	KS	US DOT	Senior Management is supportive of the VE process developed by KDOT.
30	NH	US DOT	If not mandated through federal criteria, the number of VE studies would be limited, based upon current Department policies.
34	NC	US DOT	VE is a management tool and the success of an effective VE program is dependant upon management support.
39	PA	US DOT	The Deputy Secretary for Highway Administration strongly supports the VE program. He will normally attend 1st day at VE courses to stress the importance of this program.
43	SD	US DOT	Supportive if we have projects near the $25M threshold. The SDDOT Scope process is similar to the VE process in many aspects, therefore, we perform a formalized scope of the project for most projects.
64	SK	CDN DOT	Looking at introduction.

PART 2 EDUCATION AND AWARENESS

Question 23 How would you describe senior management's familiarity with the VE program within your agency?

Excellent	**12%**
Good	**50%**
Fair	**32%**
Poor	**2%**
Do not know	**0%**
N/A	**4%**

Ref.	Agency	Category	Comments
30	NH	US DOT	Based upon the successful completion of VE studies for the three large NHDOT projects and the presentation to the Senior Management, they are aware of the importance of the VE review. The Senior Management has concluded that valuable project cost savings have resulted by the independent technical review. It is anticipated the Senior Staff will continue to support the future role VE studies through Project Development process.
34	NC	US DOT	Senior management are kept informed of recommendations from the VE Program; however, interest, attention and positive or negative feedback is seldom heard.
61	ON	CDN DOT	Senior Technical Management is familiar, other branches are not.
64	SK	CDN DOT	Looking at introduction.

PART 3 APPLICATION

Question 24 Does your agency utilize the SAVE International Value Methodology Standard (October 1998) as the basis for the VE Job Plan?

Yes	**54%**
Similar, but modified	**18%**
No	**16%**
Do not know	**8%**
N/A	**4%**

Ref.	Agency	Category	Comments
2	AK	US DOT	We have nine steps, they also cover Selection, Implementation and Program Review.
3	AZ	US DOT	The team does not spend a lot of time developing life cycle costs.
5	CA	US DOT	We have added an extra phase "Critique Alternatives" between "Development" and "Presentation".
11	GA	US DOT	SAVE methods are utilized, but the scope of some VE studies is limited, thereby limiting the applicable areas of the SAVE method.
26	MO	US DOT	Working towards including Project Performance Measures into our VE studies.
30	NH	US DOT	The general basis of the VE process that NHDOT has undertaken has followed this methodology.
44	TN	US DOT	As taught in the NHI course.
49	WA	US DOT	Our Phases are: Selection, Investigation, Speculation, Evaluation, Development, Presentation, Implementation, and Audit.
61	ON	CDN DOT	We also add another phase after we develop the ideas, we develop scenarios or alternative sets. These scenarios consist of a complete set of design alternatives that can be compared in their entirety to the proposed design.
64	SK	CDN DOT	Looking at introduction.
69	Fed Lands	FHWA	CFLHD uses the following job plan - Selection, investigation, speculation, evaluation, development, presentation, implementation, audit.

PART 3 APPLICATION

Question 25 In your opinion, does VE contribute to innovation within your agency?

Always	**10%**
Often	**51%**
Rarely	**35%**
Never	**4%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	It often contributes to lower life cycle costs but rarely to new/innovative ideas.
5	CA	US DOT	Even though VE is a great problem solver - it is not really being utilized, today, as a tool of innovation.
6	CO	US DOT	Seems to always result in at least a few recommendations that end up getting implemented.
23	MI	US DOT	But broadens thinking.
30	NH	US DOT	Innovations of construction techniques are rarely the conclusion of the VE studies. Most recommended actions remain within current construction practices. However, the most recent VE study has recommended a innovative approach for bridge construction which will be assessed by the structural design team.
31	NJ	US DOT	It helps create an innovative environment that considers more ideas besides the old and familiar.
33	NY	US DOT	Many of the recommendations that are implemented are the result of an innovative alternative.
34	NC	US DOT	VE recommendations are often innovative but little documentation exist as to the acceptance of offered innovation by Management.
36	OH	US DOT	Value Engineering at the detailed design stage paved the path to a two step VE Process: VE during the Preliminary Engineering Stage and at Detailed Design. It has helped to trouble shoot areas before detailed design, add more value and save dollars.
61	ON	CDN DOT	Value Engineering is a vehicle to welcome new ideas and innovations.
64	SK	CDN DOT	Looking at introduction.
69	Fed Lands	FHWA	The VE program currently focuses on cost-effective project-specific improvements. Many of our projects are similar in scope. We rountinely get several of the same core recommendations on each VE study conducted. Slight adjustments in the direction of the program may be beneficial to add to the value added procedures currently in place. Additional focus may be placed on design and construction procedures/techniques.

PART 3 APPLICATION

Question 26 Which VE and related tools are typically utilized during a VE study for your agency?

	Always	Often	Rarely	Never
Cost model	**67%**	**24%**	**10%**	**0%**
Space model	**6%**	**11%**	**37%**	**46%**
Traffic and/or safety model	**13%**	**37%**	**37%**	**13%**
Quality model	**14%**	**14%**	**42%**	**31%**
Risk model	**3%**	**25%**	**48%**	**25%**
Business process model	**3%**	**14%**	**39%**	**44%**
Cause and effect analysis	**8%**	**26%**	**32%**	**34%**
FAST diagram	**25%**	**39%**	**20%**	**16%**
Evaluation matrix	**36%**	**48%**	**14%**	**2%**
Criteria matrix	**18%**	**38%**	**33%**	**10%**
Performance measures	**24%**	**32%**	**32%**	**11%**
Other (Please Specify)	**0%**	**0%**	**20%**	**80%**
Do not know	**10%**			

Ref.	Agency	Category	Comments
18	KY	US DOT	The project cost estimate showing high dollar items is used extensively for the VE study.
30	NH	US DOT	The basis of the three VE studies completed by NHDOT has utilized the typical cost model approach. Other considerations were given for performance and risk models.
32	NM	US DOT	At the NMDOT we perform a qualitative survey at the end of every VE study. We try to measure the improvement, as the result of the VE study, of the following qualitative elements: a) Safety Improvement, b) Minimization of Public Inconvenience, c) Minimization of ROW and or Environmental Impacts, d) Constructibility Improvement, and e) Operational Performance Improvements.
35	ND	US DOT	There has only been one completed to date.
39	PA	US DOT	We use the methodology taught through the NHI VE course.
61	ON	CDN DOT	Where possible, we will use explicit highway safety techniques to estimate impacts of VE alternatives. This typically involves using CMF to model collisions. The problem is that the science is never complete.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	To date VE exercises have used the FAST diagram as the basis of analysis.
69	Fed Lands	FHWA	Feasibility and suitability evaluations are also used. The feasibility evaluation deletes those alternatives that the team believes are unrealistic and, therefore, unacceptable. The suitability evaluation lists the advantages and disadvantages and rates them from poor to outstanding. The rating is used to guide the team during the Development Phase ensuring the best ideas are developed first.

PART 3 APPLICATION

Question 27 How is project performance/quality established and/or measured?

	Always	Often	Rarely	Never
Quantitatively	**22%**	**59%**	**14%**	**5%**
Qualitatively	**22%**	**58%**	**14%**	**6%**
Other (Please Specify)	**100%**	**0%**	**0%**	**0%**
Do not know	**14%**			

Ref.	Agency	Category	Comments
3	AZ	US DOT	I'm not sure what this question is referring to.
5	CA	US DOT	Quantitatively when possible.
13	ID	US DOT	Number of change orders, addendums, cost, and by construction review teams.
30	NH	US DOT	Most of the evaluations were based upon subjective quantitative and qualitative approaches. The evaluation approach was left to the certified VE specialist and the VE team.
33	NY	US DOT	NYSDOT is in the process of developing a new set of performance measures. The aim is to track both qualitative and quantitative meaures.
37	OK	US DOT	I have no idea what you are asking here.
43	SD	US DOT	Quantitatively based on addendums prior to letting or Construction Change Orders post-letting. Qualitatively based on Partnership for Highway Quality awards.
61	ON	CDN DOT	Use Caltrans Performance Measures.
64	SK	CDN DOT	Looking at introduction of Value Engineering. Presently budget planning drives the work down in the field.

PART 3 APPLICATION

Question 28 To what level does your agency develop the shortlisted ideas within the time allotted for the workshop?

	Always	Often	Rarely	Never
Hand drawn/photocopy sketches	**37%**	**57%**	**4%**	**2%**
CADD drawings	**5%**	**35%**	**44%**	**16%**
Manual calculations	**27%**	**66%**	**5%**	**2%**
Spreadsheet calculations	**9%**	**59%**	**27%**	**5%**
Computer modeling and simulation	**0%**	**24%**	**40%**	**36%**
Other (Please Specify)	**0%**	**0%**	**0%**	**0%**
Do not know	**4%**			

Ref.	Agency	Category	Comments
5	CA	US DOT	We occasionally use VISSIM traffic modelling integrally with our VE studies.
23	MI	US DOT	The VE Study Team. We use 5 day VE studies.
30	NH	US DOT	On the most recent VE studies, the Department required the project consultant to supply CADD technician to assist the VE Team. The VE Team also has the use of PC units and technical software as determined needed.
56	NB	CDN DOT	We do not have workshops.
61	ON	CDN DOT	We normally have a work station at each workshop.
64	SK	CDN DOT	Looking at introduction.

PART 3 APPLICATION

Question 29 To what level does your agency calculate/determine the following project costs within the time allotted for the workshop?

	Always	Often	Rarely	Never
Life cycle costs	**17%**	**48%**	**33%**	**2%**
Collision/crash costs/societal benefits	**0%**	**20%**	**55%**	**25%**
Travel delay costs	**0%**	**30%**	**50%**	**20%**
Recurring costs	**9%**	**48%**	**39%**	**5%**
Other (Please Specify)	**4%**	**0%**	**0%**	**0%**
Do not know	**4%**			

Ref.	Agency	Category	Comments
3	AZ	US DOT	The team does not spend much time on calculating life cycle cost. An estimate on construction savings is developed and a comment on how this idea will effect future savings or costs.
5	CA	US DOT	Since the use of project performance measurements our VE program has spent a lot less time doing Benefit/Cost Analysis.
10	FL	US DOT	Although the travel delay is marked rarely, this is happening more and more.
29	NV	US DOT	Other - Construction cost savings.
30	NH	US DOT	Most assessments for life cycle costs are limited during the intensive one-week VE study. The importance and timing of this type of evaluation is left to the certified VE specialist to determine application in the VE study.
33	NY	US DOT	"Other costs": Construction of select project elements. All costs, other than Construction and life cycle costs are generally the only costs analyzed during the VE workshop. Other costs are determined independent of the workshop.
56	NB	CDN DOT	We do not have workshops.
64	SK	CDN DOT	Looking at introduction.
69	Fed Lands	FHWA	Travel delays and collision/crash/societal benefits are normally investigated during the shortlisting of alternates, costs may or may not be computed.

PART 3 APPLICATION

Question 30 How are the shortlisted ideas selected for development during the workshop?

	Always	Often	Rarely	Never
Gut feel	**8%**	**45%**	**30%**	**18%**
Paired comparison	**8%**	**56%**	**23%**	**13%**
Quality/performance criteria	**16%**	**61%**	**20%**	**2%**
Evaluation matrix	**20%**	**67%**	**9%**	**4%**
Salability of the idea to Senior Mgmt.	**5%**	**40%**	**35%**	**20%**
Champion emerges	**3%**	**41%**	**43%**	**14%**
Group consensus through discussion	**33%**	**67%**	**0%**	**0%**
Other (Please Specify)	**0%**	**0%**	**0%**	**0%**
Do not know	**2%**			

Ref.	Agency	Category	Comments
2	AK	US DOT	VE usually done by consultants.
5	CA	US DOT	Caltrans uses a paired down version of the performance measurements criteria to evaluate.
30	NH	US DOT	The VE team is directed to review all options for cost savings and enhancements (with cost increases). The team determines the practicality of each option in their evaluations and recommendations.
56	NB	CDN DOT	We do not have workshops.
61	ON	CDN DOT	Sometimes we screen the ideas by voting with dots, with each team member having about the same number of dots as the number of ideas we have time to develop. Sometimes we quickly screen ideas through gut feel to reduce the list to a manageble size. Then we use the top 4 or 5 performance criteria and quickly compare the remaining ideas against the criteria. We use a -2,-1,0,1,2 with 0 representing equivalent to proposed design.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	Typically, focus is on issues/items that have the potential to provide the same function/outcome at a lower life cycle cost.
69	Fed Lands	FHWA	See comment for item 26 for additional information. Shortlisted ideas are also selected using a method of graphically weighting alternates. Ideas are rated based on appropriate criteria or objectives. The criteria is arrived at by determining "what will affect the idea if implemented?". The objectives are determined by asking "what are the end results we would like to achieve?". A numerical rating is computed, the alternatives are ranked, and the best alternates are selected for development.

PART 3 APPLICATION

Question 31 Does your agency typically address these issues during the workshop?

	Always	Often	Rarely	Never
Road safety	40%	47%	13%	0%
Constructability	44%	56%	0%	0%
Traffic staging	28%	60%	13%	0%
Environmental impacts	38%	53%	6%	2%
Stakeholder expectations/issues	25%	60%	15%	0%
Driver expectations/human factors	17%	58%	17%	8%
Aesthetics	13%	60%	26%	2%
Schedule impacts	23%	60%	17%	0%
Flexibility for the future	17%	68%	11%	4%
Project costs	69%	31%	0%	0%
User costs/benefits	18%	33%	44%	4%
Other (Please Specify)	0%	0%	0%	0%
Do not know	0%	0%	0%	0%

Ref.	Agency	Category	Comments
3	AZ	US DOT	They are generally addressed through an evalution matrix. These criteria are also weighed when the team details the advantages/disadvantages of the recommendation.
5	CA	US DOT	Caltrans uses a paired down version of the performance measurements criteria to evaluate.
11	GA	US DOT	User costs/benefits are discussed but may not always be quantified.
17	KS	US DOT	If we have reached agreement on actions/alignments/other issues in the public involvement activities and/or environmental studies, we do not change those with VE.
30	NH	US DOT	The Department evaluates the recommendations from the VE team based upon meeting the design standards for the project, cost enhancements, community and environmental commitments, and general project design expectations.
31	NJ	US DOT	Our user costs are determined through use of our Road User Cost Manual.
36	OH	US DOT	These items are a part of every VE project. Their effects are evaluated during each VE Session and how they directly or indirectly aid in the development of the project.
48	VA	US DOT	These factors are part of the evaluation process and are addressed in the recommendation development.
56	NB	CDN DOT	We do not have workshops.
61	ON	CDN DOT	Where possible we calculate collision costs. We don't typically use the delay or travel costs, but we will use some element of travel or delay in our performance criteria.
64	SK	CDN DOT	Looking at introduction.

PART 3 APPLICATION

Question 32 Does your agency use VE to develop or update technical standards, specifications, and/or guidelines?

Always	**2%**
Often	**22%**
Rarely	**44%**
Never	**32%**

Ref.	Agency	Category	Comments
10	FL	US DOT	A District VE recommendation that affects a standard or specification gets forwarded to the Central Office responsible for that standard or specification. VE has been used to assist in the development of guidelines and manuals.
18	KY	US DOT	Construction VE procedures may have more impact on standard drawings.
30	NH	US DOT	The Department has not used the results of VE studies for updates of technical standards or specifications. The results of VE studies have been useful to provide guidelines for the preliminary engineering evaluations that are forthcoming to define alternative approaches and solutions for project needs.
34	NC	US DOT	VE development of the Specifications and Standard Drawings are available; however, the Department has previously elected not to use this method.
36	OH	US DOT	Various VE Alternatives/items have caused us to go back and review some of our design standards and construction methods. Some alternatives forced us to do more research for better results with less costs. Although we are just beginning to address this opportunity, we realize it will take time to implement an effective practice that is routine.
39	PA	US DOT	Yes, when a successful idea emerges through the VE process it works its way into a spec change or update or even a new spec as required.
43	SD	US DOT	This is done indirectly through our SCOPE process.
64	SK	CDN DOT	Not Necessarily Value Engineering but Life Cycle Costing is/was used in our Standards and Policy development.
69	Fed Lands	FHWA	CFLHD has a Technology Development Team that identifies and promotes new, underused, and emerging technologies to help us in our business of building roads and bridges. The goal is to use these technologies to make our jobs easier, better, faster, or more cost-effective.

PART 3 APPLICATION

Question 33 Does your agency use VE on routine or less complex projects (such as rehabilitation and/or intersection improvement projects)?

Always	**4%**
Often	**12%**
Rarely	**45%**
Never	**39%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	I don't recall any in the last 4 years.
10	FL	US DOT	These types of projects are used during the training workshops.
18	KY	US DOT	We use VE on large scale roadway rehabilitation jobs with the FHWA requirement.
23	MI	US DOT	I'd like to, but no/little support so far.
24	MN	US DOT	If the project meets FHWA VE requirements.
30	NH	US DOT	No formal process is utilized. Ongoing value added, engineering evaluations continue throughout the Department's design process which mirrors the VE process, but through an informal review process by technical staff.
31	NJ	US DOT	VE is rarely used when the project cost is less than $2 million.
36	OH	US DOT	A Value Engineering Session can be utilized on any project upon request. However, the primary driving factor to selecting a project to be VE'd is the $20 million and higher threshold.
39	PA	US DOT	It is up to each district coordinator to work with Sr. Mgr. to determine if a VE may be beneficial regardless of the cost of project.
43	SD	US DOT	SDDOT Scope process.
56	NB	CDN DOT	It is available for every contract but rarely used.
61	ON	CDN DOT	We use VE on small routine projects when we are not sure the project has the right scope, or we are unsure of the design and we want to validate the design.
64	SK	CDN DOT	Looking at introduction.
68	New York	US CITY	If they meet other criteria such as our cost threshold.
69	Fed Lands	FHWA	VE is primarily scheduled for reconstruction projects over $1 million.

PART 3 APPLICATION

Question 34 Does your agency have specific documentation formats for VE project reports?

Yes	**40%**
No	**52%**
Do not know	**2%**
N/A	**6%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	1. Information: design presentation, documents used, field trip (if applicable), cost model, element/function/cost/complexity model, FAST diagram (optional), elements selected for analysis. 2. Function Analysis: identify functions/costs of selected elements, identify opportunities for value enhancement. 3. Creativity: generate ideas, narrowing (first cut). 4. Evaluation: grouping, matrix analysis, advantages/disadvantages. 5. Developed Recommendations (description, function, feasibility, life cycle cost, dwgs, calcs.).
4	AR	US DOT	We use VE Workbook, Publication No. FHWA-HI-88-051
5	CA	US DOT	See: www.dot.ca.gov/hq/oppd/value
10	FL	US DOT	The study summary report shall be organized in sections by areas of focus consistent with the value engineering job plan. The format of any report should contain, as a minimum, the following: • Executive Summary • Participant List • Research Sources • Project History (including project criteria, commitments, and constraints) • Potential Study Areas • Existing Design • Performance Criteria • Basic Functions • Life Cycle Cost Estimate • VE Alternative Description • VE Alternative Cost Calculations • Evaluation by Comparison • Proposed Design • Detail Findings or Analysis • Specific recommendations & costs • Design observations • Implementation Plan
11	GA	US DOT	Individual Consulting firms establish the format.
16	IA	US DOT	FHWA VE Workshop
23	MI	US DOT	We use 5 pre-qualified firms to conduct our VE studies.
24	MN	US DOT	Consultant facilitator expected to submit to us a draft report for review and a final report for our records.
26	MO	US DOT	Working towards including a table of contents. Basically, we follow FHWA, NHI Standard forms.
30	NH	US DOT	The Department has given great latitude to the VE team to define how the final report will be formatted and how to document the conclusions of the VE study.
31	NJ	US DOT	We have a fairly standard format and style, but it is tailored to the specific project.
32	NM	US DOT	Is typically left up to the NMDOT VE Consultant to develop a VE report format. However, we try to standardize as much as possible different consultant report styles.
33	NY	US DOT	NYSDOT relies on the VE consulting firm to provide reports in their own format, pending NYSDOT approval. We look for formats that are generally consistent with our/AASHTO's VE process. The report should track the team's deliberations and considerations throughout the entire VE process and should contain sufficient detail, including sketches, calculations, analysis, and rationale to allow for prudent assessment of recommendations.
36	OH	US DOT	We use the format established by our VE Consultant.
38	OR	US DOT	VE Coordinator.
39	PA	US DOT	Same format established in NHI VE course.
42	SC	US DOT	The reports are prepared by the team leaders whether they be in-house or consultant and we do not require a specific format.
43	SD	US DOT	We have specific Scope documents, which are attached. N/A for VE project reports.
45	TX	US DOT	A. Investigation Phase – Background information, function analysis, team focus. B. Speculation Phase – Creative, brainstorming, alternative proposals. C. Evaluation Phase – analysis of alternatives, life cycle costs. D. Development Phase – develop technical and economic supporting data. E. Presentation Phase – present recommendations and team findings.
48	VA	US DOT	VDOT's VE reports are produced as a report from a Microsoft Access database. Data are entered by the Regional VE Manager; the report is automatically produced in standard format.
49	WA	US DOT	A MS excell workbook that is the report template. It can be found on the AASHTO VE Web site at www.wsdot.wa.gov/eesc/design/aashtove/toolbox
50	WV	US DOT	Project description, VE issues considered, calculations, summary, recommendations.

PART 3 APPLICATION

Question 34 Does your agency have specific documentation formats for VE project reports?

Ref.	Agency	Category	Comments
56	NB	CDN DOT	We have a minimum amount of information required that is identified in the item.
61	ON	CDN DOT	Executive Summary - Provides an overview of the project, the VE alternatives, scenarios and implementation decisions, and the VE Study Summary Report. Implementation Action - The Implementation Action section documents the dispositions of each alternative in the final report. The final status or changes made to alternatives or scenarios subsequent to the workshop shall be documented in the implementation action section. VE Scenarios - VE Scenarios documents the individual scenarios. The scenarios consist of mutually exclusive alternatives that are grouped together into a comprehensive scenario that can be compared to the original design. Measurement of the performance of the scenarios will also be documented. VE Proposals - Documents the VE Proposals and Design Suggestions. Project Analysis - Documents the results from the application of the VE tools used during the study and summarizes the key findings that guided the VE team's work. Includes the FAST diagram, cost and other models, performance measurements (including definitions) and weighting of the performance measurements. When a Highway Safety and Value Review analysis is undertaken before the workshop, the results of the analysis will be included in this section. Project Description - Describes the project and the proposed design. Includes observations made during the site visit. Includes a list of documents provided to the VE team. Idea Evaluation - Lists all of the creative ideas and the idea evaluation (screening). Includes a discussion of any assumptions involved in the idea evaluation such as life span or condition of project elements etc. Value Engineering Process - Summarizes the study job plan, the agenda, and workshop participants. Describes the pre-event preparation including a table of project issues and workshop team skill sets. This is intended to document the issues we expected at the pre-event and the team we built to meet these issues.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	Rely on format developed by consultant.
69	Fed Lands	FHWA	1. Identification of the project; 2. A brief summary of the problem; 3. An explanation of why this project was selected for study; 4. A functional evaluation of the process or procedure under study; 5. All information gathered by the group relative to the item under study; 6. A complete list of all the alternates considered; 7. An explanation of all logical alternates investigated, with reasons why they were not developed further; 8. Technical data supporting the idea(s) selected, with other factual information to assure selection of the most favorable alternate(s); 9. Original costs, cost of implementing the alternates being proposed, and cost data supporting all savings being claimed; 10. Acknowledgment of contributions made by others to the study; 11. Steps to be taken and the timetable for implementing the alternate(s) being proposed; 12. Before-and-after sketches of the items under study.

PART 4 IMPLEMENTATION

Question 35 Does your agency have a defined procedure to review and assess submitted VE ideas?

Yes	**56%**
No	**40%**
Do not know	**0%**
N/A	**4%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	After the recommendations are submitted, the ideas are reviewed and commented on by the designer. These are returned to the VE Section. If the VE team does not concur with the designer's response, it is escalated.
4	AR	US DOT	VE team submits recommendations to upper management for concurrence on recommended items.
5	CA	US DOT	See our VA team guide for our implementation procedures at "www.dot.ca.gov/hq/oppd/va"
7	CT	US DOT	(1) VE ideas are submitted to various technical units throughout agency for review and comment. (2) A meeting is held to review all comments and determine whether the ideas should be recommended for implementation. (3) Ideas and recommended actions are presented to upper management for approval. (4) Final summary report prepared and provided to FHWA.
10	FL	US DOT	The implementation plan, included in the study summary report, should identify the person who will be responsible for the implementation of the changes that have been approved by management. In addition, the plan should address the impact on funds, letting date, manpower requirements, consultant resources, design and construction schedules, and any other impact resulting from team recommendations.
11	GA	US DOT	An informal Inplementation Committee is established between the State Project Review Engineer and the Design Project Manager. Documentation and consensus is required for implementation.
16	IA	US DOT	Project Manager is to report to VE Coordinator on status of VE Team recommendations.
17	KS	US DOT	Generally, the recommendations are reviewed by Road & Bridge Managers and those having added value are approved.
18	KY	US DOT	VE ideas are usually considered on projects under construction through the Division of Construction.
23	MI	US DOT	I run the Decision meeting immediately following the VE recommendations with those MDOT staff present, w/VE Team and design consultants with us. We decide one of 3 outcomes: • Accept for implementation into Design. • Accept for further study (what is missing, and study by whom). • Reject and list 2-3 specific reasons.
24	MN	US DOT	Project team members (decision makers) review all VE ideas and decide which idea is accepted for further study or rejected.
26	MO	US DOT	After presentation of VE recommendations, VE team leader and Project Manager/Project core team decide on timeframe, when they will respond to VE recommendations.
30	NH	US DOT	The Department does not have a defined process, but has generated an informal process with the VE studies completed to date. Once the VE team's recommendations are completed, the in-house technical team evaluates the recommendations and provides an in-house recommendation to support the implementation of the VE ideas and reasons why certain components cannot be implemented. This assessment is reviewed through senior staff at NHDOT and with FHWA. All recommended actions are carried forward into further studies and implementation. Internal reports are written to document Departmentís action and provided to FHWA.
31	NJ	US DOT	VE submits comments to our Planning and Development group. It is evaluated and comments are provided back. Those comments are addressed and a revised plan submitted. Differences are worked out if possible, and if the scheme is acceptable, it becomes the preferred alternative.
33	NY	US DOT	Please see attached document: APPENDIX N - Value Engineering in Design, section 7.3.
34	NC	US DOT	The established procedure is not followed but an alternate method is used with no accountability.

PART 4 IMPLEMENTATION

Question 35 Does your agency have a defined procedure to review and assess submitted VE ideas?

Ref.	Agency	Category	Comments
36	OH	US DOT	After the final VE Report is received, a VE Review Meeting is scheduled. At this meeting, the VE Alternatives are discussed and the decisions are made to accept or reject the VE Alternatives. All rejections must have a sound basis for not being accepted.
38	OR	US DOT	Project Development Team by consensus decides the disposition of the recommendations.
39	PA	US DOT	Design VEs are evaluated by headquarters Highway Geometrics Group. Construction VEs are submitted to the Chief Engineers Office and routed to the appropriate groups for review and comment with final decision being that of the Chief Engineer.
41	RI	US DOT	Reviewed in-house with staff. Then approved by consensus.
42	SC	US DOT	We have a Value Engineering Study Approval Committee that reviews and approves the recommendations in the VE study reports. The Committee is comprised of various department and section heads within the SCDOT.
43	SD	US DOT	Yes for Scope. N/A for VE process.
44	TN	US DOT	Under development.
45	TX	US DOT	District personnel initiate VE ideas based on feasibility & district evaluation.
48	VA	US DOT	Recommendations are sent, in the VE report, to identified managers of disciplines which will be impacted by the recommendation. They respond to the Regional VE Manager. Their responses are compiled into a format and sent to the department's Chief Engineer for Program Development, who has the final approval authority. Appeals afterwards are sent to him with justification for the appeal.
49	WA	US DOT	The project manager must respond to each of the recommendations in the VE decision document.
51	WI	US DOT	Each study includes a presentation to senior management at the end of the study. A decision on recommendations is made by the Project Development Chief responsible for the project within 30 days.
61	ON	CDN DOT	An implementation meeting is held with local management. The procedures are not formalized, but they should be. This is a weakness in our program.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	Process under development.
68	New York	US CITY	Generally, each idea is read by two VE staff for the following: Is the idea clearly stated? Is it a good idea? Does the costing make sense? Is it sensitively written so as not to offend the designer? Is it politically sensitive?, etc.
69	Fed Lands	FHWA	The CFLHD Project Manager and Design Consultant assigned to the project evaluates the submitted VE ideas and determines the applicability for implementation. Formal value engineering change proposals (VECP) are submitted for review by a multi-discipline group to determine acceptance or rejection of the proposal.

PART 4 IMPLEMENTATION

Question 36 Does your agency monitor the implementation of accepted VE ideas?

Yes	**66%**
No	**26%**
Do not know	**4%**
N/A	**4%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	It is assumed that if the designer accepts the recommendation that it is implemented. Also the VE Section follows up with the Project Manager in order to get a better estimate of the cost savings for the recommendations implemented.
5	CA	US DOT	No - we have enough work getting our implementation results.
6	CO	US DOT	To report to FHWA on an annual basis.
7	CT	US DOT	Only to the extent that the ideas usually require changes to the contract drawings and the technical details are developed and reviewed subsequent to the VE process.
10	FL	US DOT	The DVE shall have the responsibility to monitor and report on all projects in the implementation process. The DVE must be aware of the progress of time critical implementations and report to management as problems arise or delays occur. The DVE's responsibility for implementation monitoring shall end upon receipt of implementation concurrence from the Project Manager. The Project Manager will be responsible for modification of the project reports, plans, and documentation. Final project savings or cost avoidance shall be calculated based on actual team recommendations or modified recommendations approved by management.
16	IA	US DOT	Project Manager is to report to VE Coordinator on status of VE Team recommendations.
17	KS	US DOT	Not formally.
18	KY	US DOT	Any recommended VE alternates are carried through by the project team and the resident engineer.
23	MI	US DOT	We should - but VE is only 1 of my hats/jobs.
24	MN	US DOT	Project teams will submit their decisions of all VE ideas to VE Coordinator for yearly reporting to FHWA.
26	MO	US DOT	We monitor implementation to fulfill FHWA reporting requirements.
30	NH	US DOT	Monitoring of the VE implemented ideas are the responsibility of the Project Manager.
31	NJ	US DOT	We always require a decision to be made. Since we stay involved in the pipeline process, we are aware of any changes incorporated.
32	NM	US DOT	Theoretically yes. However, we need to improve the process to document such recommendations implemented.
33	NY	US DOT	We ask the Regional Offices to report to the Main Office Design Quality Assurance Bureau the disposition/implementation of each alternative.
34	NC	US DOT	The VE Group maintains a data base containing proposed recommendations, cost reduction and other data to report to the FHWA. (only)
36	OH	US DOT	At the VE Review Meeting, the Design Consultant is present and they indicate whether it will or will not be a problem to incorporate the VE Alternatives into the Design. However, we do not monitor the modification costs (if any) of the design consultant to incorporate the VE alternatives into the design plan or check with construction to see how the VE alternatives helped/hurt the project.
38	OR	US DOT	VE Coordinator checks with Project Development Team.
43	SD	US DOT	Yes, for Scope. N/A for VE process.
48	VA	US DOT	Project Managers/designers are sent the notice of the Chief Engineer for Program Development's approval. They are required to initial each approval, indicating that that item has been incorporated into the project plans. These initials are returned to the VE program for inclusion in the study file.
50	WV	US DOT	Project managers are responsible for implementing VE proposals.
51	WI	US DOT	Accepted recommendations are reported in an annual report. There is no process for assuring that an accepted recommendation is actually implemented.
52	WY	US DOT	Yes to a certain extent.
61	ON	CDN DOT	The VE coordinators are supposed to track results, but this is not always done.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	Done on a project specific basis, typically through the design review phase.
68	New York	US CITY	We write a Summary of Results report following the implementation meeting that tallies the Accepted, Partially Accepted, Rejected, Further Study and Open recommendations.
69	Fed Lands	FHWA	Incorporation of accepted project-specific VE study ideas are monitored by the Project Manager. Monitoring the implementation of VE ideas on a global basis does not have a formal process, but are incorporated into projects with suitable requirements.

PART 5 MONITORING

Question 37 Does your agency monitor VE program performance?

Yes	**62%**
No	**36%**
Do not know	**0%**
N/A	**2%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	This is reported once per year; It is the same report required by the FHWA.
4	AR	US DOT	We develop a benefit/cost ratio.
6	CO	US DOT	To report to FHWA on an annual basis.
10	FL	US DOT	The Central Office in coordination with the Districts will provide a quarterly report to management detailing the progress made during the current fiscal year. The Central Office will also compile and submit to management an annual report reflecting the program accomplishments for the fiscal year.
23	MI	US DOT	Internally - No. Externally - Yes, to report to FHWA annually.
26	MO	US DOT	Beginning development of VE program performances.
29	NV	US DOT	We will begin monitoring performance once our policy is implemented.
31	NJ	US DOT	We prepare an annual report for the Federal Highway Administration.
32	NM	US DOT	Just started this fiscal year (July 2003).
36	OH	US DOT	We look at any trends in the design that seem to be common on some of our VE Alternatives and incorporate them back into future project designs; we look at the value added to the projects such as safety features, and we review the cost savings vs. the initial project cost.
43	SD	US DOT	Yes, indirectly for Scope. A report is created for FHWA based on our Scope process.
51	WI	US DOT	The only monitoring effort is the annual report. The only measure in place is that all projects over $25 million must have a study.
52	WY	US DOT	To a very limited degree.
61	ON	CDN DOT	This is a weakness in our program. We don't have defined measures to establish program success.
64	SK	CDN DOT	Looking at introduction.
67	Ottawa	CDN CITY	Process under development.
69	Fed Lands	FHWA	Monitoring of VE program performance is done at the FHWA Headquarters level.

PART 5 MONITORING

Question 38 If yes, how does your agency monitor VE program performance?

	Always	Often	Rarely	Never
Number of projects reviewed	**65%**	**24%**	**6%**	**6%**
Number of VE ideas accepted	**65%**	**29%**	**3%**	**3%**
Value of avoided cost/cost savings	**73%**	**27%**	**0%**	**0%**
Increase in project performance	**16%**	**32%**	**26%**	**26%**
Other (Please Specify)	**80%**	**20%**	**0%**	**0%**
N/A	**12%**			

Ref.	Agency	Category	Comments
3	AZ	US DOT	As stated in question number 37, we monitor the same information required in the FHWA report.
5	CA	US DOT	Quarterly VA Program performance reporting: (1) VROI - Value Improvement = VA Study Costs (2) Project Development Timing vs. Study Timing (3) ROI Project Savings Study Costs
7	CT	US DOT	These issues are documented annually to FHWA. Other - VE study cost.
10	FL	US DOT	The Districts are monitored quarterly on progress of completing their work plan submitted at the beginning of each fiscal year. The measure is actually % of work plan completed, but we don't use number of projects completed as a measure in the annual report.
26	MO	US DOT	Above items are easy to measure - but do not necessarily quantify program performance. To accurately monitor VE program performance one must quantify "value" added to projects. "Value" = performance/cost. We are modifying Caltrans methods to fit our program.
29	NV	US DOT	Again, these are not monitored at this time but will be under our new policy.
36	OH	US DOT	VE Program performance is monitored by reviewing the Quality of the VE Alternatives that were developed, the dollars saved, and the value that was added to the project.
43	SD	US DOT	Values from Scope process.
48	VA	US DOT	Included in project performance are improved operational performance (level-of-service, safety, maintainability), improved constructibility, and reduced environmental impact.
49	WA	US DOT	In addition WSDOT measures: minimized environmental or R/W impacts, enhanced operational performance, improved constructibility, compressed schedule, and partnership or consensus building.
51	WI	US DOT	The only monitoring effort is the annual report. The only measure in place is that all projects over $25 million must have a study.
61	ON	CDN DOT	We survey project team about their satisfaction with the process to try to measure customer satisfaction.
64	SK	CDN DOT	Looking at introduction.

PART 5 MONITORING

Question 39 Does your agency compare VE study investment to capital cost savings/avoided?

Yes	**52%**
No	**34%**
Do not know	**10%**
N/A	**4%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	Figures to calculate this are reported annually.
4	AR	US DOT	We develop a benefit/cost ratio.
5	CA	US DOT	Quarterly VA Program performance reporting: (1) VROI - Value Improvement = VA Study Costs (2) Project Development Timing vs. Study Timing (3) ROI Project Savings Study Costs
6	CO	US DOT	This is also reported to FHWA.
7	CT	US DOT	Noted in annual report to FHWA.
10	FL	US DOT	We refer to this as Return on Investment (ROI).
26	MO	US DOT	Looks at return on investment.
30	NH	US DOT	NHDOT informally assesses the cost of VE study to the capital cost savings.
32	NM	US DOT	We used return on investment methods before but discontinued practice.
36	OH	US DOT	We compared the VE Study cost in the beginning to see the ratio of dollars spent for the study vs. the dollars saved on the project from the VE Session.
64	SK	CDN DOT	Looking at introduction.

PART 5 MONITORING

Question 40 At what level of management in the agency is the performance of the VE Program measured and reported?

Director or Commissioner	**24%**
Senior Manager	**52%**
Technical Staff	**6%**
External Agency	**4%**
Other (Please Specify)	**6%**
Do not know	**2%**
N/A	**6%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	External is the FHWA.
10	FL	US DOT	The State Value Engineer presents mid-year progress and end of year results to the Department's Executive Board.
16	IA	US DOT	Annual report to FHWA
17	KS	US DOT	External Agency - FHWA
23	MI	US DOT	FHWA Annual Report.
30	NH	US DOT	VE program measures are reported to the Commissioner and Assistant Commissioner (Chief Engineer) as well as through FHWA Division Administrator.
32	NM	US DOT	FHWA and AASHTO Value Engineering Technical Committee Members.
34	NC	US DOT	The VE Staff try to measure the program performance and suggest what areas can be improved. This information is reported to senior management and FHWA in the Annual Report.
36	OH	US DOT	The Administrator of the Office of Production and the VE Coordinator review the VE Program on a regular basis. FHWA VE Coordinator also reviews the VE Program with us.
39	PA	US DOT	Chief Engineer and Deputy Secretary for Highway Admin.
52	WY	US DOT	Senior Manager - when reported.
64	SK	CDN DOT	Looking at introduction.
69	Fed Lands	FHWA	A VE report is completed for each VE study and VECP completed. Physically, these reports are transmitted to the Federal Lands Highway Program Administrator (FLHPA) for compiling.

PART 6 FUTURE NEEDS

Question 41 What aspects of your agency's VE program do you consider the strongest? Why?

Ref.	Agency	Category	Comments
3	AZ	US DOT	Availability of good local CVS facilitators. Procurement flexibility in providing highly qualified team members.
5	CA	US DOT	Well established procedures for carrying studies and VA program management.
6	CO	US DOT	The awareness of the availability of the VE tool.
10	FL	US DOT	Recognized Process: The VE process is recognized by Department Management as a process that can help improve the value of a project.
			Stability of VE Group: Minimum turnover in the VE Coordinator position over the past 5 years, has allowed the group to develop stable processes and incorporate strategic planning.
			Strategic Planning: VE Group meets annually to develop strategic plan. Identifies strengths, weaknesses, opportunities and threats.
			Performance Measures: Program is measured for performance and that is reported to senior management.
			Database: recently improved this strength by replacing an existing database with a user friendly Windows based system that tracks existing indicators. Can be read-only accessed by all Department employees.
			Department Education: VE studies provide one of the only if not the only setting that employees can work together and learn what different parts of the Department do. Design can learn from construction and maintenance.
11	GA	US DOT	Doing the VE Study at the Concept stage. This allows for more buy-in since the project has not been designed and eliminates the need to redo work. Also allows for more creative ideas.
12	HI	US DOT	The Highways Division has many experienced engineers from most disciplines in highway engineering. This enables much flexibility in selection of VE team members for a given project.
16	IA	US DOT	Staff position for VE program.
17	KS	US DOT	An "up front" review of plans and concepts of the original scope of the project. Also, we do not fabricate savings from an action we would not do.
18	KY	US DOT	The choice of consultants that lead the value engineering teams.
19	LA	US DOT	Just beginning formal process with much enthusiasm. First study was major success! Will generate interest in future studies.
23	MI	US DOT	5 good Consultants performing VE studies.
24	MN	US DOT	We encouraged all projects within the agency that meet FHWA VE requirements to be studied using VE methodology. Because we feel that there's a potential for cost savings and improvements in projects.
26	MO	US DOT	Organization, institutional knowledge in our districts - all districts are aware of VE, including conducting VE studies and the VE program. Following the VE process has proven to be an effective problem solving methodology.
30	NH	US DOT	NHDOT's process for VE studies are being developed as the importance of the process is accessed on the limited studies completed to date. It is expected that the Department will be embracing future VE studies.
31	NJ	US DOT	Knowledgeable in-house staff who can adjust to specific project criteria, and established time frames. Creates team work and can-do attitude.
32	NM	US DOT	The fact that the Value Engineering methodology has proven to be an effective design tool for the purpose of increasing the value of a project, including avoiding unnecessary expenses.
33	NY	US DOT	NYSDOT has a well-established procedure in place that clearly identifies the post-study activities. The procedure sets time limitations associated with post-study review of the VE recommendations. The time limitations ensure that recommendations are responded to in a timely manner, thereby increasing the likelihood that the recommendations are implemented.
34	NC	US DOT	VE Staff strives to maintain a viable VE program.
35	ND	US DOT	Our program is only based on projects that are $25 million and more. North Dakota has very few so we do not do a lot of VE.
36	OH	US DOT	Performing VE at the Preliminary Engineering stage and not just during detailed design.
38	OR	US DOT	We offer the NHI course every two years and do not have a problem filling the class. This gives us a good pool of people to do VE Studies.
42	SC	US DOT	The VE process allows for a thorough review of a project's design plans and helps with quality control.
43	SD	US DOT	SCOPE will be performed on all projects prior to STIP to determine timing of project, limits of project, type of improvements, design parameters, cost estimates, schedule, etc.
44	TN	US DOT	Upper Management support has always been strong in TDOT. They have recognized since the early years that VE is a major asset to the Department.
45	TX	US DOT	The ability to provide a value engineering specialist to facilitate a study when the districts request them.
46	UT	US DOT	VE in design is strong in some regions.
48	VA	US DOT	VDOT's VE training program is accepted statewide. Whether used as a team member or individually, the training assists staff in performing their duties.
49	WA	US DOT	Support, The agency's only CVS is senior management.
50	WV	US DOT	Support by senior management and Division/District Engineers.
51	WI	US DOT	Wisconsin has a 'major projects program' and that program was recently reviewed for consistency using VE techniques. This effort is expected to be repeated in the future.
52	WY	US DOT	Do not use to the extent we should but have usually been successful when completed.

PART 6 FUTURE NEEDS

Question 41 What aspects of your agency's VE program do you consider the strongest? Why?

Ref.	Agency	Category	Comments
54	BC	CDN DOT	Policy is that VA and VE are performed on any project over $5 million. We have a clear document as to VA VE process.
56	NB	CDN DOT	The availability to the contractor of an opportunity to change aspects of a contract for the betterment of the overall project. The ability of a contractor to share in the efficiencies and the savings.
61	ON	CDN DOT	We focus on improving value and scoping projects rather than cost cutting. We do VE studies even though there is no law requiring this.
64	SK	CDN DOT	Looking at introduction.
68	New York	US CITY	Strengths: Ability to bring in the best talent that is out there; customization of the team for each project; the "all-on-the-same-team spirit" with which we work with agencies and their designers.

PART 6 FUTURE NEEDS

Question 42 What aspects of your agency's VE program do you consider the weakest? Why?

Ref.	Agency	Category	Comments
2	AK	US DOT	We need retraining in VE. Our existing staff was trained in early 1990's and many have retired.
3	AZ	US DOT	Timely notification of potential projects to be inspected. Lack of support from Project Managers.
5	CA	US DOT	Placement of qualified VE Team Members.
6	CO	US DOT	Training, consistent application.
10	FL	US DOT	Knowledge sharing: Sharing the VE study results/recommendations with Department and FDOT consultant community. This is an area of improvement identified on our strategic plan.
			Traditional classroom training: Today's downsized Department (reduction of 2500 employees in last 5 years) requires a new delivery method for training. Identified as an improvement are on strategic plan.
11	GA	US DOT	Obtaining buy-in to the VE process. Many Design Project Managers and senior managers do not want to do VE studies and do not want to implement the recommendations.
12	HI	US DOT	The Highways Division currently does not have environmental engineers. Also, because of the ever-increasing number of projects and decreasing of staff, the amount of time spent on VE is kept to a minimum.
16	IA	US DOT	Training and Management. Need strong management support for VE. Many of our trained staff have retired recently.
17	KS	US DOT	The thought that VE is "cost savings" and the push for cost savings, when at best these "cost savings" would have been realized during our normal design process.
18	KY	US DOT	Performing VE just on FHWA requirements. All large scale projects (state or federal funded) should be considered for VE.
19	LA	US DOT	Just beginning.
23	MI	US DOT	Don't use any MDDT staff on studies - this VE is a mystery - only do VE when required for FHWA. I don't write and distribute annual VE reports. I have to "discover" jobs needing VE - No self-reporting by Project Managers/non-Systems Managers.
24	MN	US DOT	Not having a written VE policy at this time but we are working toward having a policy established sometime in the near future.
26	MO	US DOT	More emphasis is needed on VE Standards and processes.
29	NV	US DOT	Lack of policy and lack of follow-up and measurement of effectiveness.
30	NH	US DOT	The Department's weakest aspect of the VE program is the limitation of in-house training. Due to the size of NHDOT's program and focus of limited training funds, staff training remains a shortfall with the program.
31	NJ	US DOT	Minimal involvement and time spent on analyzing processes and procedures.
32	NM	US DOT	One of our major challenges is the duration of the studies. If we could manage to shorten the length of the studies, we would probably have more positive response from managers to provide VE Study team members. Another challenge is the misconception that VE is applied to save money. More work needs to be done to promote Value Engineering as a design tool that increases the value of the project rather than a tool to only reduce the cost of a project.
33	NY	US DOT	Reluctance by designers to volunteer non-mandated projects for study.
34	NC	US DOT	Support for implementation of VE recommendations.
35	ND	US DOT	We have very few projects over $25 million, so we do not do a lot of VE. This comment would apply to the remaining questions.
36	OH	US DOT	Some ODOT employees are not as willing to participate in Value Engineering. It has not become a part of their regular project program where it is a natural part of their schedule. Due to many competing interests and declining staffing levels, VE assignments/participation is a part time function.
37	OK	US DOT	The overall project costs for ODOT's projects vary and rarely exceed the mandated $25 million threshold. Approximately 95% of our projects are less than $10 million and are simplistic in scope that does not warrrant VE studies.
38	OR	US DOT	The weakest part of the program is that Project Team Leaders and Design Teams do not use the VE tool as often as they could.
41	RI	US DOT	Decisions based on cost savings.
42	SC	US DOT	Some reluctance to try different methods or products has sometimes resulted in a low rate of acceptance of VE recommendations.
43	SD	US DOT	A formalized VE process is not used because projects are less than $25M.
44	TN	US DOT	Scheduling the VE studies has always been a problem. Many times studies will be scheduled only to find that, at the scheduled time, project development has slowed or necessary project information is unavailable.
46	UT	US DOT	VECP.
47	VT	US DOT	No formalized or written procedures.
48	VA	US DOT	VE is accepted as required by law. VDOT managers see VE as a problem-solving tool only and as a required step in project development.
49	WA	US DOT	Trained team leaders. The majority of our trained team leaders have promoted into positions that no longer allow them to take the time needed to lead a team.
50	WV	US DOT	Time constraints during construction.
51	WI	US DOT	Lack of a formal VE training program.
52	WY	US DOT	Do not have a person dedicated to VE.

PART 6 FUTURE NEEDS

Question 42 What aspects of your agency's VE program do you consider the weakest? Why?

Ref.	Agency	Category	Comments
54	BC	CDN DOT	Formal training.
56	NB	CDN DOT	The tracking and confirmation of the number of projects, efficiencies and savings.
61	ON	CDN DOT	We need to measure the performance of the VE program against established benchmarks.
64	SK	CDN DOT	Looking at introduction.
68	New York	US CITY	Weaknesses include: Difficulty in getting at the real cost impact attributed to the VE (By the time we have the disposition of the VE recommendations, say 6 months to 1 year later, the project has changed considerably through the normal course of design. Estimating the impact is always very imprecise); inability to influence decision makers on certain projects (political decisions).
69	Fed Lands	FHWA	The statutory cost threshold of $1 million imposed by OMB is considered too low to justify the study investment. The threshold was established in 1993 and needs to be brought in line with current construction costs.

PART 6 FUTURE NEEDS

Question 43 What opportunities exist for your agency's VE program? Why?

Ref.	Agency	Category	Comments
3	AZ	US DOT	There are opportunities to better educate Project Managers on the benefits of a VE Study. Arizona is one of the fastest growing states requiring more infrastucture; thus there is more potential for VEs.
5	CA	US DOT	Combining project management tools and techniques with VA studies.
6	CO	US DOT	To improve the weaknesses listed above.
10	FL	US DOT	FHWA Support: The AASHTO VE Conference held in Tampa generated a renewed commitment from FHWA Florida Division.
			Sharing Results: Sharing the study results with Department employees and design consultants.
			Process Studies/Planning Studies: Perform more studies in these areas.
11	GA	US DOT	Expanding the VE program to do VE studies on projects that do not meet the established criteria.
12	HI	US DOT	Can't think of any.
16	IA	US DOT	I think should be part of all project development.
17	KS	US DOT	Few with the reduction of funding, larger and more complex projects will be reduced in number.
18	KY	US DOT	We are now incorporating constructibilty studies which should include better communications with the project design team and the contractor.
19	LA	US DOT	Much opportunity due to many projects awaiting funding.
23	MI	US DOT	A lot!
24	MN	US DOT	Potential savings and project improvements through VE program.
26	MO	US DOT	Could be used to our advantage more in "building public trust", showing the public that the best value is being obtained.
29	NV	US DOT	Since our program has been very minimal in the past, the opportunities for significant project improvements and cost savings are enormous.
30	NH	US DOT	Future opportunities to complete a greater number of VE studies are just coming into view. With recent VE study successes on three very important projects, the important role of VE assessments is being realized. As a result, future support for VE studies can be expected within the agency.
31	NJ	US DOT	Help department achieve most bang for the buck by providing alternatives for consideration.
32	NM	US DOT	Simply to increase the quality of our work! So far this methodology has been used in construction projects, but we see its application to processes and products as a great opportunity.
33	NY	US DOT	NYSDOT is exploring ways to expand our program to more actively pursue conducting VE studies on non-mandated projects.
34	NC	US DOT	VE could be an effective management tool for cost avoidance, reduction of contract time, minimization of r/w and/or environmental impacts, enhancement of safety and adding quality.
36	OH	US DOT	The VE program could expand and become a much larger and more important part of the project than it is now.
38	OR	US DOT	With our newly reorganized Project Development, I hope to get the Regions to look at VE as a tool that will benefit their entire program. The value added to their projects and the cost savings to be used on additional projects.
39	PA	US DOT	Not certain I have been on detail in another area of the Dept. for the last year.
41	RI	US DOT	Limited by size (cost) of project.
42	SC	US DOT	As more VE studies are done, a greater rate of acceptance for alternate methods and products may develop.
44	TN	US DOT	With improved and extended training of more technical staff, the VE program should be able to study more projects, not just those mandated.
47	VT	US DOT	Formalizing it to include specifying a team, leader, and report format and context. Also when to use.
48	VA	US DOT	VE is currently expanding into Project Scoping, Constructibility Reviews, standards, and non-construction VE.
49	WA	US DOT	Training and developing new team leaders and members for future VE teams.
50	WV	US DOT	Continued use in engineering, construction and manual preparation.
51	WI	US DOT	Staff are becoming excited about VE after having been involved in VE studies and seeing the positive results.
54	BC	CDN DOT	VA and VE will continue.
56	NB	CDN DOT	It allows the contractor the opportunity to be innovative and share in the cost savings that he can identify. Over time most innovation becomes included in the overall contracts unless it was very site specific. It may be time to review our Value Engineering program.
61	ON	CDN DOT	Could do more studies on processes and agency products such as driver licensing and control, rather than just engineering. Could do more studies at the concept stage. Could do more studies with outside stakeholders. VE is a process that improves collaboration and understanding from different stakeholders. We should help other processes through VE such as Road Safety Audits, Context Sensitive Design, Decision Analysis, and project risk management.
64	SK	CDN DOT	Looking at introduction.
68	New York	US CITY	There are opportunities to work together and influence the State and Feds.

PART 6 FUTURE NEEDS

Question 44 What threats exist for your agency's VE program? Why?

Ref.	Agency	Category	Comments
3	AZ	US DOT	Stagnant/shrinking state revenue could impact the state's transportataion budget in a negative manner.
5	CA	US DOT	The VA program is very well established and respected in Caltrans. I don't see any immediate threats.
10	FL	US DOT	Organizational Structure: Department reorganization over the past 5 years has reassigned the VE position to report lower in the organization structure.
11	GA	US DOT	Continued support from senior management. As the number of VE studies increases, it becomes more difficult to get DOT team members. Design Project Managers are reluctant to request VE studies, and prefer not to implement the recommendations.
12	HI	US DOT	None.
16	IA	US DOT	VE needs champion. I will be retiring soon.
17	KS	US DOT	When the Agency determines that the formal VE process has not provided significant benefit, it's use may be reduced.
18	KY	US DOT	Hopefully, no threat exists.We currently have a $40.00/$1.00 ratio for value engineering studies.
19	LA	US DOT	Resistance to change, especially after the environmental decision has been made.
23	MI	US DOT	Too busy, Fed Regs being complied with.
24	MN	US DOT	None.
30	NH	US DOT	Limited funding and cost of training.
31	NJ	US DOT	Currently strong management support and successful program have minimized program threats.
32	NM	US DOT	If the VE methodology is not well understood, it can disappoint management and therefore be discontinued for transportation projects under $25 million.
34	NC	US DOT	Without the Federal VE Mandate requiring performance of VE studies the State Program would be greatly weakened.
36	OH	US DOT	None at the moment.
39	PA	US DOT	Voluminous number of retirements causing rapid loss of knowledge base due to relative youth/age of engineers/tech's.
41	RI	US DOT	Our projects are small and limited in scope.
44	TN	US DOT	Lack of needed training and apathy by some of our technical staff.
46	UT	US DOT	Funding for VE training.
48	VA	US DOT	Reduced construction/design funding has reduced the number of projects available. Senior and middle management has changed since initiation of the program.
50	WV	US DOT	None.
51	WI	US DOT	Pressure to complete projects means that projects under $25 million (unless they are very complex) do not always use VE.
52	WY	US DOT	No person with full time responsibility.
54	BC	CDN DOT	Apathy.
56	NB	CDN DOT	Contractors are submitting Value Engineering proposals that do not fit within the parameters of what a value engineering proposal is. This is time consuming for the contractor and does not allow for an efficient use of our time.
61	ON	CDN DOT	The biggest threat is from other programs that are bringing in competing processes. For example, asset management has some alternative generation and evaluation processes. Asset Management is high profile and might eliminate the need for VE in the minds of managers. Other processes are very much in vogue and overlap or overshadow VE. These include Road Safety Audits (improve value), context sensitive design (improve aesthetics, collaborate with partners), IHSDM (generate designs), asset management (manage resources), ACTT workshops (Accelerated Construction Techniques Technology), (choosing by advantages (make decisions). The latest AASHTO VE guidelines does not give guidance on how to deal with explicit highway safety, yet highway safety is a huge priority with every agency. Is the VE community too insular from other agency priorities? The biggest threat is agency's are not considering explicit highway safety in their VE studies. The highway safety community believes with some justification that VE reduces highway safety. From a VE perspective, we don't report enough on results, we spend too much on consultants, we spend too much of the study on process rather than on the creative aspects.
64	SK	CDN DOT	Looking at introduction.
68	New York	US CITY	Changes in the Mayoral administration can result in a greater or lesser interest in supporting the VE program.

PART 6 FUTURE NEEDS

Question 45 Do you or your agency have any concerns over the preparedness of the value community to support your VE program?

Yes	**7%**
No	**78%**
Do not know	**9%**
N/A	**7%**

Ref.	Agency	Category	Comments
3	AZ	US DOT	There are many CVS's located in the Phoenix, Arizona area to assist ADOT's needs.
5	CA	US DOT	We carry out VA studies via consultant team leaders - not too many consultants understand our procedures.
23	MI	US DOT	But I wish there were more trained in CVS - in MDOT and in Consultants.
30	NH	US DOT	The VE teams has demonstrated a professional understanding of the process.
32	NM	US DOT	More promotion! The right promotion! In our view, part of the problem is that the Value Engineering community has been recognized and remembered for its potential savings on construction projects or products. Savings or cost avoidance is simply very attractive, but we well know that this is a byproduct of Value Engineering. The main purpose is to increase the value of something, and so that by itself saves money. In fact, big money, particularly when life cycles and user costs are analyzed. It is not necessarily what it does immediately to a project, product or process, but the future benefits by building or implementing the “right stuff”.
49	WA	US DOT	AASHTO is also a valuable resource for information .
61	ON	CDN DOT	Consultants are usually only willing to do studies in accordance with SAVE procedures. They don't usually bring new things to the table or show much professional development. We still have consultants who only focus on cost savings, rather than improving value. Many consultants don't read papers or do professional development. If it worked 20 years ago it is fine by them. Most of the Module I courses we have bought contain dated material which shows that the consultant has little concern for continuous improvement. Most consultants are not thinking about how to support decision analysis through risk management, choosing by advantages, performance measurement, or some other techniques.
64	SK	CDN DOT	Looking at Introduction.
67	Ottawa	CDN CITY	Limited VE Consultants in the Ottawa area at this time.

PART 6 FUTURE NEEDS

Question 46 What research needs do you feel need to be addressed in the near future? Why?

Ref.	Agency	Category	Comments
3	AZ	US DOT	Quantifying safety. You can always enhance the value of a project by increasing safety; however, at what cost?
10	FL	US DOT	Performance Measures - traditionally cost savings has been the primary measure for VE programs and FDOT is no different, but how do you quantify the other benefits to VE?
11	GA	US DOT	Research about what types of projects benefit from VE studies. The $25 million threshold should be reviewed.
17	KS	US DOT	How truthful are the reported cost savings on projects? Are the reported savings inflated to perpetuate VE? We have not experienced savings to the level reported by others.
18	KY	US DOT	Need to look at state funded projects for value engineering.
19	LA	US DOT	None at this time.
24	MN	US DOT	None that we can think of at this time.
26	MO	US DOT	Best practices, national trends on VE. For instance we're incorporating Caltrans methods on Project Performance measures and also trying to do more conceptual stage VEs.
30	NH	US DOT	Research in evaluating the timing for VE studies within the design process for projects. When is the best time in the design phase to undertake a costly VE study (i.e., prior to NEPA approval, early in final design or late in final design)? NHDOT has focused the VE study to be completed at the conclusion of the NEPA/Section 4F/Section 6F/Section 404 approvals prior to extensive final design efforts. Understanding the timing of VE studies and the reasons why it is being undertaken during certain design phase by State highway agencies would be useful in insuring continuity in the overall process from State to State.
32	NM	US DOT	Perfomance Measurements, shorter VE studies and training, the development of more and shorter VE workshops for executives, VE in design-build projects, VE in multi-modal transportation projects, more help from other VE organizations in promoting and performing short seminars for all (FHWA, SAVE International, the Miles Foundation, etc.). Only by understanding well the intent of the methodology as a design tool, is that the expectations of Value Engineering can be redirected.
34	NC	US DOT	How effective are the States VE programs? Are they accomplishing the results intended by the OMB? Are the final designs being studied to find if recommendations are incorporated to comply with the Federal Mandate?
36	OH	US DOT	Research different means of performing VE such as "Improving the Value Method with Choosing by Advantages". This would be nice just to see if a new method may work better.
44	TN	US DOT	Don't know.
46	UT	US DOT	VE performance measures other than cost savings.
49	WA	US DOT	Performance measures.
61	ON	CDN DOT	Need to research how to measure the effectiveness of VE against other processes used in project management. Need to research methods to incorporate user costs into the evaluation of alternatives. Need to research how to build explicit highway safety evaluation techniques into VE and integrate VE with road safety audits. Need to work on other processes that need techniques to generate alternatives such as context sensitive design. Need work on the decision analysis and VE, and VE and risk management. The U.K. is about 5 years ahead of North America in incorporating risk into VE studies.
64	SK	CDN DOT	Looking at introduction.

Abbreviations used without definitions in TRB publications:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NCHRP	National Cooperative Highway Research Program
NCTRP	National Cooperative Transit Research and Development Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation