3/26/2009: Pen & Ink to change office name at request of Director, Office of Design.

Approved:

Stephanie C. Kopelousos
Secretary

Effective: May 15, 2008
Office: Specifications & Estimates
Topic No.: 625-030-002-g

VALUE ENGINEERING PROGRAM

PURPOSE:

To provide a consistent and uniform process for executing the Value Engineering (VE) Program during the development of a project.

AUTHORITY:

Code of Federal Regulations, Title 23, Chapter I, Part 627;
Sections 20.23(3)(a), 334.044(10)(b), 334.046(2) and 334.048(3), Florida Statutes (F.S.);

SCOPE:

All Department personnel, consultants, contractors, and others who may be required to participate in the Value Engineering Program.

REFERENCES:

1) American Association of State Highway and Transportation Officials (AASHTO) Guidelines for Value Engineering, AASHTO Bookstore, https://bookstore.transportation.org

2) Federal Highway Administration (FHWA) Value Engineering web site, www.fhwa.dot.gov/ve.

3) FDOT Project Development and Environmental Manual, Topic No. 650-000-001, Chapter 4-2.2.11
http://www.dot.state.fl.us/emo/pubs/pdeman/pdeman.htm.

4) FDOT Project Management Handbook, Part II, Chapter 2 & Chapter 3.
http://www.dot.state.fl.us/projectmanagementoffice/PMhandbook.htm.

5) FDOT Employee Recognition Program Procedure, Topic No. 250-000-007,
http://ombnet.dot.state.fl.us/procedures/bin/250000007.pdf.

BACKGROUND:

Value Engineering is the systematic application of recognized techniques by a multi-disciplined team which identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions to accomplish the original intent of the project, reliably and at the lowest life-cycle cost without sacrificing project requirements for safety, quality, operations, maintenance, and environment.

In the ***1970 Federal-Aid Highway Act***, the U.S. Congress authorized the Federal Secretary of Transportation to require value engineering on any proposed federal-aid highway project Congress extended the federal value engineering role with the passage of the ***National Highway Systems Designation Act of 1995***. This act included a provision requiring the Federal Secretary of Transportation to "establish a program to require states to carry out a value engineering analysis for all projects on the National Highway System with an estimated total cost of $25 million or more." FHWA published regulation ***23 CFR Part 627*** establishing this program in 1997. The ***"Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users"*** (SAFETEA-LU) of 2005 expanded the role of value engineering on the Federal-Aid system. In addition to requiring a value engineering analysis for all projects on the Federal-aid system with an estimated total cost of $25 million or more, SAFETEA-LU included a provision requiring a value engineering analysis on bridge projects with an estimated total cost of $20 million or more.

The administration of the Value Engineering Program can be broken into the following key processes:

1. Project Selection
2. Team Selection
3. Value Engineering Study
4. Implementation
5. Reporting

The Districts and the Turnpike Enterprise are responsible for the Project Selection, Team Selection, Value Engineering Study, and Implementation processes, while the Central Office is responsible for the Reporting process. Guidelines for administering these processes will be outlined in this procedure.

DEFINITIONS

Certified Value Specialists (CVS): The highest level of certification attainable through SAVE International. Designation is reserved for Value Specialists or Value Program

Managers who have demonstrated expert level experience and knowledge in the practice of the Value Methodology

Constraint: A limit or restriction to the number of potential solutions available to a specific facet of a project. It may involve permitting, access, or geometrics, to name a few.

Cost: The amount paid or charged for goods and services.

Criteria: The standard that the project was designed to meet.

Design Observation: An observation that the VE team wishes to convey to the design team for consideration. The milestone of the project being reviewed may not have adequate detail to develop a full VE recommendation.

Evaluation Matrix: A method by which competing VE alternatives and the proposed design can be evaluated by the use of weighted objectives.

Function: Value Engineering defines function as "that which makes a product work or sell."

Function Cost: The amount paid or charged to provide a function.

Function Worth: The lowest amount paid or charged to provide a function.

Life Cycle Costs: A method used to evaluate the total cost of ownership over the life of a facility in terms of equivalent dollars. This method uses a discount rate to account for opportunity lost and inflation.

Maintenance Costs: The cost to keep the investment in its current condition. This may include small improvement projects such as elder user programs, but routinely includes resurfacing, painting, mowing, etc.

Operating Costs: These types of costs are what it takes to make the facility function. The expenses are generally associated with toll collections, motor carrier compliance, electricity, etc.

Preferred Alternative: A Project Development and Environment (PD&E) term associated with the apparent selected solution that has not been approved through the public involvement process. The VE team would be reviewing this solution and denoting it "as proposed" or as the basis of comparison.

SAVE International: The premier international society devoted to the advancement and promotion of the value methodology (also called value engineering, value analysis, or value management).

Transportation System Facilities: The fixed assets and control systems that move people and goods in a timely manner.

Value: The relative worth of something as measured by its qualities or by the esteem in which it is held.

Value Index: A ratio that expresses function cost divided by function worth. This ratio is used to determine the opportunity for value improvement.

VE Alternatives: The concepts the VE team identified as solutions that may be substituted for features currently depicted.

VE Job Plan: An established six-phase approach by which VE studies are performed.

VE Milestone: A point in the development of a project that is appropriate to perform a value engineering study.

VE Recommendation: The team's selected VE alternative or VE alternatives.

Worth: The lowest cost that is required to produce or obtain an essential function of an item or service.

1. PROJECT SELECTION

1.1 REQUIRED PROJECTS

1.1.1 Projects on the Federal-aid System

All projects on the Federal-aid system with an estimated total cost of $25 million or more shall have a value engineering analysis performed during the development of the project. Bridge projects with an estimated total cost of $20 million or more shall have a value engineering analysis performed. The total estimated cost shall include all costs associated with the project, including but not limited to design, right-of-way, construction, and administrative costs.

There is not a process to waive the value engineering requirement for projects on the federal-aid system.

1.1.2 Projects not on the Federal-aid System

All projects not on the Federal-aid system with an estimated total cost of $25 million or more shall have a minimum of one VE study conducted during project development. The total estimated cost shall include all costs associated with the project, including but not limited to design, right of way, construction, and administrative costs. After review, the Director of Transportation Development may waive the requirement for projects that are not on the Federal-aid system. Any such waiver shall be in writing, stating the reasons for the waiver, and apply only to that single project.

1.2 ADDITIONAL PROJECTS

The districts have the flexibility to study additional projects below the mandatory $25 million cost threshold. Projects that provide the highest potential for value improvement include:

- Projects that substantially exceed initial cost estimates.
- Complex projects.
- Capacity projects
- Interchanges
- Corridor studies
- Projects requested for VE by a Department Project Manager.
- Projects with high right of way costs.
- Projects and processes with unusual problems.

1.3 SCHEDULING

The VE study should be conducted during one of the following phases of project development: Planning, Project Development & Environmental (PD&E), or Initial Engineering Design. For Design-Build Projects, the VE study shall be conducted prior to the release of the Request for Proposal (RFP). The greatest potential for improvement in a project is during the early phases of development; therefore it is the Department's objective to schedule studies during these phases of project development.

1.4 VE WORK PLAN

The districts shall have the responsibility of developing and executing the annual Value Engineering Work Plan. The development of this plan shall be completed and submitted to the State Value Engineer (SVE) by July 1 of each fiscal year. All required projects that have not had a prior VE study and will have a VE milestone within the project schedule for the year in review shall be included on the work plan.

2. TEAM SELECTION

2.1 TEAM STRUCTURE

The District Value Engineer (DVE) shall review potential team members and coordinate the selection of team member disciplines with the Project Manager. 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. For federal-aid projects, anyone directly involved in the design of the project should not be a team member, but is expected to participate as an information source. The VE study shall be independent of other design reviews.

The districts shall determine whether to utilize Department personnel, consultant personnel, or a mixture of both to form the team.

2.2 DEPARTMENT TEAM LEADER/MEMBER CRITERIA

Department employees serving as team leaders, under the supervision of the DVE, shall have the responsibility for conducting the assigned project review in accordance with these procedures. Prior to leading a team, employees must have served as a team member on at least two VE studies, must have attended a VE team member training workshop, and must have attended a team leader training course.

Team members who have not received formal VE training or participated on a previous VE study led by a CVS or DVE may participate on a team; however, they should not be the primary team member responsible for one of the required disciplines.

2.3 CONSULTANT TEAM LEADER/MEMBER CRITERIA

Consultant team leaders must meet the following qualifications:

1. A CVS with experience in the value engineering process for transportation system facilities.

2. A Professional Engineer registered in the State of Florida with proficient knowledge and experience related to the design and/or construction of transportation system facilities..

The role as consultant team leader may be filled by one individual or by two individuals serving as co-team leaders; however, those individuals fulfilling the above qualifications shall be from the contracted consulting firm or their sub-consultants.

A consultant team member shall be a technical person with proficient knowledge and experience in the required discipline.

3. VALUE ENGINEERING STUDY

3.1 VE JOB PLAN

The VE study process shall be conducted in accordance with the following 6 phases of the internationally recognized VE Job Plan:

(1) Information*:* The team gathers information about the present design and cost, then determines the needs, requirements, and constraints of the owners/users/stakeholders, as well as the design criteria.

(2) Function Analysis: The team defines the project functions using a two word active verb measurable noun context. The team analyzes these functions to determine which need improvement, elimination, or combination. Tools used during this phase include: Random Function Identification, Function Analysis System Technique (FAST), Function Listing, and Value Index.

(3) Creative: The team uses a variety of creative techniques, such as brainstorming, to generate alternative ideas to perform the project functions.

(4) Evaluation: The team refines and combines ideas, develops functional alternatives, and evaluates by comparison. Appropriate tools of comparison include advantage and disadvantage comparison and an evaluation matrix with weighted criteria.

(5) Development: Based on the evaluation phase, the team begins to develop in detail the alternatives with the greatest potential value. During this phase it is essential to establish costs and backup documentation needed to individually convey the alternative solutions.

(6) Presentation: The final phase of the VE study in which the VE team presents to management the findings of the study in a written report. This phase may include a verbal presentation.

Once the team has completed phases (1) through (4), the team may determine that no value improvements can be identified for the project (all items have a value index of

about 1.00). Then the team leader may document the study results and disband the team. The DVE shall be notified prior to disbanding.

3.2 REQUIRED STUDY ELEMENTS

Several steps in the application of VE have been determined by the Department to be of such significance that special attention is noted here. These nine (9) items shall be required in conducting a VE study:

1. Define the original project objective.
2. Identify the design criteria for the project.
3. Verify all valid project constraints.
4. Identify specifically the components and elements of high cost.
5. Determine basic and secondary functions.
6. Evaluate the alternatives by comparison.
7. Consider life cycle costs of alternatives.
8. Develop a detailed implementation plan.
9. Define which VE alternatives can be implemented together and which stand alone. The team shall select which combination of developed solutions is being specifically recommended.

In addition to the required elements listed above, VE studies on bridge projects shall include the following:

1. Bridge substructure requirements based on construction materials.
2. Evaluation of acceptable bridge designs based on engineering and economic basis.
3. Evaluate using life cycle costs and construction duration.

3.3 PROJECT DEVELOPMENT PHASE

The information required for the VE study should be the information already available and/or prepared for the project. The information should not be generated for the sole purpose of the VE study; it should be gathered together and packaged appropriately for the VE study team.

3.3.1 Planning Study

The first VE study of a project should occur immediately following the development of a recommended concept, and/or corridor analysis. Not all transportation system facilities go through this phase during project development; therefore, a VE study may not be applicable at this phase of development. Information that should be made available to the team includes:

- Traffic information (which was utilized in making the conceptual design decisions) consisting of preliminary projections based on historical trend analysis, or volumes taken from urban transportation models. Any other known traffic impacts that are anticipated shall also be included.
- Aerial photo coverage of the project showing corridors or interchange layouts, zoning, and land use designation.
- Information on current right of way values, consisting of such items as square foot market values for areas that are affected by each proposed conceptual design.
- Information concerning the identification of a preferred alternative. Such information should include construction costs, right of way costs, environmental impacts, safety, operation, and relocations.

3.3.2 Project Development & Environmental

A VE study may occur immediately following the draft Preliminary Engineering report. This initial opportunity for VE gives the project an early review by design, construction, and maintenance. The involvement of construction and maintenance could lead to significant life cycle cost savings. The VE study shall occur prior to the public hearing in order to depict the team's enhancements. This step is critical in building public credibility for the project function.

Alternatives compared at this stage will include those submitted by the consultant and/or PD&E engineer and any additional concepts that were presented and approved by earlier VE studies. Information or data that should be available to the team at this point in the development of the project include:

- Approved technical traffic memorandum.
- Estimated construction cost breakdown by alternative.
- Estimated right of way cost for each alternative based on actual real estate values in each area.
- Business damage estimates in each alternative.
- Traffic operation analysis through utilization of computer programs.
- Life cycle costs including maintenance costs, operating costs and periodic improvements for each alternative.
- The number and cost of business and residential relocations for each alternative.
- Environmental impact analysis.
- Preliminary plans.
- Summary of public involvement.

3.3.3 Engineering Design

A final VE study may occur after completion of Phase 1 design plans, but less than Phase 2 design plans. Under extraordinary circumstances, VE studies may be conducted beyond Phase 2 when approved by the District Director of Transportation Development. Elements of the final VE study will center on drainage requirements, vertical grades, and minor horizontal refinements within the established corridor, structures, and utilities. Information and data that should be available to the team include:

- Key Sheet with location map, begin and end stations, equations, and project numbers.
- Drainage Information showing:
  a. Existing data including ridge lines, elevations, and structures
  b. High water information
  c. Drainage areas and direction of flow
  d. Horizontal alignment
  e. Proposed water retention areas
- Typical Sections
- Plan and Profile Sheets:
  a. Baseline survey, roadway alignment, curve data, and bearings
  b. Existing topography
  c. Profile grades
  d. Proposed right of way
  e. Begin and end project stations, equations, and bridges
  f. Existing utilities
- Intersection and Interchange Layouts:
  a. Existing topography
  b. Basic survey geometry
  c. Profile grades
- Cross Sections:
  a. Existing ground line
  b. Partial proposed templates
  c. Existing utilities
- Drainage Outfall:
  a. Alignments
  b. Cross sections showing existing ground line and partial templates
- Conceptual Structure Information:
  a. Bridge Geotechnical Report
  b. Bridge Developmental Report
  c. Plan and elevation sheets
  d. Cross sections through structure
- Traffic Control Plans for all alternative schemes or phasing being considered

- Preliminary Cost Estimate

These three opportunities for a VE study during project development are general in nature and close coordination is needed between the Project Manager and DVE to determine the proper timing for a value engineering study with the greatest potential for success. It is important for project elements to be developed to enough detail for the VE team to comprehend the intent of the design, but not developed to the extent that any proposed change would impact implementation. Teams should focus on features that are being developed during that particular phase of project design.

3.3.4 Design-Build

A VE Study performed on a Design-Build project shall be performed prior to the release of the Request for Proposal (RFP). The VE team on these studies should focus on the criteria contained within the proposed RFP.

3.4 STUDY SUMMARY REPORT

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 Description
- Performance Criteria
- Evidence that Function Analysis was performed
- Basic Functions
- Life Cycle Cost Estimate
- VE Alternative Description
- VE Alternative Cost Calculations
- Evaluation by Comparison
- Proposed Design
- Detail Findings or Analysis
- Specific Recommendations and Costs
- Design Observations
- Implementation Plan

A draft ***Value Engineering Study Summary Report***, including all pertinent data (as proposed and VE alternative concepts), shall be assembled, published, and made available to the team members and management for their review and comments within two weeks of the study conclusion.

The content, presentation, and professional engineering certification of the final published report are the responsibility of the VE team leader. The purpose of the certification is to ensure that the VE study was conducted according to the principles and practices of the value engineering profession. The professional engineer certifying the report shall have been a team member and full participant in the VE study that is the subject of the report.

The DVE and/or team leader shall attempt to resolve any issues that arise from the draft report. If the team leader deems it necessary, the team may be contacted or re-assembled to enhance sketches, make editorial changes, refine cost calculations, etc. This may be needed for complex projects.

The team leader shall submit the final report with copies to the DVE. The DVE will send a copy to the Project Manager, District Design Engineer, District Estimates Engineer (preliminary), Director of Transportation Development, Director of Operations, District Secretary, and the State Value Engineer. Extra copies shall be made available to appropriate authorities as directed by the District Secretary and/or designee.

4. IMPLEMENTATION

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 general impact on design and construction costs, letting date, manpower requirements, consultant resources, design and construction schedules, and any other impact resulting from team recommendations. Specific changes required by these impacts shall be determined and addressed by the project manager.

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 District Management.

5. REPORTING

The State Value Engineer shall be responsible for monitoring program compliance and reporting to Central Office and District Management. Value engineering operations will be monitored for compliance with the policies, procedures, and standards identified in the preceding sections. Specific areas to be monitored include:

- District Value Engineering Work Program and Schedule.
- District Value Engineering accomplishments.
- Documentation of value engineering activities.
- Economic analysis methods being used in cost/benefit determinations for project decisions.
- Compliance with the provisions of the value engineering procedures.

Monitoring of program compliance shall conform to the Department's QAR policy and may include the following:

- Regular visits with district engineering personnel.
- Periodic participation in value engineering team meetings.
- Attending VE team presentations.
- Formal program review of all records, study summaries, interview documentation, periodic activity, and quarterly VE reports.

The basis for most reporting will be information contained in the ***Value Engineering Reports (VER)*** database. The Districts are responsible for the initial input and updating of project data, while the State Value Engineer is responsible for reporting and disseminating the results throughout the Department.

The State Value Engineer will prepare a quarterly report detailing the progress made during the current fiscal year. This report will be submitted to Central Office and District Management on a semi-annual basis and will reflect the program accomplishments for the fiscal year.

6. VALUE ENGINEERING RECOGNITION AWARDS

6.1 DISTRICT RECOGNITION

AWARD: Inscribed Plaque. Total value up to $100.

FREQUENCY: Awarded annually

QUALIFICATIONS: Presented to a District in recognition of excellent value engineering program performance as demonstrated by established performance measures.

DOCUMENTATION: Value Engineering Annual Report, Value Engineering Reporting System and Value Engineering Project Files.

TIME FRAME: The State Value Engineer will process for presentation by the last work day in August.

6.2 TEAM RECOGNITION

AWARD: Identified within each category.

FREQUENCY: Awarded annually in each category.

QUALIFICATIONS: There are two award categories at this level:

1. District Team of the Year – A team that most notably demonstrates the utilization of the value engineering team process, exemplifying a thorough understanding of the tools and techniques of the process. Consideration will be given to implemented recommendations that lead to measurable gains in productivity, cost savings, or other project improvement opportunities. Each team member shall receive a certificate and a non-monetary recognition item. Total value up to $50.00.

2. Statewide Team of the Year – The District or Central Office Value Engineering team, identified by the State Value Engineer, as exemplifying a thorough understanding of the tools and techniques of Value Engineering. Consideration will be given to implemented recommendations that lead to measurable gains in productivity, cost savings or other project improvement opportunities. Each team member shall receive a certificate and a non-monetary recognition item. Total value up to $100.00.

Presented to value engineering teams in recognition of their respective superior performance within the fiscal year. Recognition items may only be presented to State employees.

DOCUMENTATION: Supportive information from the VER System and the Value Engineering Project File.

TIME FRAME: The District Value Engineer must submit the recommendation and supporting data to the State Value Engineer by the last work day in July. The State Value Engineer will process for presentation by the last work day in August.

6.3 INDIVIDUAL RECOGNITION

AWARD: Non-monetary recognition item escalating in value of up to $20, 40, 60, and $100 for 1, 3, 5 and 10 studies, respectively.

FREQUENCY: Periodic

QUALIFICATIONS: Presented to team members for participation on value engineering studies. The recognition items are presented for 1, 3, 5 and 10 time team members. Recognition items may only be presented to State employees.

DOCUMENTATION: Supportive documentation from the VER System and the Value Engineering Project file.

TIME FRAME: The State Value Engineer will distribute the awards to the District Value Engineer by the last working day of the month following the end of each fiscal quarter.

6.4 PROCUREMENT OF AWARDS

Awards must be purchased and tracked in accordance with the Department's ***Employee Recognition Program, Procedure No. 250-000-007***.

7. TRAINING

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.

8. FORMS

None