

**VOLUME II  
PART C  
VALUE ENGINEERING**

**VOLUME II**

**TECHNICAL, COST ESTIMATING AND  
VALUE ENGINEERING REQUIREMENTS**

**PART C - VALUE ENGINEERING**

**INDEX**

Para. No.	Title	Page No.
1.1	GENERAL .....	C-1
1.2	APPLICABLE PUBLICATIONS.....	C-1
1.3	PRECONCEPT SUBMITTAL REQUIREMENTS.....	C-1
1.4	CONCEPT/EARLY PRELIMINARY (35%) DESIGN SUBMITTAL REQUIREMENTS .....	C-1
1.5	SIXTY PERCENT (60%) SUBMITTAL REQUIREMENTS.....	C-1
1.6	PRELIMINARY (60%) DESIGN SUBMITTAL REQUIREMENTS.....	C-2
1.7	FINAL (100%) DESIGN SUBMITTAL REQUIREMENTS .....	C-2
1.8	CORRECTED FINAL DESIGN SUBMITTAL REQUIREMENTS.....	C-2
1.9	VE VERSUS DESIGN.....	C-2
1.10	BEFORE THE VE METHODOLOGY CAN BE APPLIED.....	C-2
1.11	SCOPE OF WORK.....	C-2
1.12	VALUE ENGINEERING STUDY SERVICES .....	C-3
1.13	ESTABLISHMENT AND APPROVAL OF THE VE TEAM.....	C-3
1.13.1	Members .....	C-3
1.13.2	VE Experience .....	C-3
1.14	METHODS OF PROCUREMENT .....	C-3

## INDEX (Cont.)

Para. No.	Title	Page No.
1.15	VE AND A-E FIRM REQUIREMENTS .....	C-4
1.15.1	Typical VES Team Requirements (Subcontracted VES) .....	C-4
1.15.2	Typical Design A-E Effort for VE Briefing and Review Response of the VE Study .....	C-5
1.16	STUDY GROUP REQUIREMENTS AND ENVIRONMENT .....	C-5
1.16.1	Information Required .....	C-5
1.16.2	Environment .....	C-6
1.17	BASIC REQUIREMENTS FOR VE .....	C-6
1.18	REPORTS AND MINIMUM DOCUMENTATION REQUIREMENTS FOR VE .....	C-7
1.19	VE REPORT FORMAT .....	C-8
1.19.1	Numbering System .....	C-8
1.19.2	Alternatives .....	C-8
1.20	VE REPORT SUBMISSION SCHEDULES FOR ORAL PRESENTATION .....	C-9
1.20.1	Working Relationships .....	C-9
1.20.2	Presentation and Report .....	C-9
1.21	APPROVAL AND IMPLEMENTATION OF PROPOSED VE CHANGES .....	C-9
1.22	GUIDANCE AND CONSULTATION .....	C-9
1.23	SPECIFIC INSTRUCTIONS .....	C-9

## VOLUME II

### TECHNICAL, COST ESTIMATING, AND VALUE ENGINEERING REQUIREMENTS

#### PART C - VALUE ENGINEERING

1.1 **GENERAL.** Each year, a considerable amount of this nation's available resources are allocated to construction. The costs of construction have risen sharply in the past decade, and the rise in costs exceeds that of the preceding year. Every means, therefore, must be utilized to obtain our required construction within funds allocated, to efficiently and effectively utilize the taxpayers' money placed in our trust for military readiness. Value Engineering (VE) is a tool to help management gain the desired results within the constraints of time and cost. To capture this potential, VE must be clearly understood and correctly applied and must have the involvement and cooperation of management and every decision-maker in the design and construction process.

#### 1.2 APPLICABLE PUBLICATIONS.

AR 5-4 and OCE Supplement I	Department of the Army Productivity Improvement Program (DAMPIP)
AR 672-20	Incentive Awards
DR 1180-1-1	Construction Contract Modification
EP 11-1-3	Value Engineering Workbook
ER 5-7-1	Project Management
ER 37-2-10	Accounting and Reporting - Civil Works Activities
ER 37-34-5-10	Accounting and Reporting - Military Activities
FAR Part 48	Value Engineering

1.3 **PRECONCEPT SUBMITTAL REQUIREMENTS.** VE Studies will not be performed on preconcept submittals. Any studies of project criteria will be performed by the Savannah District VE Officer (VEO).

1.4 **CONCEPT/EARLY PRELIMINARY (35%) DESIGN SUBMITTAL REQUIREMENTS.** VE Studies for concept/early preliminary design submittals will be performed during the design review period. Studies shall be scheduled to begin on the day after design submittals are scheduled to be received by the study group. Results of the studies shall be received by the Savannah District at the same time that design review comments are received and coordinated. Once the VE suggestions to be adopted are approved by the User, then the design A-E or the inhouse (IH) designers and Project Manager (PM) will determine if the approved items are outside the original scope for design services. If so, a modification to the contract will be issued prior to the incorporation of the items with the final design. Start of final design will not necessarily have to wait on the processing of a modification if other nonrelated work can be started.

**1.5 SIXTY PERCENT (60%) SUBMITTAL REQUIREMENTS.** Normally, VE Studies will not be performed for a project with a requirement for a 60 percent submittal. The design does not stop at the 60 percent stage. The limited submittal is for a prefinal check on the cost and functional layout. If a VE Study is performed, the design A-E or the IH design team is to continue with their original effort without interruption even though the results of the VE Studies may result in lost design effort.

**1.6 PRELIMINARY (60%) DESIGN SUBMITTAL REQUIREMENTS.** Remarks concerning concept/early preliminary design are applicable to preliminary designs.

**1.7 FINAL (100%) DESIGN SUBMITTAL REQUIREMENTS.** VE Studies will generally not be performed on final design submittals. If studies are made, they will be due to the project cost being over the budget or due to failure to perform VE Studies earlier or due to a reduction in the programmed amount during the final design phase. Remarks concerning concept/early preliminary design will be applicable to final design. If VE findings are small in scope, the necessary changes or additions may be incorporated during the corrected final period. If VE findings have a major impact on the design, then a contract modification to include a contract time extension will be necessary.

**1.8 CORRECTED FINAL DESIGN SUBMITTAL REQUIREMENTS.** VE Studies will normally be performed prior to the corrected final design submittal. If a study is required later, special arrangements will have to be determined jointly by the PM and the VEO.

**1.9 VE VERSUS DESIGN.** VE encompasses a "new look" by a SECOND TEAM approach which objectively analyzes a system and its functional purpose and its interface with other systems to achieve the required function at least cost commensurate with its useful life and time frame. The prime purpose of this analysis is not to find fault or tear down the original designers, but rather to determine if the function is actually worth the cost. A comprehensive functional analysis study to identify high cost-low worth or low value items and/or entire systems is essential to an organized VE team approach. It can be said that the VE functional study and SECOND TEAM approach make the difference. Since VE augments normal design efforts, the A-E or the IH design team is compensated for his "extra special effort" according to the level of effort required to perform such service. Based on experience, the expected cost-benefit ratio is generally 1 to 30 or greater. The subject of additional design fees to incorporate VE alternatives will be considered and negotiated on a case-by-case basis.

**1.10 BEFORE THE VE METHODOLOGY CAN BE APPLIED.** Items for the building, process and production equipment, site work, site utilities, and support features of potentially "high cost and low worth" must be isolated. This identification process is the "art" of the VE approach. There are some 3,000 to 5,000 cost items involved in a modern facility. To find those few items or areas that represent the bulk of unnecessary costs is not easy. As part of the VE process, a cost model to identify the component costs must be prepared and included in the VE report.

**1.11 SCOPE OF WORK.** VE service shall include a VE analysis of the entire design package. The Value Engineering Study (VES) may be conducted on any of the design submittals shown on EXHIBIT I-C-1, and shall consist of a minimum of one 40-hour team study by a multi-discipline team of professionals normally meeting on five consecutive work days. The study group will follow the five-step job plan (see paragraph 1.17) as recognized by the Society of American Value Engineers (SAVE). A VES Report No. 1 shall encompass the recommendations of the VES team with detailed "BEFORE" (as designed) and "AFTER" (VE alternative) cost estimated life-cycle cost considerations with calculations, sketches, and isometrics as necessary. A VES Report No. 2 will be a summation of those items that were accepted by the Government and which shall be incorporated into the final design package. The Value Engineering Executive Report (Brief), EXHIBIT II-C-1, shall be attached as the first page of each of the reports described above. A formal oral presentation to the design A-E or the IH design team and to the Government will be required as delineated under paragraph 1.15 and 1.20 of these instructions.

**1.12 VALUE ENGINEERING STUDY SERVICES.** They shall be performed in accordance with the schedules set forth in paragraph 1.20 of these instructions.

**1.13 ESTABLISHMENT AND APPROVAL OF THE VE TEAM.** To be cost effective, VE analysis necessitates that the VE effort be performed by a separate or independent firm or group of professional persons not associated with or in the regular employment in the same firm or firms performing the original design. VE services shall be performed by a second team of experienced professional designers having complete independence from the original design team which prepared the original plan and specifications. These VE services shall be performed by a qualified firm or persons having Certified Value Specialist (CVS) credentials that qualify them to perform such services. In all situations, the team leader shall be responsible for and shall select his own team members to meet the foregoing requirements and qualifications.

**1.13.1 Members.** The VE team size shall be as required to provide VE expertise in all design disciplines included in the original design. However, in instances where a discipline has little impact on the total project cost and/or contributes an insignificant design portion of the overall project, a waiver may be granted only by the VEO. The VE team members shall not be the same personnel that are involved in the original design. This statement, however, is not to be construed or interpreted to rule out consultation and partnership between the design A-E and VE disciplines which are mandatory and vital to achieve a well-balanced and cost effective workshop as delineated in the A-E configuration for "review and response" under paragraph 1.15.2 of this guide.

**1.13.2 VE Experience.** All members of the team shall be completely knowledgeable of VE methodology. The VE Team Leader will be CVS certified by the Society of American Value Engineers or have completed the Corps of Engineers 40-hour VE Workshop or equivalent certified training approved by the Society of American Value Engineers with demonstrated professional leadership, experience, and qualifications. The team leader shall have had a minimum of 8 years combined college education and practical on-the-job VE experience. Practical experience is considered to have been gained primarily by being actively engaged as a consultant and leader in VE activities. All members of the VES team shall have prior VE experience and training, thereby making the 40-hour team study or workshop effective and accomplished within the shortest time frame.

**1.14 METHODS OF PROCUREMENT.** At the option of the Government, procurement for VE services shall be accomplished by one of the following two methods:

a. Design A-E Selects VE Firm. A list a professional team members by name (with alternate members if desirable) and their respective resumes representing the various disciplines to be covered (generally four or five) together with the certified (CVS) team leader's qualifications and discipline shall accompany the fee proposal and be made available for approval at the time of fee negotiations. The total VE fee submitted by the design A-E shall include the VE firm's fee for VE services along with the VE team's cost for travel and subsistence, if applicable, and the design A-E's fee for review and response time listed under paragraph 1.15.2 and study group requirements listed under paragraph 1.16. Subsequent changes or substitutions to the approved VE team configuration shall be submitted in writing to the VEO for approval.

b. Government Selects VE Firm. A list of professional team members (with alternate members if desired) and their respective resumes representing the various disciplines to be covered together with the certified (CVS) team leader's qualifications and disciplines shall be ascertained by separate Government contracts in response to CBD announcements. Approval of the VE firm will be exercised by selection committees utilizing the normal Government selection process. If this method is exercised by the Government, the total VE fee submitted by the design A-E shall be the designer's fee for review and response time listed under paragraph 1.15.2 of this guide and study group requirements listed under paragraph 1.16.

#### **1.15 VE AND A-E FIRM REQUIREMENTS.**

##### **1.15.1 *Typical VES Team Requirements (Subcontracted VES):***

- a. Qualified Architect or Engineer/CVS Leader.
- b. Structural Engineer.
- c. Mechanical Engineer.
- d. Electrical Engineer.
- e. Civil Engineer.
- f. On a case-by-case situation, Cost Estimating/Life Cycle Analysis and Drafting technician.
- g. Obtain overview of original design from design A-E.
- h. Site visitation (on a case-by-case basis).
- i. At the termination of the VE Workshop, the VE Team Leader will make a formal presentation to the design A-E or the IH designers, the User and the Government. Fee is to be structured accordingly. See paragraph 1.15.2.

j. The VE Team Formal Presentation to the Government, design A-E, User, and others will be held at the project site, unless otherwise specified. It is anticipated that a maximum of two disciplines may be required. See paragraph 1.15.2 of this guide.

k. Preparing Report No. 1, including the following mandatory enclosure:

Executive Report format with summary of initial cost savings attached. The savings must be checked off as "proposed" in Report No. 1.

l. Other Requirements for VES:

(1) The specific level of effort will be developed for the VES team based on the scope and nature of the specific project and should consider other factors such as geographical location.

(2) The PM shall coordinate the VE workshop with the VEO, the User, the IH designers, the design A-E and the VE firm as far in advance as possible. The PM shall notify all participants by phone and in writing 2 weeks or more in advance of the workshop dates to allow for adequate scheduling.

(3) The Savannah District VE Officer shall be put on "Copy to" list of review conference minutes and any correspondence relating to VE.

1.15.2 *Typical Design A-E Effort for VE Briefing and Review Response of the VE Study.* The specific level of effort for support of the VES, review of the study results, participation in the Report No. 1 presentation, and preparation of Report No. 2, which will be prepared by the VE A-E, OVEST or the IH VE team, shall be based on the scope and nature of the specific project and should consider factors such as geographic location. The level of effort will be determined by negotiations.

1.15.2.1 First two days of the 5-day VE Team Workshop - VE disciplines meet in geographical location of the designer (A-E or IH), where the designers and the user present an overview of the original design to VES team. The design team includes only design A-E or IH disciplines, ie, Project Engineer Manager, Architectural, Structural, Mechanical, Electrical, and Civil, as appropriate.

1.15.2.2 At termination of the VE Workshop or upon completion of VE Report No. 1, the VE Team Leader makes a formal presentation of VE proposals to the designers, User, VEO and PM. The designer then joins and interacts in partnership with the VE firm by phone to supplement the VE effort in preparation for the VE Study Report No. 1 presentation. The design A-E or IH design team and the user shall review each VE change proposed by the VE Team Study and reach an agreement on acceptability. If the proposal, however, is totally unacceptable, it shall be included in the report as having been considered by the VE Team and the rejection shall be accompanied by specific technical reasons for the rejection. Upon a mutually agreeable understanding between the design A-E or the IH design team and the VE firm, the proposal may be indicated as "void" within Report No. 1 and then discussed at the oral presentation. Inasmuch as the designers may wish to include their response during the minutes covering the VE formal presentation, his response need not be in writing prior to the presentation.

1.15.2.3 The designers, VEO, PM, User and VE team shall meet at the Savannah District or other designated geographical location for the VE Study Report No. 1 review conference where the formal

oral presentation is made by the VE Team Leader. Resolution of VE proposals and concurrence or nonconcurrence is achieved at this scheduled meeting.

1.15.2.4 At the conclusion of the VE presentation of Report No. 1, the VE A-E, OVEST or the IH VE team shall prepare Report No. 2 which shall reflect the final decision of the Government's management team. Report No. 2 shall include EXHIBITS II-C-1 and II-C-2. EXHIBIT II-C-1 shall be checked as "Implemented." EXHIBIT II-C-2 is the VE Study proposal summary listing with minutes of the formal VE presentation attached. The Return on Investment (ROI) is to be completed by the Government VE Officer. EXHIBIT II-C-2 serves as a record of decision.

1.15.2.5 The total VE fee should take into account the mobility of the VE consultant so that the fee may be structured at the least cost to the Government.

#### **1.16 STUDY GROUP REQUIREMENTS AND ENVIRONMENT.**

1.16.1 *Information Required.* Prior to commencing a VE Study, the design A-E or the inhouse design team will make available, as far in advance as possible, the following information to the VES Team:

- a. Two sets of full size drawings.
- b. Two sets of detailed cost estimates.
- c. Two sets of specifications.
- d. DD Form 1391 and PDB or other project justifications and description of project pertinent to criteria as appropriate.
- e. Basis of design.
- f. Pertinent technical requirements including technical portions of design manuals that may constrain achieving needed function at lowest overall cost consistent with desired performance.
- g. Design calculations (Mechanical, Electrical, etc.)
- h. Boring logs and soil reports.
- i. Life cycle cost calculations and energy studies based on 25-year life cycle and 10 percent annual discount rate unless otherwise directed.
- j. Other project information such as catalog cuts, photographs of the site, design and criteria manuals, etc., that will be useful to the VES team during the study period.

1.16.2 *Environment.* The VES Team shall be assembled and isolated away from their normal work station in order to avoid daily interruptions such as phone calls, quick questions, brief meetings, etc., which tend to be very disruptive to studies of this type. If circumstances require it, an appropriate meeting room, motel room, etc., should be rented for the workshop to provide the following:

- a. Room size at least 250 SF isolated from normal environment.
- b. Adequate lighting for prolonged reading, writing, etc.
- c. Four large tables with a minimum of eight chairs.
- d. Proximity and access to telephones and duplicating machines.
- e. Blackboard and/or flip chart.
- f. Film projectors and screens as necessary.
- g. Current estimating books, at least three-holed punch, scissors, scales, tracing paper, multi-color felt tip pens, loose-leaf notebooks, etc.

**1.17 BASIC REQUIREMENTS FOR VE.** The determination of use and aesthetic function(s) (both primary and secondary) is a requisite for all VE studies. Accordingly, VE studies shall be accomplished using a functional analysis approach. It should be noted that cost reduction actions cannot be labelled "Value Engineering" unless the action includes identifying the function, brainstorming to determine what else will do the job, and selecting the alternative that will perform the required function at the lowest total cost considering performance, reliability, quality, and maintainability. True VE concept shall be followed in the performance of the study. The key distinguishing features separating the "VE Job Plan Approach" from the general or normal design procedures, economic studies, and other cost reduction techniques are functional analysis, use of creativity to develop sound multiple alternatives, and the principles of maintaining the quality needed by the User. The five-phase VE Job Plan is as follows:

- a. Information. For information gathering and identification of high cost - low worth functions. Define and analyze design, evaluate function, and establish worth. Note: Original design team is required to present the VE Team with an overview of original current design. The design team, VEO and PM shall attend.

- b. Creative (Speculative) Phase. For brainstorming the generation of alternative ideas by means of creative thinking atmosphere and the withholding of judgment during this phase. The design team, VEO and PM shall attend.

- c. Analysis (Judgment/Judicial) Phase. For evaluating and judging each alternative idea for merit and separating needs from desires. List basic advantages/disadvantages, compare, evaluate, refine, and select best alternative ideas for development of firm proposals. The design team, VEO and PM shall attend.

- d. Development Phase. Fully develop and summarize best alternative ideas using accurate and realistic costs. Develop "before" and "after" cost comparisons with net savings. Discard alternatives that prove to be not cost effective or of low value. Only the VE team shall attend.

- e. Presentation Phase. Prepare a formal presentation report in sufficient detail for the fully developed viable alternatives including view-graphs, savings, and recommendations needed to

implement each specific VE proposal. The report must be in sufficient detail to permit a technical review to evaluate the merits of each proposal. The design team, VEO, User and PM shall attend.

**1.18 REPORTS AND MINIMUM DOCUMENTATION REQUIREMENTS FOR VE.** The results of each VE Study performed on the project shall be documented as follows:

a. Reports and Minimum Documentation.

(1) EXHIBIT II-C-1 - Executive Report and contents page with summary of initial cost savings. EXHIBIT II-C-1 is mandatory for both Report No. 1 and Report No. 2.

(2) EXHIBIT II-C-2 - VE Study proposal summary listing with summary of initial cost savings. ROI to be completed by the Government VE Officer. EXHIBIT II-C-2 serves as a "Record of Decisions" and is mandatory for Report No. 2.

(3) Brief description of total project and project requirements with a copy of DD Form 1391.

(4) Brief summary of VE recommendations including initial and life cycle cost savings (provide "use" experience where material alternates are recommended - EXHIBIT II-C-3).

(5) Site plan, floor plan, and one elevation. Use 8-1/2 x 11 fold out.

(6) VE cost model of project plus bar graphs of subsystems.

(7) Each VE proposal will be described "Before and After VE" listing advantages and disadvantages. Also, each proposal will be accompanied with a detailed realistic cost estimate of savings.

(8) "Before" and "After" sketches and isometrics, as necessary, to clearly depict VE proposals.

(9) Life cycle cost analysis for energy proposals and other proposals, as appropriate, all in accordance with acceptable guidance. See EXHIBIT II-C-4 (25-Year Life, 10 percent Annual Discount Rate).

(10) Footnote new material and recommendations to change criteria.

(11) Complete five-step job plan of all work will be submitted as a glossary for reference (EXHIBIT II-C-3).

b. VE Report No. 1. This preliminary report shall be prepared by the VE Study Team and shall document the "VE Job Plan" and the results of the Value Engineering Study and services performed. The VE Team shall not be limited by the technical requirements and the design data, but shall challenge it except for the construction cost limitation which shall not be exceeded. Savings generated by criteria challenges and/or waivers to criteria shall be footnoted. All proposals and their respective original and proposed detailed estimates shall be documented in this report. Where clarification is deemed appropriate, the proposal shall be supported by rough-hand sketches, isometrics, drawings, descriptions, interface systems, specifications, and life-cycle cost to permit a thorough evaluation by the design A-E, the IH design team, VEO, PM and User. The report shall be

concise, yet informative in all respects. If the VE study of the design results in no recommended changes to the design, a detailed report indicating the effort and areas considered shall be submitted.

c. The Second and Final Report No. 2. This report will be prepared by the VES team and is a summation of those items that were accepted by the design A-E, the IH design team, VEO, PM and User. Report No. 2 shall be complete and final in all respects with all proposals resolved unless specifically reserved by the Government. Accordingly, Report No. 2 shall not list any items "Held in Abeyance" unless so directed. Description and summation of proposals shall include initial and life cycle savings for all proposals. Minutes of VE presentations are mandatory and shall be the responsibility of the VES team. A copy of the minutes shall be included in Report No. 2. The accepted proposals enumerated in Report No. 2 shall constitute a "Record of Decisions" on VE recommendations to be implemented if so directed by a separate order. Also, certain proposals that have been accepted in past VE studies will be accepted in future projects unless ruled otherwise by the Government.

**1.19 VE REPORT FORMAT.** Report No. 1 and Summary Report No. 2 (and other reports that may be called for in the scope of work) must be systematically assembled and must be short and concise, yet informative. VE reports shall be prepared and submitted on 8-1/2 x 11 bond paper and bound under hardback cover appropriately identified. Sketches may be 8-1/2 x 11 or fold out. Pages must be sequentially numbered in the lower right-hand corner to facilitate assembly. Report No. 1 shall be referenced by Report No. 2. There is no requirement to duplicate information from Report No. 1 in Report No. 2. The reports shall be computer generated in accordance with the latest guidance and shall follow the Value Engineering Support System (VESS) format.

**1.19.1 Numbering System.** If responding is necessary, the design A-E or the IH design team shall refer to the VE report using the same numbering system as in the VE report and in the same sequence as in the report submitted by the VE team. This will facilitate an orderly final review by all concerned parties.

**1.19.2 Alternatives.** All alternatives which are unacceptable to the design A-E, the IH design team, the User and the reviewers must be supported by reason for rejection, including technical, cost code, etc. All of the designers' calculations, both cost and technical calculations, should be included in an appendix. Also, all alternatives presented in the VE report, identified as Other Areas of Potential Savings, must be responded to in the same manner. Where possible, savings associated with these other areas should be included even though the savings are not shown by the VE Team in the VE Study.

**1.20 VE REPORT SUBMISSION SCHEDULES FOR ORAL PRESENTATION.** VE services are an integral part of the design process and, as such, shall be submitted in accordance with the schedules and required number of submittals set forth at the predesign or prestudy conference.

**1.20.1 Working Relationships.** Copies of Report No. 1 shall be mailed in time to be received and reviewed by the Government at least 2 weeks prior to the formal VE oral presentation. Report No. 1 shall receive concurrent review by the design A-E or the IH design team and the Government to include the Using Agency. The design A-E or the IH design team shall consult with the VES Team as necessary during the review time to identify problem areas or questionable VE proposals. It is envisioned that with a good harmonious relationship and the proper spirit of cooperation prior to the

formal oral VE presentation to the Government, differences will have been resolved and agreement and concurrence will have been reached between the design A-E or the IH design team and the VE team regarding acceptable cost effective VE proposals or alternative proposals. Accordingly, the Government will have to rule only on those proposals involving criteria changes and those few proposals where agreement is in doubt.

**1.20.2 Presentation and Report.** In all cases, the VE Team will be required to make a formal oral VE presentation (using aids such as flip-charts, view-graphs, sketches, isometrics, or other acceptable methods) to the Government, the design A-E, and the User within a 2-week period (unless indicated otherwise) immediately following the submittal of VE Report No. 1. View-graphs are particularly effective and are required for the formal on-board VE presentation. Prime A-E representatives shall attend the VE presentation unless otherwise scheduled. Copies of VE Report No. 2 will be prepared by the VES team and submitted following the oral presentation to the Government. It is particularly important that other cost effective suggestions that may evolve from attendees during the VE presentation to the Government be incorporated by the VES team in the VE Report No. 2.

**1.21 APPROVAL AND IMPLEMENTATION OF PROPOSED VE CHANGES.** The Contracting Officer may approve or reject in whole or in part any VE change and reasons for rejection shall be included in the minutes of the formal VE presentation and Report No. 2. The implementation of approved VE changes shall be the incorporation of the approved changes into the final design of the project only as directed by the PM and the Contracting Officer under the changes clause of the contract.

**1.22 GUIDANCE AND CONSULTATION.** Additional guidance for the VE job plan is contained in EXHIBITS II-C-3 and II-C-4. Any questions concerning VE reports, waivers, general guidance, etc., may be resolved by consultation with the Savannah District VE Officer and the Project Manager.

**1.23 SPECIFIC INSTRUCTIONS.** The VE proposals and ideas become the property of the Government and may be used on future contracts or designs without additional compensation to the A-E.

**VALUE ENGINEERING**  
**EXECUTIVE REPORT**  
**US ARMY ENGINEER DISTRICT SAVANNAH**

DATE \_\_\_\_\_

POTENTIAL (     ) )  
REALIZED (     ) )

STUDY CONTROL NO. VES \_\_\_\_\_

PROJECT:

STATION/LOCATION:

LINE ITEM:

PROGRAM YEAR:

DESIGNER:

VES TEAM:

VES TEAM LEADER: \_\_\_\_\_

PROPOSED SAVINGS: \$ \_\_\_\_\_

ACCEPTED SAVINGS: \$ \_\_\_\_\_

ACCEPTANCE RATE: \_\_\_\_\_%

\*\* TEAM STUDY COST: \$ \_\_\_\_\_

\*\* REDESIGN/IMPLEMENTATION COST: \$ \_\_\_\_\_

\*\* REVIEW COST: \$ \_\_\_\_\_

\*\* TOTAL VES COSTS \$ \_\_\_\_\_

\*\* ROI SAVINGS/COST=

\*\* CONSTRUCTION CONTRACT NO: DACA21-

\*\* AWARD DATE:

\*\* AWARD AMOUNT: \$ \_\_\_\_\_

\*\* BY SAV DIST VEO

Exhibit II-C-1 .....

VE STUDY PROPOSAL SUMMARY

<u>CHANGE DESCRIPTION</u>	<u>POTENTIAL SAVINGS</u>	<u>SAVINGS IMPLEMENTED</u>	<u>GENERAL COMMENTS AND/OR JUSTIFICATIONS FOR REJECTION</u>
1. Use Precast Duct in lieu of Concrete Encased PVC	24,000	0	
3. Eliminate Supervisory Control and Data Acquisition System	435,000	435,000	ACCEPTED WITH CONTRACTOR'S OPTION. Precast Duct with PVC liner will be allowed as a contractor option. Manhole to manhole duct must be of the same type construction. No saving anticipated.
4. Use Lower Cost Supervisory Control and Data Acquisition System	20,000	0	
5. Eliminate Redundancy from Supervisory Control Data Acquisition System.	44,000	0	ACCEPTED
6. Eliminate Paper Insulated Lead Covered Neutral Cable and Provide Ethylene Propylene Rubber 15 KV Cable Throughout	18,000	0	REJECTED. Rejected in favor of 1-3
7. Use Shielded 133 Percent Insulation 15 KV Ethylene Propylene Rubber Cable	94,000	94,000	
9. Delete Watt and Volt Ampere Reactive Metering from Substation Breakers	13,000	0	REJECTED. Rejected in favor of 1-3
10. Use Wood Distribution Poles for Overhead in Lieu of Concrete	681,000	562,000	
TOTALS			ACCEPTED ACCEPTED

$$\text{Acceptance Rate} = \frac{\text{Savings Implemented}}{\text{Potential Savings}} = \frac{\$562,000}{681,000} = 82.5\%$$

$$*\text{ROI} = \frac{\text{Savings}}{\text{Study Cost}} = \frac{\$562,000}{\text{Study Cost}} =$$

\*To be completed by VE Officer  
Exhibit II-C-2

Value Engineering  
**WORKBOOK**  
 (EP 11-1-3)

Project	
Study Item	

Study Team	Office Symbol	Telephone
Leader		
Members		

DISCIPLINES	
ARCH	SPECS
CIVIL	STRUCT
ELEC	_____
MECH	_____

**US ARMY CORPS  
 of Engineers**

STUDY NUMBER	DATE
--------------	------

□

ENG Form 3986-R, Sep 85

EDITION OF JUN 76 IS OBSOLETE

(Proponent: DAEN-EC)

**Consultants**

Name-Title

Address

Telephone

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## INFORMATION PHASE I

### TECHNIQUES

Get all facts from the best possible sources.

Determine and evaluate the function of the present design.

Prepare a FAST diagram.

Obtain cost information.

Determine present design constraints.

### USE GOOD HUMAN RELATIONS

### KEY QUESTIONS TO ANSWER

WHAT IS IT?

WHAT DOES IT DO?

WHAT MUST IT DO?

WHAT DOES IT COST?

RECORD ALL INFORMATION

PHASE I

INFORMATION

Value Engineering  
WORKBOOK

PRESENT  
System or Design

Status of Project

Approval Authority Individual	Position/Organization	Telephone

Historical Data

Codes

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Special Criteria

Restrictions

Other

# FUNCTION ANALYSIS WORKSHEET



Place the name of the item being studied (What is it?) at the top of the table.

Indicate the component parts on the table.

List all the functions performed by the item (What does it do?) in the Function column. As indicated in the table, a two work (verb-noun) description should be used.

Identify the item's function(s) as to basic "B" (What must it do?) and secondary "2d". The Expanation column can be used when necessary to add more detail on the function of the item.

List the quantity requirements for each component and the unit of measure.

Indicate the cost of each component and a total for the original design

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Sep 85



PHASE I

INFORMATION

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WORKBOOK

FAST  
Diagram  
Original  
Design



PHASE I

INFORMATION

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NOTES

Exhibit II-C-3  
page 12 of 39



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## SPECULATION

## PHASE II

### TECHNIQUES

Use creative thinking (group brainstorming).

Don't let regulations or people control your thinking.

Eliminate.

Simplify.

Modify and/or combine alternatives.

### USE GOOD HUMAN RELATIONS

### KEY QUESTION TO ANSWER

WHAT ELSE WILL PERFORM THE BASIC FUNCTION(S)?

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PHASE II SPECULATION

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Ideas

BASIC FUNCTION: \_\_\_\_\_  
verb noun

Alternatives - List as many as possible.



ANALYSIS  
PHASE III

TECHNIQUES

Use cost references.

Apply matrix.

Make sketches.

Consult experts.

Use your own judgement.

USE GOOD HUMAN RELATIONS

KEY QUESTIONS TO ANSWER

WHAT DOES EACH FEASIBLE ALTERNATE  
COST?

WILL EACH PERFORM THE BASIC FUNCTION(S)?



## CRITERIA WEIGHING PROCESS INSTRUCTIONS

List functions, elements to be compared. (In this case-cost, maintainability, aesthetics, etc.)

Based on information obtained, compared "A" with "B" (cost vs. Maintainability) and place the letter representing the most important in the upper left hand block in the matrix. Add to this block the appropriate weight factor, i.e., 1-2-3-4-5. (The weight factor is determined by the speed of the decision, i.e., if rapid use 5, etc.)

Compare "A" to "C" (cost vs. aesthetics) in a similar manner and add the weight factor.

Compare "A" to each of the other elements, determining importance and weight.

When this is done, step to "B" and compare it, on a one-to-one basis, to each other letter element. Continue this process until every element has been compared to every other element.

After all elements have been compared, add the weight factors for each letter, both vertical and horizontal, and indicate the sum.

Then transfer, in descending order, the element with its associated weight to the ANALYSIS MATRIX.

## ANALYSIS MATRIX INSTRUCTIONS

Transfer the criteria evaluated in the CRITERIA WEIGHING MATRIX to the spaces above the letters a. through i. it is not necessary to use all the criteria evaluated since the previous evaluation may indicate minor importance. The criteria should be listed in descending order of weight.

Transfer the weight determined for criteria to the appropriate spaces below the letters a. through j.

Describe briefly the original design after 'Present Way.' List the alternative proposals in the spaces below the 'Present Way.'

In the upper left triangular shaped area of the blocks after the present and alternative ideas, place one of the numbers shown at the bottom of the page. This number indicates the performance of the idea relative to the desired criteria.

Multiply the weight (discussed in paragraph 2 above) by the performance evaluation number (discussed in paragraph 4 above) and place the answer in the space diagonally below. This will provide an evaluation of alternatives with the higher number being the more desirable.





PHASE III

ANALYSIS

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Sketches  
& Notes



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DEVELOPMENT  
PHASE IV

TECHNIQUES

Recommend specifics not generalities.

Gather convincing facts.

Spend as if your own.

USE GOOD HUMAN RELATIONS

KEY QUESTION TO ANSWER

WILL THE ALTERNATIVE(S) MEET ALL  
NECESSARY REQUIREMENTS?

PHASE IV

DEVELOPMENT

Value Engineering

PROPOSED

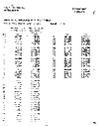
WORKBOOK

FAST  
DIAGRAM



Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Revenue	100	100	100	100	100	100	100	100	100	100
Expenses	100	100	100	100	100	100	100	100	100	100
Net Income	0	0	0	0	0	0	0	0	0	0





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**PRESENTATION  
PHASE V**

## TECHNIQUES

FAST diagram as communications tool.

Be brief, pertinent, convincing.

Remove roadblocks.

## USE GOOD HUMAN RELATIONS

### ORAL PRESENTATION

this presentation should include, but not be limited to, the following:

- Identification of project studied.
- Brief summary of problem (high cost, difficult ..... construction, et al.).
- Description of original design.
- Cost of original design.
- Results of FAST (function analysis systems ..... technique).
- Technical data supporting selection of the ..... alternative(s).
- Cost data supporting the alternative(s).
- Advantages and disadvantages and reasons for ..... accepting alternative(s).
- Sketches of before and after designs, clearly . depicting proposed changes  
(drawings marked to  
show proposed changes are acceptable).
- Problems and cost of implementation.
- Estimated cost savings.
- Acknowledgement of contribution by others.
- Summary statement.

### CONSIDERATIONS

People are:

- Interested in performance first.
- Influenced by the effect adoption of the proposal will have on their sphere of work.
- Persuaded by the before and after part of the proposal with advantages and disadvantages of each.

## PHASE V PRESENTATION

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WORKBOOK

Outline



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**IMPLEMENTATION**

## PHASE IV

### TECHNIQUES

Provide assistance.

Correct misconceptions.

Minimize delays.

Schedule follow-up meetings.

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PHASE VI

IMPLEMENTATION

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Plan

Implementation Actions. (List actions required to implement each of the selected alternatives.)

### Critical Items

### Problems

Technical Evaluation. (Detail for each selected alternative any required test or analytical procedures that may be necessary to verify that the basic function(s), can be performed without decrease in necessary quality, maintainability, reliability, performance, and compatibility. If any tests or analysis have been performed, list results.)

Remarks. (List all other actions necessary such as obtaining approvals, shop drawings, samples, operational tests and persons, groups or agencies to take action to complete acceptance of recommendations. Include any approval actions required at higher authority.)

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**PROPOSAL**  
 (EP 11-1-3)

Project	
Study Item	

Study Team	Office Symbol	Telephone
Leader		
Members		

<b>DISCIPLINES</b>	
ARCH	SPECS
CIVIL	STRUCT
ELEC	_____
MECH	_____

**US ARMY CORPS  
 of Engineers**

STUDY NUMBER	DATE
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EDITION OF JUN 76 IS OBSOLETE **SAVINGS**\_\_\_\_\_

PRESENT

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PROPOSAL

Description

FUNCTION OF ITEM

VERB

NOUN

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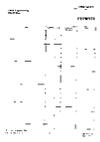
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DESCRIPTION

Value Engineering  
PROPOSAL

PRESENT

SKETCH



Value Engineering  
PROPOSAL

PRESENT

FAST  
DIAGRAM

**PROPOSED**

**Value Engineering  
PROPOSAL**

**Description**

**PROPOSED**

**Value Engineering  
PROPOSAL**

**SKETCH**



ENG

Value Engineering  
PROPOSAL

PROPOSED

FAST  
DIAGRAM  
(Use is Optional)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Revenue	100	100	100	100	100	100	100	100	100	100
Expenses	100	100	100	100	100	100	100	100	100	100
Net Income	0	0	0	0	0	0	0	0	0	0

**Value Engineering  
PROPOSAL**

**INTEREST  
TABLES**

**ANNUAL COMPOUND INTEREST TABLE**

**EFFECTIVE RATE (APR) = 10%**

**BASE = 1.10**

YEARS	PRESENT VALUE REVERSION OF 1	PRESENT VALUE ORD. ANNUITY 1 PER PERIOD		PW	PWA
	PW	PWA		PW	PWA
1	.909091	.909091	41	.020086	9.799137
2	.826446	1.735537	42	.018260	9.817397
3	.751315	2.486852	43	.016600	9.833986
4	.683013	3.169865	44	.015091	9.849089
5	.620921	3.790787	45	.013719	9.862808
6	.564474	4.355261	48	.012472	9.875280
7	.513158	4.868419	47	.011338	9.886618
8	.466507	5.334926	48	.010307	9.896926
9	.424038	5.759024	49	.009370	9.906296
10	.385543	6.144567	50	.008519	9.914814
11	.350494	6.495061	51	.007744	9.922559
12	.318631	6.813692	52	.007040	9.929599
13	.289664	7.103355	53	.006400	9.935999
14	.263331	7.366687	54	.005818	9.941817
15	.239392	7.606080	55	.005289	9.947106
16	.217629	7.823709	56	.004809	9.951915
17	.197845	8.021553	57	.004371	9.956286
18	.179859	8.201412	58	.003974	9.960260
19	.163508	8.364920	59	.003613	9.963873
20	.148644	8.513564	60	.003284	9.967157
21	.135131	8.648694			
22	.122846	8.771540			
23	.111678	8.883218			
24	.101526	8.984744			
25	.092296	9.077040			
26	.083905	9.160945			
27	.076278	9.237223			
28	.069343	9.306567			
29	.063039	9.369606			
30	.057309	9.426914			
31	.052099	9.479013			
32	.047362	9.526376			
33	.043057	9.569432			
34	.039143	9.608575			
35	.035584	9.644159			
36	.032349	9.676508			
37	.029408	9.705917			
38	.026735	9.732651			
39	.024304	9.756956			
40	.022095	9.779051			

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PROPOSAL

REMARKS

PROPOSED PLAN:

PRESENT PLAN:

SUMMARY OF COST OF PRESENT DESIGN:

INITIAL COST \$ \_\_\_\_\_  
OR  
LIFE CYCLE COST \$ \_\_\_\_\_  
  
COST OF PRESENT DESIGN \$ \_\_\_\_\_

SUMMARY OF COST OF PROPOSED DESIGN:  
(W/O IMPLEMENTATION COSTS)

INITIAL COST \$ \_\_\_\_\_  
OR  
LIFE CYCLE COST \$ \_\_\_\_\_  
  
COST OF PROPOSED DESIGN \$ \_\_\_\_\_  
GROSS SAVINGS (PRESENT MINUS PROPOSED) \$ \_\_\_\_\_

SUMMARY OF IMPLEMENTATION COSTS FOR  
PROPOSED DESIGN:

COST OF STUDY \$ \_\_\_\_\_  
COST OF RE-DESIGN \$ \_\_\_\_\_  
COST OF MODIFICATION \$ \_\_\_\_\_  
  
TOTAL COST OF IMPLEMENTATION \$ \_\_\_\_\_

NET SAVINGS:  
(GROSS SAVINGS MINUS COST OF IMPLEMENTATION) \$ \_\_\_\_\_