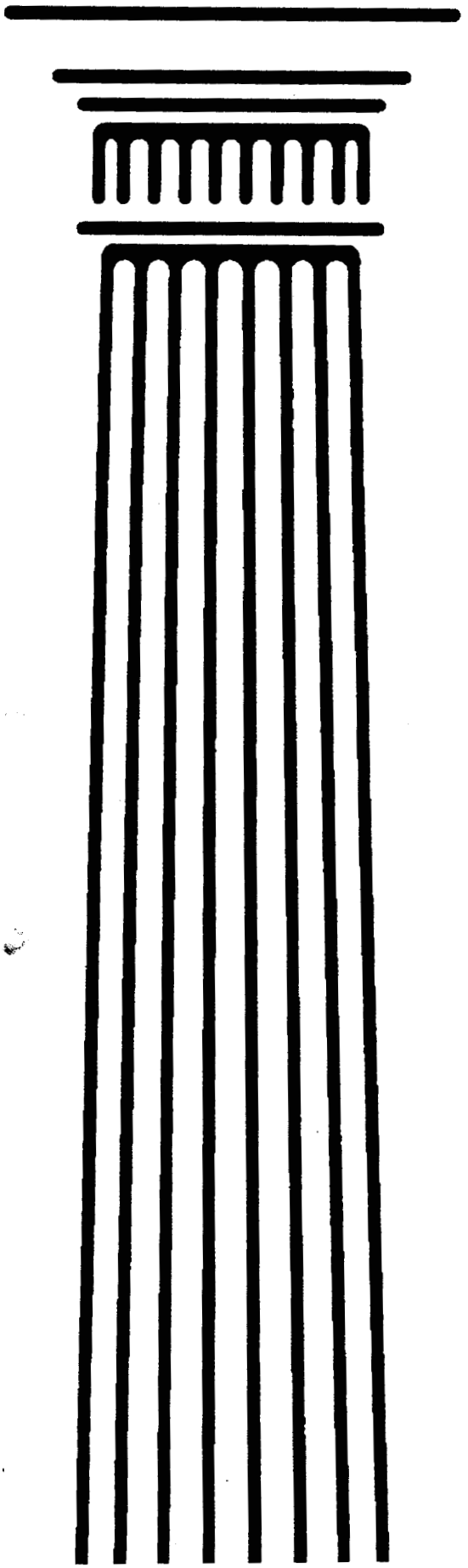

Value Engineering Program Guide for Design and Construction

Volume 2

Contracting Officers and Professional Services Contractors

PBS-PQ251

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Value Engineering Program Guide for Design and Construction

Volume 2 - Contracting Officers and Professional Services Contractors

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Chapter 1 General

Introduction

This document provides guidelines for contracting officers on the methods of acquiring value engineering (VE) services. This document also provides guidance for professional service contractors on responding to solicitations for VE services by the PUBLIC BUILDINGS SERVICE (PBS). It is applicable to PBS projects under the technical direction of the Regional Design and Construction (D&C) Divisions.

This guide has been prepared for use by contracting officers and professional services contractors - VE consultants, architects-engineers (A-Es) and construction managers (CMs). This guide is intended to be incorporated as a reference in professional services contracts and to serve as a basis of negotiating the services and fees of these contracts.

Past VE practices in PBS were set up under a centralized management approach with extensive involvement and participation by dedicated in-house staff. The implementing GSA Orders (PBS P8000.1A, P8020.2 and P8050.1B) were cancelled by the succeeding GSA Order, Public Buildings Service Value Engineering (VE) Programs (PBS 8050.1C). This Order (included as Appendix A) eliminated the central management of VE and requires each PBS program office to set up its own VE programs in applicable areas. By this approach, the direction and emphasis of VE can be specifically tailored to the diverse program areas in which it is to be applied.

A principal area for VE application is in design and construction - both for new facilities and for repair and alteration of existing ones. This guide (Volume 2) replaces the cancelled GSA Handbook, Architect Engineer and Construction Manager Value Management Services (PBS P8010.1).

Background

PBS started its formal VE program in 1970. In the mid 1970's, PBS adopted the term Value Management (VM) and developed and issued a body of policy and procedural guidance on VM. These documents defined a single, centrally managed program for all functional areas within PBS.

Resulting VE activity was high during the 1970's, particularly on major PBS design and construction projects. During the 1980's VE activity dropped off as emphasis on the program was reduced.

The Office of Management and Budget (OMB) has placed a renewed emphasis on the application of VE in the federal government and established new requirements. As a result, a study was undertaken by PBS to determine how best to establish and manage a VE program. This study, completed in 1991, consisted of a review of previous and existing programs in federal and private sectors and interviews with PBS personnel in the regions and at the Central Office. The primary focus of the study was on design and construction.

The final product of the study was a report outlining key features and elements of a PBS D&C VE program. This guide is based on the conclusions of that report.

Chapter 1 General

Governing Directives

On January 26,1988, OMB issued circular A-131 which required all agency heads to establish and/or improve their use of VE. Subsequently on December 5,1988, GSA Order ADM 8030.1A was issued in order to establish overall GSA-wide guidelines for VE.

On August 14, 1991, the GSA Order, Public Buildings Service Value Engineering Programs (PBS 8050.1C) was issued. This Order establishes PBS-wide general guidelines for implementing VE. These guidelines form the basis for the specific requirements of the DC&VE Programs.

Approach

The approach to VE as outlined in this guide and as called for in PBS 8050.1c consists of the following key objectives:

(1) To help PBS live up to its responsibility to serve the public trust.

(2) To conform to the letter and the spirit of OMB Circular A-131 and GSA Order ADM 8030.1A.

(3) To not unduly impede the efficient and effective delivery of services to PBS customer agencies.

Value Engineering is defined as 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 the required performance, reliability, quality and safety Numerous other terms (value management, value analysis, etc.) are also used when referring to VE. While there are subtle differences among these terms they all refer to generally the same process. PBS will uniformly use the term value engineering, as does this guide.

Relationship to Other Documents

The general requirement to apply VE on D&C projects is also addressed in the following GSA documents:

- The GSA Handbook, Facilities Standards for the Public Buildings Service (PQS-100).
- The GSA Order, Design and Construction Operating Principles and Procedures (PBS 3430.4).
- The GSA Handbooks, Procurement and Administration of Design and Construction, Volumes 1 and 2 (PBS P 3420.1A and PBS P 3420.2A).

If specific references or provisions within these directives are inconsistent with this guide, the guide will govern. Any inconsistencies will be corrected by future modifications of these existing directives.

The regulatory basis for the D&C VE program is the FAR - Part 48. The applicable standard clauses for the participation of A-E and construction contractors in the VECP process appear in the FAR - Part 52. The two standard FAR clauses (A-E and construction), and the deviation clause for design-build contracts, all are provided in Appendix C.

Organization of this Guide

This guide is divided into seven chapters. Each chapter is intended to cover individual and generally independent areas of interest. The purpose of each chapter is as follows:

(1) ***Chapter I - General*** - Provides general and background material. Sets the context in which the D&C VE program operates.

(2) ***Chapter 2 - Value Engineering Program Intent*** - Provides the overall philosophy and intent of the D&C VE program. Discusses program evaluation and constraints.

(3) ***Chapter 3 - Program Implementation and Management*** - Provides guidance for degree of VE consultant independence and the impact of cost estimate revisions.

(4) ***Chapter 4 - Value Engineering Consultant Selection Guidelines*** - Provides guidelines for VE consultants on responding to advertisements and selection.

(5) ***Chapter 5 - Value Engineering Study Requirements*** - Provides specific requirements for conducting VE studies on GSA-PBS projects. This includes technical guidance, scope of services and suggested level of effort.

(6) ***Chapter 6 - Life Cycle Costing Guidelines*** - Provides general guidelines on applying LCC techniques as part of a VE study.

(7) ***Chapter 7 - Other Issues*** - Covers other issues including training and education and impact of VE on GSA-PBS criteria.

Appendices are included to supplement material presented in the chapters. Appendix B in particular is intended to provide specific VE workshop procedures.

Definition and Use of Terms

In general, terms used throughout this guide are presented and defined within the appropriate chapter or section. However, for consistency, the following terms are used throughout the guide.

(1) **Value Engineering** (VE) is used in lieu of all the various related terms such as Value Analysis (VA) and Value Management (VM) Further distinction of terms is not necessary.

(2) **VE study** refers on the overall process of applying VE on an individual project. The VE workshop refers to the specific portion of the study involving an intensive group/team effort and a specific agenda.

(3) **PBS representative** refers to the PBS project manager or other PBS employee in charge of the project under consideration.

(4) **User agency** refers to the specific agency or agencies to occupy the building being constructed or altered.

(5) **VE consultant** refers to the specific firm providing VE services on a project or projects.

(6) **A-E** refers to the architect or architect/engineering firm responsible for the design of the project under study.

(7) **CM** refers to the firm providing construction management services for the project under study.

(8) **VEP** refers to Value Engineering Proposal. VECP refers to Value Engineering Change Proposal. These terms are defined in the FAR Standard Clauses contained in Appendix C.

Index of Acronyms

A-E	Architect-Engineer
CADD	Computed Aided Design and Drawing
CBD	Commerce Business Daily
CM	Construction Manager
COTR	Contracting Officer's Technical Representative
CVS	Certified Value Specialist
D&C	Design and Construction
FAR	Federal Acquisition Regulations
FAST	Function Analysis System Technique
GSAR	General Services Administration Regulations
IQ	Indefinite Quantity
LCC	Life Cycle Cost
MEP	Mechanical-Electrical-Plumbing
OMB	Office of Management and Budget
PBS	Public Buildings Service
PM	Project Manager
R&A	Repair and Alteration
RFP	Request for Proposal
SAVE	Society of American Value Engineers
VA	Value Analysis
VE	Value Engineering
VECP	Value Engineering Change Proposal
VEP	Value Engineering Proposal
VETC	Value Engineer Team Coordinator
VM	Value Management

Chapter 2 Value Engineering Program Intent

Chapter 2 Value Engineering Program Intent

Philosophy and Overall Objectives

The basic philosophy of the PBS D&C VE program is to enhance the value received per dollar spent over the life-cycle of constructed assets. The program is centered on several major overall objectives:

(1) The VE program is an integral part of the overall project delivery process and is not a separate entity designed to "second-guess" PBS management, the design A-E or the CM. The application of VE will be planned and scheduled on projects to promote timely, efficient and effective delivery of services to PBS customer agencies.

(2) For maximum effect without undue impact on project schedules, VE focus must begin early in the design process (at Concept Design), then continue through Tentative Design and into Construction Documents, if necessary.

(3) Primary emphasis is placed on obtaining maximum life-cycle value for first-cost dollars expended within project budgets. Improved value can be represented in a number of different ways depending upon specific project needs. This would include improved function, flexibility, expandability, maintainability and/or aesthetics, as well as reduced life-cycle cost (LCC).

(4) Secondary emphasis is placed on first-cost reductions derived from the program. First-cost reductions achieved to bring a project within approved budget are not considered as "savings". First cost savings are only those dollars withdrawn from approved budgets and reallocated to other uses, all as a result of VE. This will occur when required project functions and features can be delivered at a reduced project budget. VE is not to be applied as a simple cost cutting mechanism at the expense of required functions or features.

Philosophy and Overall Objectives (Continued)

(5) First cost budget increases will be considered when justified based on life-cycle cost reductions. This will be a priority use for funds accumulated as a result of budget revisions described above.

(6) Estimated life-cycle cost reductions will be considered and reported as savings only when supported by a full economic analysis. Acceptance and implementation of VE ideas based on projected life-cycle cost reductions are encouraged, whether or not the cost reductions meet the criteria to be counted as savings.

(7) VE services generally will be provided by an independent consultant, with support from the design A-E, CM, PBS and the user agency.

(8) Regions will have broad flexibility in determining the level of VE effort allocated to each project, based on a reasonable expected return on investment relative to project size, complexity and status.

(9) VE is not intended to serve as an instrument for project scope/budget reconciliation. Using VE for this purpose is discouraged, because it compromises both the integrity of VE process and the accountability of the A-E in meeting the "design to" cost limitation.

Basis of Evaluating the Program

Within PBS, the effectiveness of the D&C VE program is assessed by evaluation of several interrelated factors. These factors are explained in detail in following chapters. They fall into the following general areas:

(1) First Cost Reduction

These reductions are attributed to the VE program only when required project functions or features can be delivered at the reduced cost. Simple cost cutting - e.g. reducing cost at the expense of required features or functions - is not VE. VE first cost reductions are counted as VE savings to the extent that dollars are withdrawn from approved budgets based on the results of VE studies.

(2) Life Cycle Cost Reduction

LCC reductions are based on the aggregate of first cost and anticipated future cost in maintenance and operations. Techniques in LCC are presented in Chapter 6. When additional first cost is required to implement a specific VE suggestion, this can be offset by other VE suggestions which reduce initial cost. As long as they do not entail first-cost project budget increases, VE suggestions, based on apparent life-cycle cost reductions, may be adopted without formal LCC analysis. However, LCC reductions will be counted as VE LCC savings only when supported by sufficient economic analysis as described in Chapter 6. Further guidance on LCC analysis is provided in the PBS Facilities Standards Handbook (PQS-100)

(3) Value Improvement

Value improvement is a subjective expression referring to a projected or apparent favorable shift in cost/worth ratio. The objective of all VE suggestions is value improvement, whether or not cost reductions are involved. VE suggestions may be to reduce life cycle cost with no reduction or a lesser reduction in worth, to increase worth with no increase or a lesser increase in life-cycle cost, or (ideally) to increase worth and reduce cost. All VE suggestions which involve adjustments in worth should be related to specific forms of such adjustment (e.g., productivity, flexibility, expandability, aesthetics, etc.), whether or not they also involve cost adjustments.

Overall Constraints

No specific constraints are set against the VE program except as overall funding may limit and specific procedures of this guide may apply.

1. Technical Criteria and Standards

Technical considerations should be set on a project by project basis and should not limit the reasonable application of VE. GSA and other governing criteria are considered to be open to challenge and reconsideration when significant benefits can be obtained. Applicability of criteria and requirements for justifying deviations from these criteria are generally provided in the issuing documents. Only criteria that are governed by law or by codes must be followed without exception.

2. Programmatic Requirements

Concept stage VE studies may also include consideration and challenge of a project's program of requirements, if there are apparent inefficiencies in the program. The primary focus in this area should be on whether the program most efficiently accommodates the basic spatial and functional needs and desired features. With regard to program review, what is and is not VE needs to again be emphasized. Simply paring down the program to reduce cost is not VE. Restructuring the program to achieve the same basic end objectives more fully or efficiently is a legitimate and desired VE activity. Attention in this area can typically focus on support space requirements, with emphasis on redundant or otherwise unnecessary program elements.

Program revisions may require intervention by PBS management to authorize reviews and reconsideration of the program as developed.

Chapter 3 Program Implementatio and Management

Chapter 3 Program Implementation and Management

Project Delivery Methods

Major PBS projects are undertaken using either or a combination of two general delivery methods.

(1) ***Traditional*** which calls for competitive selection of a design *A/E* and a CM. This is followed by a construction procurement action using either sealed bids or competitive proposals.

(2) ***Design-Build*** which effects a contract for both design and construction in one or more steps. These steps may involve some form of design competition or may be more straightforward technical and price proposal competition.

The primary emphasis for the VE program as defined in this guide is on the traditional delivery process. VE is implemented in the design-build process entirely through contractor incentive provisions. (See Appendix C)

Independence of the VE Consultant

VE services generally are to be obtained from a VE consultant under direct contract with PBS. Brooks Architect-Engineer Services Act (PL92-582) procurement procedures will be used.

The preferred arrangement is for the VE consultant to have no affiliation with the design A-E, nor to be otherwise providing any services through the design A-E. While total independence may be impracticable, maximum independence of the VE consultant from the design A-E is required. In some instances, it may be appropriate for Contracting Officers to exclude A-E's or VE consultants from consideration for contracts due to conflict of interest. (See the Federal Acquisition Regulations, Subpart 9.5)

Impact of Cost Estimate Revisions on Design A-E Contract

The A-E's design fee is limited by law to six percent of the estimated construction contract award amount. This limitation is based on the estimate (including escalation to projected contract capability date) at the time of negotiation of the A-E fee. The estimate may then be substantially reduced as a result of VE, even to the extent that the design fee exceeds six percent of the new estimate. There is no requirement to reduce the A-E design fee in this circumstance. The Government generally will not reduce the A-E design fee as a result of VE application. Conversely, the A-E's cost to implement VE proposals is considered part of the normal design process and is generally not compensable by an increase in fee. In extreme cases a VE study may result in a major departure from the design effort envisioned at the time of negotiation of the A-E fee. In such cases, renegotiation of the fee (upward and downward) may be in order. Fee increases should only be considered when extensive redesign is required to implement a design solution that could not have reasonably been conceived by the A-E.

Each A-E design contract includes a construction cost limitation. The contract provides that if the bids or offers received exceed this limitation, the A-E must redesign the project within the limitation at no additional cost or forfeit the entire fee for failure to perform the contract. As the estimated project cost is adjusted during design due to VE application, care must be taken to ensure fair treatment of the A-E and the Government with regard to the construction cost limitation. The following guidance should be applied:

1. The A-E's design contingency, if any, should not be coopted by the VE program. If the working cost estimate is below the construction cost limitation and is increased as a result of adoption of a set of VE proposals, the construction cost limitation may be increased by a like amount. If the working estimate is below the cost limitation by an amount exceeding a prudent design contingency, the A-E may agree to no increase or a lesser increase in the cost limitation.

Impact of Cost Estimate Revisions on Design A-E Contract (Continued)

2. If the working estimate exceeds the construction cost limitation before a VE workshop, the A-E is required to explain the reasons. By applying VE the cost estimate may then be brought within the construction cost limitation. However, implementation of the VE the proposals may entail extensive redesign effort which is not necessarily subject to a fee increase to the A/E.

3. The A-E should not be expected to assume additional risk with regard to the construction cost limitation as a result of VE If the working cost estimate is substantially reduced through VE, the construction cost limitation should not be reduced accordingly. The amount of the A-Es design contingency should be added to the new working estimate to establish a target construction award amount. If the bids or offers exceed this target but are within the cost limitation, the A-E should be required to explain why the target was not met. If the bids/offers exceed the cost limitation, the A-E remains liable under the applicable provision of the contract — but only to meet the original cost limitation, not the lower cost target.

Chapter 4 VE Consultant Selection Guidelines

Chapter 4 VE Consultant Selection Guidelines

General Considerations

Except when VE services are included in a CM contract, VE consultant services will be procured under the provisions of the Brooks Architect-Engineer Services Act (PL92-582). Contracts will generally be either fixed-price contracts for services on one or more specifically identified projects or IQ contracts for multiple, unspecified projects.

The consultant providing VE services must demonstrate the necessary resources and experience to conduct the VE studies called for. In the case of an individual project or projects, the VE consultant will be selected based on qualification to perform studies on one or more specific sets of project requirements. For an indefinite quantity contract, the VE consultant will be selected based on qualification to perform studies on a probable cross section of projects which may be of different types, sizes and complexity.

In either case, certain important considerations should be addressed in the selection process:

(1) The consultant demonstrates skills and experience in the design and construction field.

(2) Value engineering represents a significant portion of the firm's overall services.

(3) The consultant demonstrates sufficient skill levels and depth of resources to handle the magnitude and complexity of required tasks.

(4) The consultant shows a capability to integrate VE into the overall design process and demonstrate the proper sensitivity to design and owner issues. This is particularly important for early design phase efforts.

Responses to VE service consultant solicitations may be madeup of joint ventures or teams of two or more firms. It is important that the VE consultant team demonstrate experience and a track record at working together effectively at performing similar services.

Value Engineering Team Qualifications

The proposed VE team will consist of one or more VE team coordinators (VETC) and multiple technical team members representing various disciplines.

The VETC's responsibilities include:

- coordination of all aspects of the studies with PBS, the *A/E* and the CM
- final selection of VE team members for each study
- management of each study
- collection and organization of material before each study

preparation of required reports and presentations

assistance in evaluating VE proposals and implementing the results

The VETC's qualifications are critical to the success of VE studies and the overall VE program. VETC qualifications should consist of the following:

(1) Demonstrated competence and experience in value engineering and related fields. This would normally consist of completion of a formal 40-hour VE training seminar, participation in at least 10 VE studies and general experience in VE of at least four years. A Certified Value Specialist (CVS) would typically possess at least these qualifications. CVS certification is administered by the Society of American Value Engineers (SAVE) and is an accepted standard of competence in the field. CVS certification or equivalent for VETC's is recommended.

(2) Construction industry experience including familiarity with design, construction and construction management.

(3) Experience as a VETC on construction related projects of a similar nature and complexity as those contemplated under the VE contract.

(4) Demonstrated skills in technical report writing and oral presentation.

(5) Technical degrees in architecture or engineering and related certifications such as cost estimating or specifications should generally be considered as minimum requirements.

Value Engineering Team Qualifications (Continued)

VE team members provide the technical input into VE studies in the fields of programming, architecture, engineering, cost estimating, specifications and special areas (environmental, asbestos, building automation, etc.) Qualifications should consist of:

(1) Completion of a formal 40-hour VE training session or participation in a previous VE study for each team member.

(2) Experience in the design, construction and operation of buildings of similar nature, scope and complexity as those contemplated.

(3) Appropriate technical degrees and professional registrations should generally be required. Use of non degreed/registered members is encouraged if they are otherwise uniquely qualified because of extensive field experience. It is extremely important that the skills and experience of the VE team are equal to or superior to those of the design A/E.

(4) Related certifications should be considered as advantages.

(5) The mix of proposed disciplines and experience of the team should be sufficient to cover the anticipated needs of the projects to be studied. This should include at minimum the normal architectural and engineering disciplines as well as special disciplines appropriate to the projects under consideration.

Support Qualifications

Additional qualifications are pertinent to the conduct of VE studies and should be considered in the selection process. These include:

(1) Availability of cost and performance information on similar facilities to those under consideration. This information is useful in determining potential areas of study as well as providing data for cost evaluation of VE proposals.

(2) Access to automated construction cost data systems or applications for assistance in costing VE ideas.

(3) Familiarity with the use and application of Computer Aided Design and Drafting (CADD) systems.

(4) Word processing and other automation systems useful in supporting VE studies and producing reports.

(5) Support disciplines such as graphics which can enhance the quality of printed material.

(6) Management and administrative systems useful in supporting indefinite quantity contracts (as appropriate).

VE Consultant Solicitation Guidelines

This section provides general guidelines for selecting VE consultants under the Brooks Act procedures.

VE consultant contract opportunities will be publicized in the *Commerce Business Daily* (CBD). Depending on the specific approach to contracting for VE services, the CBD notice would address a single project, multiple projects or a group of potential projects. Information will typically include:

(1) A description of the project(s) under consideration. A program or early facility plan should be available for review by the "short-listed" firms.

(2) The design schedule(s) (typically in milestone form, showing percentage completion vs. date).

(3) The estimated construction cost for each project.

(4) The number of VE studies to be performed and the points in time (i.e., percentage of design completion) at which each VE workshop is expected to be performed. Scope and timing of VE studies will be based on the requirements outlined in this guide.

(5) The evaluation criteria which will be used to rate the proposals and select the VE consultant (e.g., relative weight to be applied to qualifications, facility design and construction experience, proposed approach, etc.)

The response to the CBD notice by the prospective VE consultants should consist of the following:

(1) General Statement of Qualifications (SF 254,255,etc.)

(2) VE experience and references

(3) VETC qualifications and resume

(4) Technical team qualifications and resumes

(5) Special qualifications

(6) Technical approach to services

(7) Demonstrated experience with conduct of VE studies, as evidenced by examples of VE study final reports previously performed on projects of a similar type as the project at hand.

Chapter 5 VE Study Requirements

Chapter 5 VE Study Requirements

Timing of Studies

VE services generally are to consist of two studies to be conducted at:

(1) the completion of Concept Design

(2) the completion of Tentative Design

Additional studies may be conducted at Intermediate Design and for final Construction Documents if deemed necessary due to technical or budget constraints. A single study may be appropriate on smaller, less complex projects.

For new construction projects, the first study at Concept Design is intended to review basic design decisions that pertain to areas such as:

(1) Siting and building orientation

(2) Building form, shape and massing

(3) Layout

(4) Occupiable to gross area relationships

(5) Design criteria

(6) Building systems selection options

(7) Space program options

(8) Building space/volumeparameters

(9) Vertical and horizontal circulation

(10) Major Mechanical-Electrical-Plumbing(MEP) considerations

(11) Overall energy considerations

(12) Site access/egress

(13) Overall phasing/scheduling plans (as appropriate)

(14) Sub-soil conditions and geological data

(15) Utility availability

For repair and alteration projects, the applicable items from the above list are appropriate to the concept stage study.

Timing of Studies (Continued)

The second study at Tentative Design will focus on more detailed design decisions including (as applicable):

(1) Specific building system design

(2) Specification and performance requirements

(3) Proposed design details

(4) Layout options within overall building geometry

(5) Specific MEP system selections

(6) Site paving, grading and utilities

(7) Phasing and scheduling plans

(8) Major constructibility issues

The basic approach is intended to consider macro level issues at Concept Design and more micro level issues at Tentative Design. In general, decisions made as a result of the first study will not be reconsidered in the second study unless significant new information is available. Furthermore, design changes implemented as a result of the studies will generally be considered to be within the bounds of the normal design process. Exceptions to this will be considered on a case by case basis.

Recommended VE Procedures

Successful VE involves the cooperative participation of PBS (and user), the design A-E, the CM and the VE consultant. In addition, the success of the effort also depends on the management and organization of the overall VE process. The following procedures are recommended for use by VE consultants. This section provides general guidance while Appendix B provides specific guidance.

VE Sequence and Typical Schedule

The VE study effort is divided into three sequential periods of activity: (1) pre-workshop activity, (2) VE workshop, (3) post-workshop. Two VE studies are held at different stages of design completion as described previously. Therefore, the pre-workshop activities, the workshop, and the post-workshop activities will be performed twice. Basically, the size and complexity of a project control the effort required.

Pre-Workshop Activity

The VE Team Coordinator (VETC) uses this period to become familiar with the project, obtain and review the technical and cost data, complete logistical arrangements for the VE workshop, coordinate timing for the VE workshops, complete the selection of VE team members, and establish a productive working relationship with the A-E, the PBS representative and the CM.

It is also at this time that the VETC will contact the PBS representative and the A-E to coordinate the handling of material and overall schedule. Any limitations or constraints on the overall study should be addressed at this time. (See section forward for more detail on defining constraints.)

VE Workshop

The VE Workshop(s) will be for the duration deemed appropriate for the size and complexity of the project. (See guidelines on Level of Effort) The workshop portion will typically vary from a one day effort involving five participants to a five day effort involving as many as eleven participants.

VE Workshop (Continued)

VE Job Plan

The recommended VE methodology (Job Plan) used by the VE team during the Workshop has five distinct phases. Briefly, these phases are:

1. Information Phase:

During this phase, the VE team gains as much information as possible about the project design, background, constraints, and projected costs. The team performs a function analysis and relative cost ranking of systems and sub-systems to identify potential high cost areas.

2. Speculative/Creative Phase:

The VE team uses a creative group interaction process to identify alternative ideas for accomplishing the function of a system or sub-system.

3. Evaluation/Analytica Phase:

The ideas generated during the Speculative/Creative Phase are screened and evaluated by the team. The ideas showing the greatest potential for cost savings and project improvement are selected for further study.

4. Development/Recommendation Phase:

The VE team researches the selected ideas and prepares descriptions, sketches and life cycle cost estimates to support the recommendations as formal VE proposals.

5. Report Phase:

The VE consultant will work in concert with the A-E and the PBS representative to produce a preliminary written VE Report which is intended to represent the results of the VE workshop activities, and meet the VE Program objectives.

Post Workshop Activity

Following the VE Workshop, the VE consultant will prepare and submit the final VE report, incorporating all comments from the preliminary report. The A-E will then work in concert with the VE consultant and the PBS representative to ensure that all VE proposals are considered for implementation.

Formal consideration is given to all VE proposals by the A-E and the PBS representative for inclusion into the design. Consultation with the user agency(s) will be conducted as appropriate.

After completion of this effort the A-E will prepare a report itemizing the status of each of the proposals presented in the final VE report. The VE implementation summary report will include reasons for the acceptance, partial acceptance or rejection of all proposals.

Post workshop activity would also include processing of a budget adjustment. If a budget increase is required to support one or more of the VE proposals, those proposals cannot be adopted for implementation until the budget increase is approved. In such cases, the A-E's final implementation summary report cannot be completed until the request for a budget increase has been acted upon.

Typical time periods for accomplishing VE are:

- Pre-Workshop Activity (each workshop) ..... 1 to 2 weeks
- VE Workshop (each workshop) ..... 1 week maximum
- Post-Workshop Activity (each workshop) ..... 1 to 4 weeks

Coordination with Design A-E and CM

The VE consultant is responsible for coordinating the activities of the A-E and CM during the VE process. The following is a list of items/services to be provided:

(1) The VE consultant will advise the A-E and CM of the schedule for the VE services.

(2) During the pre-workshop portion of the effort the VE consultant must advise the design A-E of information requirements. The A-E is expected to provide sufficient copies of workshop material directly to the VE consultant. (For specifics refer to the "Scope of Services" section of this chapter.)

(3) The VE consultant will provide sufficient facilities for the workshop including allowances for the A-E and CM. The A-E and CM are expected to provide a full-time representative to the Concept Design workshop and a part-time representative to the Tentative Design workshop.

(4) The A-E is expected to make a technical project presentation at the beginning of each workshop. This will include key members of the A-E team as necessary to present technical issues.

(5) The VE consultant will present a preliminary report of workshop proposals to the A-E on the last day of each workshop. The A-E will initiate review of proposals at that point and await receipt of the final report to be provided by the VE consultant. The final report should generally be provided within one week of the completion of the workshop.

(6) In the one to two week period following the issuance of the final report, the VE consultant will coordinate with the A-E, CM and the PBS representative and review the implementation of VE proposals. Questions will be answered and additional information or clarification will be provided by the VE consultant as may reasonably be required.

(7) The VE consultant will assist the A-E in preparing the final VE implementation summary report and will provide a review and analysis of the report to the PBS representative.

Establishing Value Objectives and Study Constraints

The philosophy and objectives of the overall VE program are outlined in Chapter 2. The objectives of any specific study must be consistent with the overall philosophy and objectives of the program, considering the individual requirements of the project.

For a project whose construction cost is within budget, the emphasis will be on maintaining or improving value in terms of operations, flexibility, expandability, etc. If this can be delivered at reduced cost then cost reduction becomes a secondary goal with the possibility of reducing the budget.

When a project is determined to be above budget, the emphasis of the VE study should be on reducing construction cost to within budget without compromising the program of requirements or eroding the value of the finished project. The VE study is not intended to be used as a device for producing cost reductions by "cost cutting" with an accompanying reduction in the scope of the project or in value to be realized over the life cycle of the completed facility.

As a general rule, no constraints are placed on the VE program in terms of areas of study for projects. Likewise governing criteria, except as required by codes or law, is considered open for challenge by the VE consultant providing that the value and cost benefits are worthwhile and no compromises are made to important project functions. Even the program of requirements for a project is open to challenge by the VE team, to the extent that programmatic inefficiencies can be eliminated without sacrificing the basic project objectives and intended features or functions of the completed facility.

For a specific project, any constraints to be placed on the study must be identified and justified prior to the VE study. Normally such constraints will be the result of specific studies carried out by the A-E or other consultants and not just the result of the normal design process. It is intended that these conditions will be uncommon.

Conversely, the VE team is expected to use the rule of "common sense" in challenging design decisions or criteria which are deep seeded and important issues to the A-E, PBS or the agency user. The rule of "common sense" should also preclude the team from expending valuable time on far fetched or frivolous ideas which have little or no chance of acceptance.

Implementation Strategies

It must be understood that the VE program only suggests changes in the design or program of requirements. The ultimate responsibility for the design rests with the A-E and therefore the A-E must accept and implement changes or reject changes for valid reasons. The risk involved is a factor for consideration when suggesting new ideas.

The VE consultant will assist in the implementation process and provide technical backup as needed. However, the PBS representative in consultation with the agency user(s) is responsible for administering the implementation process.

Suggested strategies to improve implementation include:

(1) Assure that the A-E fully understands the nature and benefits of each VE proposal under consideration. If necessary, the VE consultant can provide additional backup information to better clarify the proposal.

(2) Reasons provided by the A-E for rejection must be valid and be based on technical considerations and not just a critique of the validity of the VE proposal. Rejections should be accompanied by distinct technical analysis. In the case where choices represent opinions, this should be so stated.

(3) If a proposal is rejected because the A-E claims that the issue had been studied previously, assure that the conditions are actually the same and not just similar. The failure of one idea is not necessarily justification for the rejection of a similar idea, especially if the circumstances are different.

(4) New and comparatively untried ideas should be investigated carefully before acceptance. However, newness by itself is not a valid reason for rejection.

(5) A disagreement with the VE consultant's cost estimate for a proposal is not by itself a reason for rejection. In the case where the A-E disclaims that a savings actually exists, then the proposal still must be evaluated on other merits. In other words, cost saving is not a sole reason for acceptance and neither is the lack of cost saving a sole reason for rejection.

Implementation Strategies (Continued)

(6) Redesign cost and/or time is not by itself a reason for rejection, only one consideration among others. If substantial redesign effort is required, then the A-E. would be eligible for additional compensation only if the effort was beyond the normal design evolution and not reasonably identifiable by the A-E. However, it should be noted that the VE process is conducted in two steps (at Concept and Tentative Design). A major reason for the early study is to identify and make any broad-based changes in design direction before definitive/detailed design begins. As a result extensive redesign past Concept Design is much less likely.

(7) Proposals which provide improved value irrespective of added or reduced cost should be considered for implementation. If added cost is required, other proposals which reduce cost can offset the added cost. In other words, the cost saving goals are collective to the project and not individual to proposals.

(8) Proposals which offer substantial reductions in life-cycle cost should not be summarily rejected because of increased first-cost, even on a project with actual or potential budget overrun problems. LCC savings opportunities should not be passed over simply because a project is over budget or was not properly budgeted at the outset.

(9) Proposals which are common to disciplines and or building elements should be considered as a group. It is the VE consultant's responsibility to group proposals in a logical and efficient way for consideration.

(10) Care should be taken that the impact of VE proposals on other areas is properly considered.

Reporting and Follow-Up Procedures

Detailed report preparation procedures for the VE consultant are included in Appendix B - Suggested Value Engineering Procedures. This section provides overall guidance.

The report which results from a VE study should be a concise yet self-sufficient document. It should contain enough technical project description so that someone not intimate with the project can understand the major issues. In addition, the individual **VE** proposals should clearly document the original concept, the proposed concept, advantages and disadvantages and economic consequences. Summaries should be presented which allow for a quick overview and also provide the A-E with a simple means of review and inclusion into the A-E's final VE implementation summary report.

Study Evaluation Guidelines

The relative success of a VE Study is a subjective effort but can be based on a number of factors which can be individually assessed. Typical considerations include:

(1) Overall organization of study

(2) Adherence to schedule

(3) Skill levels of the VE team

(4) Cooperation and working relationship between the VE consultant and A-E and CM

(5) Number of ideas generated

(6) Number of proposals generated

(7) Percentage of proposals indicating value improvement

(8) Percentage of proposals indicating initial cost savings

(9) Percentage of proposals indicating LCC savings

(10) Total potential initial savings

(11) Total potential LCC savings

(12) Quality of cost models, function analysis and supporting technical analysis

(13) Clarity of proposals

(14) Organization and clarity of report

(15) VE consultant implementation support

Recommended Scope of Services

A scope of services should reflect the requirements of this guide as well as the size, nature and special requirements of the project. The following outlines the contents of a scope of services typically provided to the VE consultant for a proposal:

(1) Number and timing of studies to be performed. Normally this will be at the completion of Concept and Tentative Design. Other studies may be merited in special cases, such as a criteria review. A single study during preliminary design may be appropriate on smaller, less complex projects.

(2) Project description, budget, current status, A-E of record and key user agencies involved.

(3) Reference to or attachment of this guide.

(4) Special requirements or special disciplines required in the study (e.g. environmental, asbestos, etc.) Also, whether energy and life-cycle cost models are be required.

(5) Space and support requirements for study room. Normally a study would require a minimum of 300 SF for sufficient work area and would increase depending on the magnitude of the study. Easy access to telephones, fax machines, computers and copy machines is also important.

(6) Suggested location of the study. Normally the study would be conducted near the A-E's office. For reconstruction projects or projects with significant site restraints, it is important and normal for the VE team to visit the site. This may affect the suggested location if it is deemed appropriate to be near the site.

(7) Any other special requirements.

The VE consultant is expected to respond typically within one week with a technical and fee proposal addressing the above issues.

Chapter 6 Life Cycle Costing Guidelines

Chapter 6 Life Cycle Costing Guidelines

The Economic Analysis Concept

Life cycle costing (LCC) is the development of all significant cost of acquiring, owning and using an item, system or service over a specified length of time. The time period used is the projected effective useful life of the facility and its determination includes consideration of functional obsolescence of major components or systems. LCC is a method used to compare and evaluate the total costs of competing solutions based on the anticipated life of the facility or product to be acquired. In performing a VE study, LCC analysis is performed in the development phase of the VE job plan to determine the least costly alternative. Additional guidance on LCC analysis is provided in the GSA Handbook, Facilities Standards for the Public Buildings Service (PQS-100). Specific LCC references are listed in this chapter under the section, *Technical Guidelines.*

The value of an item includes not only consideration of what the costs are to acquire it, but also the cost to use it or the cost of performance to the user for as long as the user needs it. It is the user who determines value. Therefore, one measure of value to the user is to calculate the cost of ownership or use.

Costs of repairs, operations, preventive maintenance, logistic support, utilities, depreciation and replacement, in addition to capital cost, all reflect on the total value of a product to a user. Calculation of LCC for each alternative during performance of a VE study is a way to judge whether product quality is being maintained in sufficient degree to prevent degradation of necessary reliability, performance, and maintainability.

The concept of economic analysis, which is used in LCC, requires that comparisons be made between things similar in nature. For example, one cannot compare the LCC of a bus to a car on a product basis, nor can one compare a house to a school on a product basis. In VE all ideas can be compared on a LCC basis if all alternatives were defined to satisfy the same basic function or set of functions.

In addition to comparable functions, economic analysis requires that alternative choices be considered on the same:

(1)	Time Frame	(5)	Economic Conditions
(2)	Quantities	(6)	Market Conditions
(3)	Quality Level	(7)	Operating Conditions
(4)	Levels of Service		

The Economic Analysis Concept (Continued)

Life cycle cost analysis requires the knowledge of several basic economic concepts. One of these is the concept of equivalent costs to deal with time frame. Equivalent costs are typically developed by equating all costs to a common baseline using an interest rate to adjust for variable expenditure years. One must also hold the economic conditions constant while the cost consequences of each alternative are being developed. That is, the same economic factors are applied to each alternative using a uniform methodology.

Selection of Useful Life Parameters

A thirty year (30) useful life is to be used unless otherwise specified on a case by case basis.

Discount/Interest Rate

A discount/interest rate of 10 percent is to be used unless otherwise specified.

Cost Elements

In performing LCC for a VE study the emphasis is on performing a comparative estimate rather than on developing a full budget estimate over the life span. This means that the VE team should identify, and quantify, only those elements of cost that they consider statistically significant in the decision making process. The applicable cost elements will vary with the item, system, or facility being studied. However, some of the types of costs to consider fall into the following three categories.

A. Initial Costs

(1) Item Cost:

These are costs to produce or construct the item.

(2) Development Cost:

These are costs associated with design, testing, prototype, and models.

Cost Elements (Continued)

A. Initial Costs: (Continued)

(3) Implementation Cost

These are costs expected to occur after approval of the idea such as: redesign, inspection, testing, contract administration, training, and documentation.

(4) Miscellaneous Cost:

These costs depend on the item and include costs for owner furnished equipment, financing, licenses and fees, and other one-time expenditures.

B. Annual Recurring Costs

(1) Operation Cost:

These costs include estimated annual expenditures associated with the item such as for utilities, fuel, custodial care, insurance, taxes, other fees, and labor.

(2) Maintenance Cost:

These costs include annual expenditures for scheduled upkeep and preventative maintenance for an item to keep it in operable condition.

(3) Other Recurring Costs:

These include costs for annual use of equipment associated with an item as well as annual support costs for management overhead.

Cost Elements (Continued)

C. Nonrecurring Costs:

(1) Repair and Replacement Cost:

These are costs estimated on the basis of predicted failure and replacement of major system components, predicted alteration costs for categories of space related to the frequency of moves, and capital improvements predicted necessary to bring systems up to current standards at given points in time. Each estimated cost is for a specific year in the future.

(2) Salvage:

Salvage value is often referred to as residual value. Salvage value is an equivalent credit and is entered as a negative amount in the LCC calculation. Salvage value represents the remaining market value or use value of an item at the end of the selected LCC life span.

Recommended Approaches

The two most frequent methodologies used to calculate LCC are: **1)** annualized costs, and **2)** present worth costs. Both methods will arrive at an equivalent answer for selection of alternatives.

Present-Worth Method

GSA recommends the use of the present worth method of Life Cycle Cost Analyses of competing alternative design solutions. The present-worth method requires the conversion of all present and future expenditures to a base line of today's costs. Initial costs are already expressed in present worth. Conversion tables are to be found in most VE and LCC textbooks for converting recurring and non-recurring costs into present-worth values.

Impact of Escalation:

Department of Energy guidelines for escalating future cost increases for fuel will be followed. This usually will result in a 3-5 percent differential escalation rate (e.g. above general inflation) for energy.

Economic Criteria:

The VE consultant shall itemize the economic criteria as part of each LCC analysis for reference in the final report of the VE study proceedings and results. The economic criteria shall clearly reference the values of key parameters and for all significant variables in LCC analyses.

Technical Guidelines

An LCC analysis should be undertaken when the VE recommendation has significant impact on future costs. It must be emphasized that the analysis need only cover those items which vary between options under consideration. Items in common can be ignored. Specific techniques are presented in Economic Analysis, VE and LCC textbooks and handbooks.

Following is a listing and description of current technical references (including computer programs) on life cycle costing:

LCC References:

1. Life-cycle Cost Manual for the Federal Energy Management Program, National Institute of Standards and Technology, Handbook 135 (revised 1991).

   Handbook 135 is a guide to understanding life-cycle costing and related methods of economic analysis as they are applied to Federal decisions. It describes the required procedures and assumptions, defines and explains how to apply and interpret economic performance measures, gives examples of Federal decision problems and their solutions, explains how to use the energy price indices and discount factors which are updated annually in the supplement (2), and provides worksheets and other computational aids and instructions for calculating the required measures.

2. Energy Prices and Discount Factors for Life-Cycle Cost Analysis, National Institute of Standards and Technology, (Annual Supplement to NIST Handbook 135 and NBS Special Publication 709), NISTIR 85-3273 (updated annually).

   This report, which is updated annually, gives the energy price and discount factor multipliers needed to estimate the present value and other future costs. The data are based on energy price projections developed by the Energy Information Administration of the U.S. Department of Energy. Request the latest edition.

3 The NIST "Building Life-Cycle Cost" (BLCC) Computer Program (version 3.1), National Institute of Standards and Technology, 1990.

   The NIST Building Life-Cycle Cost computer program (BLCC 3.1) provides economic analysis of proposed capital investments that are expected to reduce long-term operating costs of buildings or building systems. It is especially useful for evaluating the costs and benefits of energy conservation projects in buildings. Two or more alternative designs can be evaluated to determine which has the lowest life-cycle cost. Economic measures, including net return savings, savings-to-investment ratio, and adjusted internal rate of return can be calculated for any design alternative relative to the designated base case.

Technical Guidelines - continued

BLCC can be used for evaluating both Federal and private-sector projects. It complies with ASTM standards related to building economics as well as FEMP and OMB A-94 guidelines for economic analysis of Federal building projects. BLACC is designed to run on an IBM-PC or compatible microcomputer with approximately 640K of random access memory (RAM), with or without a hard disk. The BLCC program supersedes both the FBLCC and NBSLCC computer programs previously released by NIST (NBS).

4. DISCOUNT - A program for Discounting Computations in Life-cycle Cost Analyses (version 3.1), NISTIR 4513, National Institute of Standards and Technology, 1991.

   The DISCOUNT program computes discount factors and related present values, future values, and periodic payment values of cash flows occurring at known points in time. DISCOUNT is especially useful for solving life-cycle cost analysis problems which do not require the comprehensive summation and reporting capabilities provided by the BLCC program. DISCOUNT performs all of the functions of standard discounting tables, computing present values of periodic payments, periodic payments corresponding to present and future amounts, and corresponding discount factors. In addition, DISCOUNT computes the present value of periodic payments which increase at known rates projected by the U.S. Department of Energy for use in Federal life-cycle cost analyses. DISCOUNT provides the added flexibility of accepting non-integer discount rates, time periods, and escalation rates in its computations. DISCOUNT runs on most IBM-PC and compatible microcomputers with no special equipment requirements. The user's guide and reference manual is included on the program diskette.

   Both BLCC and DISCOUNT computer programs access DOE energy price projections from the same two disk files included with these programs (currently ENCOST92.SEQ and ENCOST92.RAN). These files are updated and released at the same time that NISTIR ***85-*** 3273, Energy Prices and Discount Factors for Life-Cycle Cost Analysis, is released each year. These disk files ensure that BLCC and DISCOUNT are compatible with computations performed using factors in NISTIR 85-3273.

5. PBS Facilities Standards Handbook (GSA HB PBS PQ100, Feb 28, 1992)

Chapter 7 Other Issues

Chapter 7 Other Issues

Impact on Criteria Review/Development

GSA-PBS governing criteria is subject to ongoing review, evaluation, updating and modification. The VE program offers a means of input into this process by feeding back the results of VE studies. VE activities in the regions are monitored by regional staff and Central Office staff for trends or patterns indicating that a criteria review should be considered.

VE Study Participation by Facility Operating Personnel

When specific ideas and issues under consideration have obvious implications on facility operations, operating personnel should be consulted for advice and input to the study. The degree of participation by operating personnel in the study and the review of subsequent proposals should be determined by the PBS representative.

Appendix A

PBS 8050.1C
Public Buildings Service
Value Engineering Program

GENERAL SERVICES ADMINISTRATION
WASHINGTON. D.C. 20405

PBS 8050.1C
August 14, 1991

GSA ORDER

Subject: public Buildings Service Value Engineering Programs

1. Purpose. This order serves to redefine and revise the Public Buildings Service (PBS) Value Engineering (VE) effort.

2. Cancellations, PBS P 8000.1A, PBS P 8020.1B, and PBS 8050.lB are canceled.

3. Background.

a. The PBS VE Program was established in 1970. During the following 5 years the program was expanded in scope of application and developed into a Value Management (VM) Program with full-time employees performing VE analysis on PBS projects and programs. The VM Program was formally established in 1974.

b. A series of standard PBS value incentive contract clauses was developed in conjunction with the VM program, and was issued for use in 1978. Also in 1978, PBS issued a handbook, Value Management (PBS P 8000.1A) of detailed instructions for operation of the VM Program. That handbook prescribed a heavily in-house oriented, resource-intensive VE process under a centralized management approach. The method of implementing VE studies in PBS has changed. In-house effort requiring GSA value specialists has been replaced by VE services contracted from private firms. Also, the previously issued value incentive contract clauses have been superseded by VE clauses provided in the Federal Acquisition Regulation (FAR) and General Services Acquisition Regulation *(GSAR).*

c. Throughout its history in PBS, practical application of VE has been predominantly on major design and construction (D&C) projects. The GSA HB, Archftect-Engineer and Construction Management Value Management Services (PBS P 8010.1), was issued specifically for the D&C program. This handbook established requirements for obtaining contract VM services and provided related administrative guidelines. The D&C handbook contains dollar thresholds and other requirements that are no longer valid in the current environment and need revision.

d. There has recently been a renewal of emphasis on VE in the Federal Government. OMB Circular A-131, Value Engineering, dated January 26, 1988, requires all Federal agencies to establish and

Distribution: P1; P2; P3; F; RP(10, 20, 30); WP(10, *20,* 30)

improve their use of VE Programs in all applicable areas, including all major systems as defined by Public Law 93-400 (41 U.S.C. 403) The implementing GSA order, GSA Value Engineering Program (ADM 8030.1A), requires the establishment or improvement of agency VE Programs in all GSA offices having programs and procurements whlch lend themselves to the conduct of VE studies. The GSA order also establishes a GSA VE Program Director in the office of the Associate Administrator for Acquisition Policy (V), and requires each GSA Service to appoint a VE Program Director.

4. Nature of revisions. This revision does the following:

a. Disestablishes VM councils;

b. Disestablishes VM boards;

c. Eliminates outdated VE contract clauses:

d Provides guidance for redirection of PBS VE effort under a decentralized management approach:

e. Defines the role of the PBS VE Program Director:

f. Modifies the applicability of the GSA HB; Architect-Engineer and Construction Manager Value Management Services (PBS P 8010.1); and

g. Requires appointment of VE Program Managers with full authority and responsibility to establish, implement and maintain VE Programs for all PBS operational areas suited to VE application.

5. Definitions.

a. 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 perfomance, reliability, quality, and safety.

b. Value Engineering Change Proposal (VECP). A change proposal that is submitted by a contractor under a value engineering incentive or program requirement clause included in a Federal contract.

c. Value Engineering Proposal (VEP). A change proposal developed by employees of the Federal Government or contractor value engineering personnel under contract with the agency to provide value engineering services for the contract or program.

d. Life Cycle Cost (LCC). The summation of all costs over the useful life of a building, system or product. It includes all

relevant costs to the Government to acquire, own, operate, maintain and dispose of a building, system or product over a specified period of time, less any salvage value.

6. Goal and objectives The goal of the PBS VE effort is to obtain maximum value for funds expended over the life cycle of systems. equipment, facilities, services and supplies, recognizing that the potential savings are generally greater during the early phases of project/program development. The related objectives are to:

a. Increase awareness and application of VE as a cost management tool;

b. Extend available resources (financial, personnel, material) by eliminating nonessential costs:

c. Improve operating efficiency by application of LCC analysis in the development of projects and programs;

d. Instill the concepts and methodology of VE in PBS managers and technical staff;

e. Emphasize the advantages of VE in the planning, development and design stages of projects or programs, whereby the Government receives full benefit of optimum savings opportunities (as opposed to shared savings with contractors); and

f. Encourage full application and use of value engineering provisions in PES contracts.

7. Program management.

a. PBS VE Program Director. The Commissioner, PBS, has appointed a PES VE Program Director, as required by ADM 8050.1A. The responsibilities of the PBS VE Program Director are to:

(1) Promote the use of VE and monitor its application throughout PBS:

(2) Provide management guidance to Assistant Commissioners on the establishment, implementation and maintenance of VE Programs: and

(3) Consolidate summary VE Program data from all PBS offices for reporting to the GSA VE Program Director.

b. VE Program Managers. The Assistant Commissioners, Offices of Planning (PL), Real Property Development *(PQ)*, Real Property Management and Safety (PM), Governmentwide Real Property Policy and Oversight (PG), PBS Information Systems (PK), and Physical Security

and Law Enforcement (PS) will identify operational areas within their offices which are suited to application of VE, in accordance with the provisions of the GSA Order ADM 8030.1A, and appoint VE Program Managers to establish, implement and maintain VE Programs for identified operational areas. Names and telephone numbers of VE Program Managers will be reported to the PBS VE Program Director. Appointments will be updated as necessary. The authorities and responsibilities of the VE Program Managers are to:

(1) Establish a VE Program tailored to the mission and organizational structure of the office involved.

(2) Emphasize, through training, evaluation, and other programs, the potential for VE to reduce unnecessary costs.

(3) Establish criteria and guidelines to identify those programs and projects that are most appropriate for VE studies. The criteria and guidelines should recognize that the potential savings are generally greatest during planning, design and other early phases of project/program development.

(4) Require that files be documented to explain why VE studies were not performed or required for any programs/projects meeting the established criteria.

(5) Establish guidelines to evaluate and process value engineering proposals.

(6) Develop and issue, through the Assistant Commissioners, regional guidelines for administration of VE Programs. Receive, assemble and forward to the PBS VE Program Director, data on resources expended and results achieved through VE.

c. Controller (PF). The Controller will ensure that funds and full-time equivalents (FTE) necessary for operating VE Programs are included in annual budget requests. The Controller will disseminate guidance from the Office of the Comptroller (B) on funding for VE staffing, awards, training, and on the disposition of savings from contract and internal VE Programs. The Controller will assist the VE Program Managers with development and administration of VE training programs.

d. Assistant Commissioner for Procurement (PP). With support as necessary from the program offices identified in subpar. 7b, the Assistant Commissioner for Procurement will develop and issue guidance to ensure that all affected PBS contracting officers and their duly authorized representatives:

(1) Ensure that appropriate VE provisions are included in contracts associated with planning, development and design stages of projects or programs.

(2) Actively elicit soundly based VECPs from contractors.

(3) Promote VE through contractor meetings and the dissemination of promotional and informational literature regarding VE provisions of contracts.

(4) Process VECPs in a timely manner and document contract files when it takes more than 45 days to accept or reject a VECP.

(5) Document contract files to explain the rationale for accepting or rejecting VECPs.

(6) Use the VE clauses provided in the FAR and/or GSAR for appropriate supply, service, architect-engineer and construction contracts

e. Assistant Regional Administrators for PBS. The Assistant Regional Administrators for PBS will:

(1) Ensure that regional PBS Divisions and staff offices Comply with VE Program guidance issued by the Controller and Assistant Commissioners in accordance with Subpars. b., c. and d. above.

(2) Ensure regional compliance with reporting requirements provided in par. 9, below.

8. VE guidance for D&C projects. The GSA HB, Architect-Engineer and Construction Manager Value Management Services (PBS P 8010.1) will be canceled upon issuance of new documents currently under development. For the interim, the provisions of the current handbook are to be treated as optional guidance only, Regional D&C program managers should tailor VE requirements to individual projects based on the general guidance contained in this order, with appropriate adjustments to the specific requirements in the handbook. All references in the handbook to other directives canceled by this order should be disregarded. No design phase VE services are required on D&C projects which fall below the prospectus construction dollar threshold prescribed by Section 7 of the Public Buildings Act of 1959, as amended (40 U.S.C. 606).

9. Reporting requirements.

a. Each VE Program Manager must submit periodic summary reports on their VE Program to the PBS VE Program Director. VE program managers are required to maintain documentation supporting their summary reports. Reports must be submitted by April 10 for the preceding 6-month period of October 1 through March 31 and by October 10 for the preceding l-year period of October 1 through September 30.

b. Each report must include:

(1) The estimated total amount of funds invested in VE during the fiscal year and the estimated amount of return on investment for in-house or contractor VE efforts, if available,

(2) The total VE savings achieved during the fiscal year:

(a) Savings achieved by in-house staff.

(b) Savings generated by contractors.

(3) The number of employees assigned to value engineering work;

(a) Number of employees dedicated full time to VE.

(b) Number of FTE used on VE activity.

(4) Number of employees receiving 8 hours or more of VE training during the fiscal year:

(5) Number of VE proposals received during the fiscal year, number of these proposals wholly or partially accepted, and number still pending at the end of the reporting period: and

(6) Any other VE Program data that may be requested.

10. Resources. The VE Programs outlined in this order must be initially implemented within currently available resource allocations. PBS program offices planning to establish new or expand existing VE programs in response to this Order should include related resources in their annual budget requests. Implementation plans should accommodate the 2-year lead time inherent in the PBS budget cycle, VE activities that are not inherently governmental should be contracted if the necessary VE capability is not available in-house.

11. Implementing actions. The PBS Assistant Commissioners, Controller, and Assistant Regional Administrators shall initiate all actions necessary to implement this order.

WILLIAM C. COLEMAN
Commissioner
Public Buildings Service

Appendix B

Suggested Value Engineering Procedures

Appendix B

Suggested GSA/PBS Value Engineering Procedures

Value Engineering (VE) is a structured, function oriented approach to cost control which yields savings and/or improved value without compromising quality, performance or usefulness.

The main goal of a VE effort is to supplement the A-E's work on the project in order to arrive at improved value and a better end product. VE offers a systematic approach for searching out high cost areas in a design and arriving at the best balance between cost, performance and reliability and other key issues of the project. It is not a design review but rather an in depth cost study based on achieving the required program and functions at the lowest life cycle cost **(LCC).**

This material provides recommended procedures for conducting **VE** studies for GSA-PBS. The contents are as follows:

Suggested GSA/PBS Value Engineering Procedures (continued)

Section 3

3. Post Workshop Activity

- 3.1 Review of the VE Report
- 3.2 Final VE Implementation Summary Report

Section 4

4. Reference Material

- 4.1 Sample Workshop Agendas
- 4.2 Sample Report Format
- 4.3 Sample Worksheets

Section 1 - Preparation for the VE Workshop

1.1 Overview

The success of the overall VE study depends heavily on the organization and management of the pre-workshop activity. During the preparation for the VE workshop, the following activities should be accomplished in the general sequence listed below:

- A coordination meeting between the PBS representative, A-E and value engineering team coordinator (VETC).
- Accumulation of the project's technical and cost data.
- Confirmation of the composition of the VE team and logistical arrangements for the VE workshop.
- Preparation of initial cost, energy, and life cycle models.
- Distribution of the technical and cost data to VE team members.

1.2 Coordination Meeting

The VETC will conduct a meeting with the PBS representative, A-E, and CM at the beginning of the pre-workshop activity of each workshop. The meeting is intended to promote a common level of understanding about the objectives and constraints of the VE workshop, establish a productive working environment, confirm the schedule of events, and coordinate the handling of material. Items discussed during the meeting would include the availability and format of technical and cost data, agenda of the VE workshop, processing of the VE recommendations, plus the date, location, and other logistical arrangements for the VE workshop.

13 Technical and Cost Data

The A-E should supply the project data to the VETC at least two weeks before the VE workshop to allow sufficient time for review and development of the VE study models.

The technical data consist of the functional space program, engineering reports, design calculations and all current drawings and specifications. The cost data consist of construction cost estimates and any special cost studies.

Material Required for the Concept Workshop:

The purpose of the Concept Phase of design is to establish basic design approaches such as building massing, functional relationships, space allocations and schematic layouts. In addition, basic building systems concepts should be established as well as any special requirements including environmental, safety and historic preservation.

Material to be submitted by the A-E to the VETC should typically include:

- Initial phasing/scheduling plans
- Functional space program
- Gross and occupiable area analysis
- Drawings including block layouts, building siting, preliminary elevations and sections
- Narrative descriptions of major building systems and basis of design
- Renderings, perspectives and model photographs
- Special studies, statistical reviews and calculations
- Boring logs, soil reports or preliminary analysis
- Preliminary narrative specifications
- Cost estimate and cost studies
- Utility rate guidelines
- Planned building operating profile
- Utilities available to site

Normally two sets of all drawings/graphic material and two copies of the cost estimate are required. One copy of other material is normally sufficient.

1.3 Technical and Cost Data (Continued)

Material Required for the Tentative Design Phase Workshop:

The purpose of Tentative Design is to establish final layouts and appearance of the facility and to determine major building system selections. Most special requirements should be finalized or under study and approaching completion.

Material to be submitted by the A-E to the VETC should typically include:

- Drawings including architectural, civil/site, structural, mechanical and electrical
- Preliminary specifications
- Preliminary phasing/scheduling plans
- Design calculations
- Boring logs and soil reports
- Gross and occupiable areas analysis
- Utility rates
- Energy studies
- Life cycle cost studies
- Building operating profile
- Construction cost estimate
- Construction market survey

Normally two sets of drawings, specifications and cost estimates are required. One copy of other material is normally sufficient.

1.4 VE Team Composition and Logistical Arrangements

The final selection of the VE team members should be accomplished by the VETC after a detailed review of the project's technical data. Special disciplines required and the degree of participation of standard disciplines should also be finalized.

Once the VE team(s) selection is finalized, the VETC should distribute selected technical and cost data to each team member for a brief review prior to the workshop. The pre-workshop review should typically allow for **2** to **4** hours per team member. This review is intended to briefly familiarize the participant with the project.

1.4 VE Team Composition and Logistical Arrangements (Continued)

The VE workshop should be located at a site which is mutually agreeable with the PBS representative, A-E, CM, and VETC. A location in reasonably close proximity to the A-E's office is usually desirable. A site visit prior to the start of the workshop is also often beneficial for the VETC and selected VE team members especially for reconstruction projects or those projects with significant site restraints.

Arrangements for the VE workshop facilities should be made with the following considerations in mind:

- The location should isolate the team members from their normal on-going activities and promote interaction of the team members throughout the study.
- Room size should be at least 50 SF per team member.
- The facilities should be well lighted with ample working space. The amenities should include a large table for each team member plus access to telephone and copy services.
- A mini-computer with appropriate software and peripherals may be required. Terminal access to remote ADP capability may also be needed for accessing automated cost estimating services. If some of the design documentation is CAD-based, one or more CAD workstations may be needed.
- Blackboards and/or flip charts should be provided.

1.5 Cost Estimates

The availability of accurate and comprehensive cost data is an essential element in the success of all VE studies. The **VE** team uses cost data as its primary tool for establishing potential study areas and evaluating alternative ideas.

Estimates by the A-E as well as any review comments by the CM are required to follow existing GSA-PBS guidance. Information, quantities, unit costs and pricing assumptions should be clearly delineated. The project schedule and contemplated escalation should likewise be clearly defined.

Any special cost studies should also be reviewed.

16 Cost, Energy and Life Cycle Cost Models

In VE studies, the cost and energy data are organized in a manner to facilitate rapid analysis and identification of high cost systems or components. This is accomplished by assembling the cost and energy data in the form of models. The VETC typically prepares the cost, energy and life cycle models with the assistance of a cost estimator prior to the VE workshop. The preparation of a cost model is always required. The need for energy and life cycle cost models will be determined on a project by project basis.

Cost Model:

A cost model is a VE study tool which presents both estimated and target construction costs distributed by subsystem or functional area. The target cost is determined during the VE workshop since it represents the VE team's estimate of the least cost to perform the function of each subsystem or functional area. The past experiences of team members and historical cost data serve as the basis for developing the target costs. The target costs represent the least possible cost for each subsystem or functional area. The target cost can be a historical average value or the worth. Large differences between estimated costs and target costs highlight areas with potential for large cost savings or value improvement.

Energy Model:

Energy optimization is one of the goals of a VE study. To achieve this goal, the VETC can assemble an energy model for the VE team to use in a similar manner as the cost models. Energy models present displays of energy consumption for the facility subsystem or functional area. The models typically express energy in units of KWH per year. As in the cost model, target energy consumption estimates are assigned to each area by the VE team during the workshop. The target estimates represent the least possible energy consumption for each subsystem or functional area based on historical energy data and the VE team's experience.

The energy model is not intended to provide a precise projection of energy demand or cost. Its primary purpose is the rapid identification of energy intensive areas which offer a high potential for energy reductions and cost savings.

1.6 Cost, Energy and Life Cycle Cost Models (Continued)

Life Cycle Cost Model:

A life cycle cost (LCC) model can be prepared to illustrate the total cost of ownership. The LCC model provides a complete cost picture and can serve as a baseline for the VE team's determinations of the cost impacts of VE recommendations.

The interest or discount rate used to prepare LCC models should be an appropriate value established by the PBS representative, the A-E, and VETC.

Life cycle cost models are useful for energy and operational intensive facilities such as laboratories or computer processing centers.

Section 2 - The VE Workshop

2.1 VE Job Plan

The VE workshop is the major component of a VE study. The systematic methodology used by the VE team to accomplish the workshop is called the VE Job Plan. It should be noted that throughout the field of value engineering there are variations in the titles for these phases. However, despite these variations in terminology, all job plans represent the same basic methodology.

Use of the Job Plan assists the VE team in a number of ways:

- It is an organized approach which allows the VE team to analyze a project by quickly identifying high cost to worth areas and selecting alternatives which minimize costs while maximizing quality.
- It encourages the VE team to think in a creative manner, i.e., to look beyond the use of common or standard approaches.
- It emphasizes total ownership costs (life cycle costs) for a facility, rather than just initial capital costs.
- It leads the VE team to develop a concise understanding of the purposes and functions of the facility.

The suggested VE Job Plan consists of the following five distinct phases:

1. Information Phase
2. Speculation/Creative Phase
3. Evaluation/Analytical Phase
4. Development/Recommendation Phase
5. Report Phase

The five VE Job Plan phases from the Information Phase through the oral presentation of the VE team recommendations in the Report Phase are normally performed during a VE workshop.

It should be noted that for workshops whose duration is only one day the formal VE job plan is compressed as may be necessary.

2.2 Information Phase

During the Information Phase, the VE team solicits comments on the technical and cost data to develop an overall understanding of the project's functions and requirements. Most of the data, including the cost and energy models, will have been reviewed by the **VE** team members prior to the workshop. The Information Phase occurs during the morning of the first day of the workshop.

An oral presentation by the PBS representative, user agency, A-E and CM on the first morning of the workshop provides the **VE** team with an understanding and appreciation of the factors that have influenced the project's design. This oral presentation serves to open the lines of communication between the **VE** team members, PBS, and the A-E. It allows the **A-E** to expose the **VE** team to the difficulties encountered during the design of the project.

The oral presentation should include a description of the rationale, evolution, constraints and alternatives, for the major design components. The quality and organization of the data presented are important since these factors directly impact the usefulness of the VE recommendations.

It is important for the VE team to understand the A-E's rationale for the project's development, including the assumptions used to establish the design criteria and select the materials and systems. The VE team should identify and review the alternatives considered by the A-E.

For a Concept Phase workshop the **A-E,** CM and PBS are expected to provide a full time workshop attendee. This is necessary because the background and rationale of project decisions are important considerations during a Concept Phase review and this is not always easily communicated in the documents. It is the VETC's responsibility to assure that the input of the A-E, CM and PBS representative is positive and contributes to better communication.

For a Tentative Phase workshop, the **A-E,** CM and PBS representative are expected to attend only the initial presentation and final presentation of results on the last day of the workshop.

2.2 Information Phase (Continued)

Function Analysis:

Function analysis is the cornerstone of value engineering since it separates **VE** from direct cost reduction techniques. The function analysis approach is used in value engineering to arrive at the basic purpose of building systems and sub-systems. It aids the **VE** team in determining the least costs to perform primary functions and peripheral or support functions and identifying costs which can be reduced or eliminated without affecting the performance or reliability of the facility.

Functions are identified by a two word verb-noun description. The verb is an *action verb* and the noun is a *measurable noun. As an* example, the function of an electric cable is to "conduct current." "Conduct"is the action verb and "current"is the measurable noun. Other examples are to "support load," " contain heat" and -provide access."

The basic function of an item is the specific task or work it must perform. Secondary functions are those functions that may be desired but are not actually required to perform the specific task or work. Required secondary functions are absolutely necessary to accomplish the specific task or work, although they do not exactly perform the basic function.

The following is a list of questions which are helpful in determining the functions of an item:

1. What is its purpose?

2. What does it do?

3. What is the cost?

4. What is it worth?

5. What alternative would accomplish the same function?

6. What would that alternative cost?

In function analysis, it is important to identify functional areas sequentially since the functions vary according to the selected area. For example, the function of the total facility would be established before functions are established for the building elements.

2.2 Information Phase (Continued)

Function Analysis: (Continued)

The most difficult part of the function analysis is establishing an estimate of the worth of each subsystem or component for comparison with its estimated cost. Since worth is an indication of the value of performing a specific function, extreme accuracy in estimating the worth is not critical. Worth is merely used as a mechanism to identify areas of high potential savings and value improvement. Subsystems performing secondary functions have no worth because they are not directly related to the basic function. As an example, an access road to an office building does not provide the primary function of housing people even though the road may provide a required secondary function for the facility. Thus, the road is an area to examine for potential savings without affecting the basic function of the facility.

Value engineering looks for alternatives to the original design that might effectively increase the value and/or reduce the cost of the project. Alternatives may be developed by asking the basic question, 'What else will perform the essential function, and what will it cost?" The alternatives for performing a function identified in determining worth often become part of the creative idea listing for the function.

A function analysis would be completed as follows:

1. Identify the study area.
2. Identify the basic verb/noun function of the study area.
3. List the component parts of the study area.
4. List the verb/noun function of each component and subcomponent.
5. Identify whether each function is basic, secondary, or a required secondary function.
6. Identify the estimated construction cost of each function.
7. Speculate on the worth or the least cost to accomplish the function.

2.2 Information Phase (Continued)

Function Analysis: (Continued)

As part of the function analysis, the VE team makes a comparison of the cost-to-worth ratios for the total facility and its subsystems. These cost-to-worth ratios are obtained by dividing the estimated cost of the system or subsystems by the total worth for the basic functions or the system or subsystem. High cost-to-worth ratios suggest areas of large potential cost savings and identify systems or subsystems which would be selected for further study by the VE team. Similarly, low cost-to-worth ratios indicate areas where further study efforts would probably not be justified due to diminished potential for cost savings. Cost-to-worth ratios greater than two usually indicate areas with the potential for substantial cost savings and value improvement.

Fast Diagramming:

FAST is an acronym for Function Analysis System Technique. It is tool that graphically shows the logical relationship of the functions of an item, subsystem, or facility. The FAST diagram is a block diagram based on answers to the questions of Why?" and "How?" for the item under study.

A FAST diagram is most appropriately used on complex systems as a road map for clear delineation of the basic and secondary functions of a particular system.

FAST diagramming may be used to augment the function analysis portion of the Information Phase and is often most useful in delineating functional space program issues.

Most VE textbooks contain a detailed description of the FAST diagramming process.

2.3 Speculative/Creative Phase

The Speculative/Creative Phase is a group interaction process which the **VE** team uses to identify alternative ideas for accomplishing the function of systems or subsystems associated with specific study areas. This phase involves an open discussion without any restrictions on the imagination or inventive thinking of individual team members. All analysis, evaluation, or judgement of the ideas generated is delayed until the Evaluation/Analytical Phase.

The ideas should be listed by system, subsystem, and component to facilitate effective organization of the study.

The objective of the Speculative/Creative Phase is to generate a completely free interplay of ideas between team members to create an extensive list of alternative ideas for later evaluation. ***The key to successful results is the deferral of any critical judgments or comments which might inhibit any of the team members.***

The active participation of all team members must be encouraged in the creative development of ideas. The VETC is responsible for maintaining a climate for the free exchange of ideas by directing the team members away from discussion or arguments about relative merits of individual ideas.

The following points should be considered during the Speculative/Creative Phase.

1. When team members believe that improvement can be made to the project, they will work to achieve it.

2. There is always room for improvement in a project. Most **A-E's** will have ideas for improving their project after observing its construction.

3. The word "impossible" should be eliminated from the team's thinking. The synergistic effect of free flow of information generated by a multidisciplined team can create extraordinary results.

4. Encourage all participants to share all ideas with the group, even if they seem extremely unconventional. After initial consideration, those ideas that are too frivolous or far-fetched to merit further serious study can be discarded. (Use the rule of "common sense".)

2.3 Speculatuve/CreativePhase (Continued)

5. Develop as many ideas as possible. This stimulates the creative ability of team members.

6. Look for associations of ideas. Often a function can be performed by a technique currently applied to another area or industry.

7. Ask questions which elicit information based on the knowledge and experience of team members.

8. Record all ideas as they are developed rather than risk forgetting them.

2.4 Evaluation/AnalyticaPhase

During the Evaluation/Analytical Phase, the ideas developed in the Speculative/Creative Phase are examined to assess which have the best opportunity for implementation, cost savings, and value improvement. The VE team evaluates the feasibility of each idea by identifying its advantages and disadvantages. The ideas are then rated on a scale of one to ten. A ten represents either the best technical idea or the one with the greatest potential for cost savings and value improvement.

In ranking ideas, the VE team should consider the following:

- Are the aesthetic, performance, quality and reliability requirements met or exceeded?
- Will excessive redesign or project delay be created?
- Is there improvement in operation and maintenance?
- Will life cycle cost savings be achieved?
- Does the idea have a reasonable chance of acceptance and implementation?

The ideas with the highest ratings are selected by the VE team for more detailed investigations in the Development/Recommendation Phase.

2.5 Development/Recommendation Phase

In the Development/Recommendation Phase, the best ideas from the Evaluation/Analytical Phase are developed into workable VE proposals. The VE team researches and develops preliminary designs and life cycle cost comparisons for the original designs and the proposed alternative ideas.

During this phase, the technical expertise of the team becomes very important. Frequently, it is necessary to consult outside experts, vendors, and reference sources to obtain additional evaluation information before developing the VE proposals.

The development of an idea into a proposal should include the following steps:

1. Description of the original design and the alternative idea.
2. Sketch of the original design and the alternative idea.
3. Discussion of the advantages and disadvantages of the alternative idea including its impact on life cycle costs and other key facility issues.
4. Preparation of a cost estimate and a life cycle cost analysis if necessary, for the original design and the alternative idea.
5. Recommendation of preferred approach.

It is important that the VE team be able to convey the concept of each VE proposal in a clear and concise manner to avoid its rejection due to a lack of understanding by the A-E or PBS. In preparing VE proposals, it is helpful to view them from the A-E's perspective for value, reliability, cost effectiveness and implementation.

In the development of the VE proposals, each alternative idea should be presented as a single independent VE recommendation. Ideas should not be grouped together into a proposal unless there is a technical advantage to doing so. This procedure assures each recommendation will be reviewed on its own merit.

2.6 Report Phase

The Report Phase consists of both an oral and written presentation of the results from the VE study.

Oral Presentation:

The VE proposals are presented by the VE team in an oral presentation on the last day of the VE workshop. The oral presentation should be a relaxed and informal meeting which lasts approximately one to three hours. The presentation provides an opportunity for the PBS representative and the A-E to discuss the VE proposals with the VE team.

The VETC should start the presentation with an overview of the VE study and a summary of the VE proposals including the potential cost savings. The major factors which influenced the study would be highlighted by the VETC. This presentation would be followed by a brief description of each VE proposal. The PBS representative and A-E should seek only to understand the concept and background of each proposal during the oral presentation. They should delay detailed discussions on the merits of the proposals.

A summary of the VE proposals should be provided to the PBS representative and A-E during the oral presentation so they can commence their review and analysis prior to the receipt of the VE report.

VE Report:

The VE consultant prepares a written report which summarizes the results of the entire VE study. This report is used by the PBS representative and A-E in their review and evaluation of the VE proposals. The report should be prepared and submitted within one to two weeks following the workshop to avoid delaying the project's design. Since the VE report stands alone as an independent document, it should contain at least the following information:

1. Executive summary
2. Project name and general description and summary functional space program
3. Scope of the VE study
4. Names of the PBS representative, the A/E the CM and VE team members and their related responsibilities

2.6 Report Phase (Continued)

VE Report: (Continued)

5. Location and date of the workshop
6. List of the data provided by the A-E
7. Project objectives and constraints
8. All cost, energy, and life cycle models, and worksheets from the Job Plan phases.
9. Summary of VE proposals and cost savings
10. Specific VE proposals with supporting documentation
11. Appendix with additional information which the VETC may find appropriate

Reports which result from one day workshops will still contain the required elements but in a compressed and condensed form.

Section 3 - Post-Workshop Activity

3.1 Review of the VE Report

The post-workshop VE activity involves a thorough review and evaluation of each VE recommendation presented in the VE report and the preparation of the VE implementation summary acceptance by the A-E .

The PBS representative and A-E evaluate each VE proposal on the basis of technical, operational, and life cycle cost savings considerations and may consult with the VETC to clarify any questionable items which arise during their review of the VE proposals. An in-depth evaluation of each VE proposal provides the best basis for reaching a sound decision to accept or reject.

3.2 Final VE Implementation Summary Report

Once all the VE proposals have been reviewed, this report is prepared by A-E to summarize the results of the action taken on each of the VE proposals. The VE implementation summary report and the VE report serve as the complete documentation for the VE study. Separate sets of reports must be prepared for each VE study conducted on a project.

Accepted VE Proposals:

The acceptance of a VE proposal requires no justification in the VE implementation summary report. Such action requires only a statement of acceptance. When certain elements of a VE proposal are acceptable and other elements of the proposal are unacceptable, a justification should be provided for only the rejected portion of the proposal. The ***A/E*** may also modify a VE proposal before incorporating it into the design. These modifications would be described in the VE implementation summary report.

Rejected VE Proposals:

Each rejection of a VE proposal must be supported by valid reasons which are specifically detailed in the VE implementation summary report. Reasons should be based on sound technical analysis. When rejection is based on an opinion, it must be clearly stated as such.

In the VE implementation summary report, the specific reasons for the rejection or partial rejection of individual VE proposals must be stated in sufficient detail to convince PBS and the user agency of the validity of the rejection. For example, the reasons for rejecting a proposal on the basis of safety would explain how and why the proposals would create an unsafe condition.

3.2 Final VE Acceptance Report

Contents of the Final VE Implementation Summary Report:

The VE implementation summary report should include:

- A brief description of the project, the scope of the VE efforts, and the timing of the study.
- A summary list of the accepted and rejected VE proposals. Identification numbers from the original VE report should be carried forward.

An implementation schedule for incorporating the accepted proposals into the design.

- An analysis by the A-E of the value improvement effect of VE proposals. This can be done in a summary form or by individual proposal(s).

Section 4 - Reference Material

4.1 Sample Workshop Agendas

Attached are samples of suggested agendas:

- One day workshop
- Three day workshop
- Five day workshop

These agendas are intended as guidelines for specific agendas to be prepared by the VE contractor.

Sample - 1 **Day Agenda**

VE Review Workshop (8 hours participation required)

Day 1

- **Orientation**

  VE team leader distributes project workbooks and information, reviews scheduling, purpose and methodology of study with VE team.

- **Information Phase**

  Project briefing by PBS representatives and Fee A-E design team members.

- **Creative Phase**

  VE team brainstorms alternative ways to improve function and value of project design and design construction; lists ideas.

- **Evaluation Phase**

  VE team evaluates ideas for achieving improved value.

- **Development Phase**

  VE team develops Value Engineering review proposals from idea listings.

  VE team develops range of cost savings potential for each idea proposed and identifies LCC benefits where appropriate.

  VE team completes review evaluation.

- **Conclusion**

  VE team leader collects all worksheets

Sample - 3 Day Agenda

VE Review Workshop (24 Hours Participation Required)

Day 1

- **Orientation**

  VE team leader distributes project workbooks and information, reviews scheduling, purpose methodology of study with VE Team.

- **Information Phase**

  Project briefing by PBS representatives and fee A-E design team members. Function analysis and Cost Model Review.

- **Creative Phase**

  VE team brainstorms alternative ways to improve function and value of project design and design construction.

Day 2

- **Evaluation Phase**

  VE team evaluates ideas for achieving improved value and identifies those to be developed into proposals for cost savings and LCC benefits.

- **Development Phase**

  VE team develops proposals for cost savings. Development consists of the following:

  Description of the original design with sketches if considered necessary to support narrative.

  Description of the proposed changes with sketches if considered necessary to support narrative.

  List of advantages and disadvantages.

  Cost estimate of both designs for comparison.

  LCC Analysis to be performed (i.e. energy, maintenance, reduced staffing, etc. that will improve the facility value long term).

Sample - 3 Day Agenda

VE Review Workshop (24 Hours Participation Required)

Day 3

- Development Phase (continued)

  VE team completes development of all proposals to be included in VE study report.

  Concentrate on completing narratives, sketches and supportive discussion sections (Cost & LCC will be added afterwards if not completed during study session).

- Conclusion

  VE team leader collects all VE proposals and team member worksheets required for the **VE** study report.

  Presentation of results to PBS representative and A-E.

Sample - 5 Day Agenda

VE Review Workshop (40 Hours Participation Required)

Day 1

- **Orientation**

  VE team leader distributes project workbooks and information, reviews scheduling, purpose methodology of study with VE team.

- **Information Phase**

  Project briefing by PBS representatives and fee A-E design team members. Review of Cost Model. In depth Function Analysis preparation.

Day 2

- **Creative Phase**

  VE team brainstorms alternative ways to improve function and value of project design and design construction.

- **Evaluation Phase**

  VE team evaluates ideas for achieving improved value and identifies those to be developed into proposals for cost savings and LCC benefits.

Day 3

- **Evaluation Phase**

  Complete review and ranking of ideas.

Sample - 5 Day Agenda

VE Review Workshop (40 Hours Participation Required)

Day 3

- **Development Phase**

  VE team develops proposals for cost savings. Development consists of the following:

  Description of the original design with sketches if considered necessary to support narrative.

  Description of the proposed changes with sketches if considered necessary to support narrative.

  List of advantages and disadvantages.

  Cost estimate of both designs for comparison.

  LCC Analysis to be performed (i.e. energy, maintenance, reduced staffing, etc. that will improve the facility value long term).

Day 4

- **Development Phase (continued)**

  VE team completes development of all proposals to be included in VE study report.

  Concentrate on completing narratives, sketches and supportive discussion sections (Cost & LCC will be added afterwards if not completed during study session).

Day 5

- **Conclusion**

  VE team leader collects all VE proposals and team member worksheets required for the VE study report.

Section 4 - Reference Material

4.2 Report Format

Attached is a sample Table of Contents for a suggested report format.

Sample Federal Building
Washington, DC
March 9,1992 – March 13,1992

Table of Contents

Sample Federal Building
Washington, DC
March 9,1992 – March 13,1992

Table of Contents (continued)

Sample Federal Building
Washington. DC
March 9, 1992 - March 13, 1992

List of Tables and Figures

List of Tables

Section 4 - Reference Material

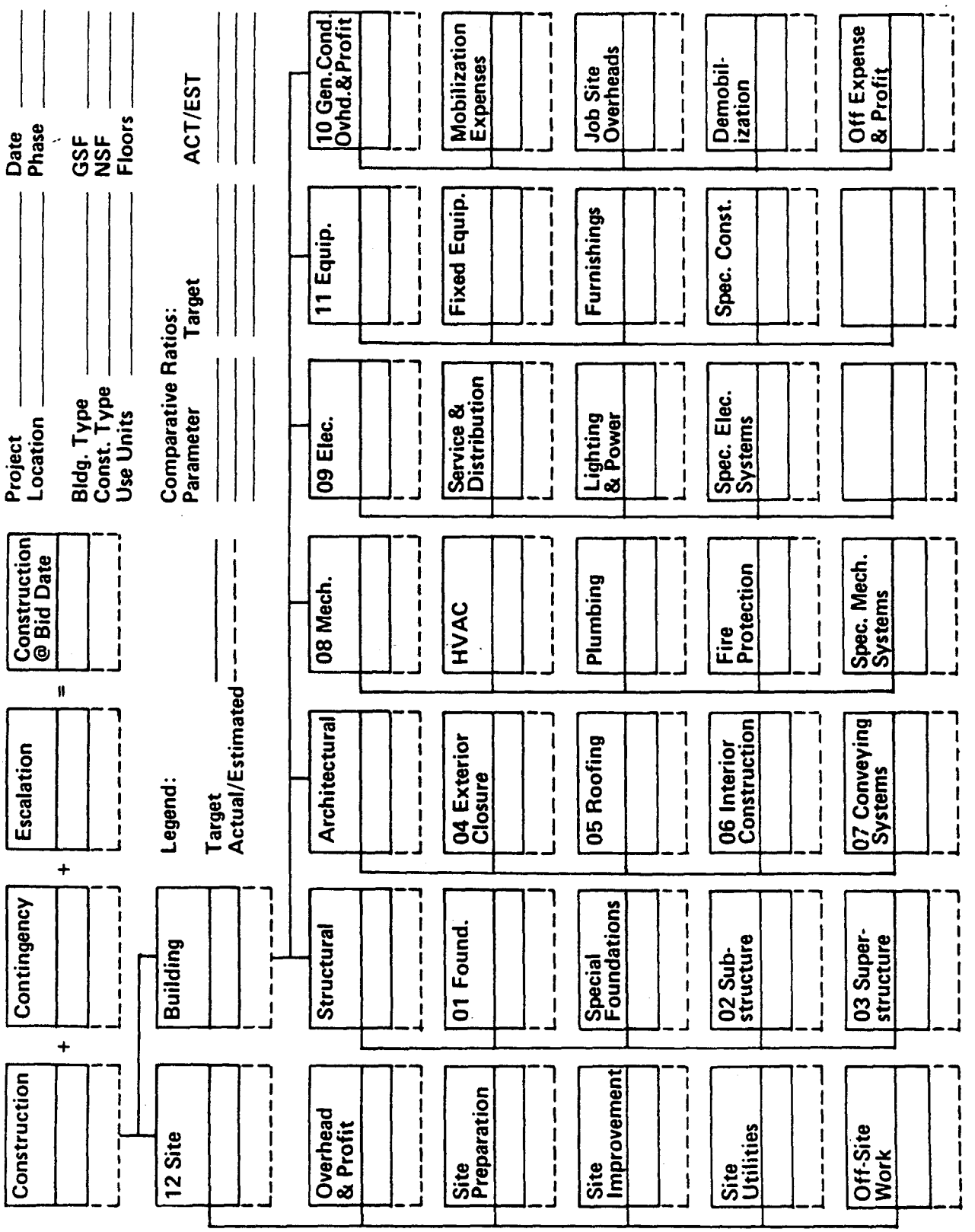
4.3 Sample Worksheets

Attached are selected sample worksheets as follows:

- Cost Model
- Function Analysis
- Idea Listing/Evaluation
- **VE** Proposals
- Cost Estimates
- Summary of Proposals
- Life Cycle Cost Estimate

These worksheets are provided for general guidance only. The **VE** consultant may use proprietary worksheets providing that the overall content is similar.

Cost Model


Construction
Contingency
Escalation
Construction @ Bid Date
Project
Location
Bldg. Type
Const. Type
Use Units
Date
Phase
GSF
NSF
Floors
Comparative Ratios:
Parameter
Target
ACT/EST
Legend:
Target
Actual/Estimated
12 Site
Building
Structural
Architectural
08 Mech.
09 Elec.
11 Equip.
10 Gen.Cond. Ovhd.&Profit
Overhead & Profit
Site Preparation
Site Improvement
Site Utilities
Off-Site Work
01 Found.
Special Foundations
02 Sub-structure
03 Super-structure
04 Exterior Closure
05 Roofing
06 Interior Construction
07 Conveying Systems
HVAC
Plumbing
Fire Protection
Spec. Mech. Systems
Service & Distribution
Lighting & Power
Spec. Elec. Systems
Fixed Equip.
Furnishings
Spec. Const.
Mobilization Expenses
Job Site Overheads
Demobil-ization
Off Expense & Profit

PROJECT _____
LOCATION _____
CLIENT _____
SYSTEM _____

FUNCTION ANALYSIS PHASE

DATE _____
PAGE _____ OF _____
ITEM _____
FUNCTION _____

ITEM NO.	DESCRIPTION	FUNCTION			COST	WORTH	VALUE INDEX C/W	COMMENTS
		VERB	NOUN	KIND				

ACTIVE VERB
MEASURABLE NOUN

KIND P = Primary or Basic
S = Secondary

Cost/Worth Ratio of Basic Function only.

C/W: _____

IDEA LISTING & EVALUATION

PROJECT: _____
LOCATION: _____
CLIENT: _____

DATE: _____
SYSTEM: _____
FUNCTION _____
PAGE _____

CREATIVE PHASE		EVALUATION PHASE		
NO.	IDEA	ADVANTAGES	DISADVANTAGES	IDEA RATING (1 - 10)

CREATIVE / EVALUATION PHASE 1 = LEAST DESIRABLE 10 = MOST DESIRABLE

	VALUE ENGINEERING PROPOSAL	PROPOSAL NO. PAGE OF
PROJECT: LOCATION: CLIENT:	DATE: SYSTEM: ITEM: FUNCTION:	

ORIGINAL DESIGN :

PROPOSED DESIGN

ADVANTAGES

DISADVANTAGES

DISCUSSION / JUSTIFICATION

LIFE CYCLE COST SUMMARY	COST SAVINGS (PRESENT VALUE)		
	INITIAL COST	O & M COSTS	TOTAL LIFE CYCLE COSTS
ORIGINAL DESIGN			
PROPOSED DESIGN			
GROSS SAVINGS			

PROJECT ______
LOCATION ______
CLIENT ______

COST ESTIMATES

PROPOSAL NUMBER ______

DATE ______
PAGE ______ OF ______

AS DESIGNED

ITEM	UNIT	RATE	TOTAL
TOTAL			

AS PROPOSED

ITEM	UNIT	RATE	TOTAL
TOTAL			

PROJECT _____

LOCATION _____

CLIENT _____

VALUE ENGINEERING STUDY
SUMMARY OF PROPOSALS

DATE _____

PAGE _____ OF _____

PROP. NO.	DESCRIPTION	COST SAVINGS (PRESENT VALUE)					
		ORIGINAL DESIGN COST	PROPOSED DESIGN COST	INITIAL COST SAVINGS	ESTIMATED IMPLEMENT COST	O & M COST SAVINGS	TOTAL LCC COST SAVINGS
	TOTAL INITIAL COST SAVINGS						
	TOTAL LIFE CYCLE COST SAVINGS						

Life Cycle Cost Analysis

Using Present Worth Costs

Life Cycle Costing Estimate
General Purpose Work Sheet

Study Title: _____ Date: _____
Discount Rate: _____
Economic Life: _____

		Original Describe:		Alternative 1 Describe:		Alternative 2 Describe:		Alternative 3 Describe:	
		Estimated Costs	Present Worth	Estimated Costs	Present Worth	Estimated Costs	Present Worth	Estimated Costs	Present Worth
Initial/Collateral Costs	Initial/Collateral Costs								
	A.								
	B.								
	C.								
	D.								
	E.								
	F.								
	G.								
	Total Initial/Collateral Costs								
Replacement/Salvage Costs	Replacement/Salvage (Single Expenditure) Year ____ PW Factor ____								
	A.								
	B.								
	C.								
	D.								
	E.								
	F.								
	G.								
	H.								
	Salvage								
	Total Replacement/Salvage Costs								
Annual Costs	Annual Costs Diff. Escal. Rate ____ PWA W/Escal. ____								
	A.								
	B.								
	C.								
	D.								
	E.								
	F.								
	G.								
	Total Annual Costs								
LCC	Total Present Worth Life Cycle Costs								
	Life Cycle Present Worth Dollar Savings								

PW – Present Worth PWA – Present Worth Of Annuity

Worksheet 15

Appendix C

Value Engineering Clauses for A-E, Construction and Design-Build Contracts

- A-E - FAR Standard Clause **(52.248-2)**
- Construction - FAR Standard Clause **(52.248-3)**
- Design-Build - Special Clause
  (Deviation from FAR Standard) - Reserved

Federal Acquisition Regulation

Part 52 - Solicitation Provisions and Contract Clauses

52.248-2 Value Engineering--Architect-Engineer

As prescribed in 48.201(f), insert the following clause:
Value Engineering — Architect-Engineer
(March 1990)

(a) *General.* The Contractor shall (1) perform value engineering (VE) services and submit progress reports as specified in the Schedule; and (2) submit to the Contracting Officer ant resulting value engineering proposals (VEPs). Value engineering activities shall be performed concurrently with, and without delay to, the schedule set forth in the contract. The services shall include VE evaluation and review and study of design documents immediately following completion of the 35 percent design state or at such stages as the Contracting Officer may direct. Each separately priced line item for VE services shall define specifically the scope of work to be accomplished and may include VE studies of items other than design documents. The Contractor shall be paid as the contract specifies for this effort, but shall not share in savings which may result from acceptance and use of VEPs by the Government.

(b) *Definitions.* "Life cycle cost," as used in this clause, is the sum of all costs over the useful life of a building, system or product. It includes the cost of design, construction, acquisition, operation, maintenance and salvage (resale) value, if any.

"Value engineering", as used in this clause, means an organized effort to analyze 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.

"Value engineering proposal", as used in this clause, means, in connection with an A-E contract, a change proposal developed by employees of the Federal Government or contractor value engineering personnel under contract to an agency to provide value engineering service for the contract or program.

(c) *Submissions.* After award of an architect-engineering contract the contractor shall-

(1) Provide the Government with a fee breakdown schedule for the VE services (such as criteria review, task team review, and bid package review) included in the contract schedule:

(2) Submit, for approval by the Contracting Officer, a list of

team members and their respective resumes representing the engineering disciplines required to complete the study effort, and evidence of the team leader's qualifications and engineering discipline. Subsequent changes or substitutions to the approved VE team shall be submitted in writing to the Contracting Officer for approval; and

(3) The team leader shall be responsible for prestudy work assembly and shall audit, reproduce, and sign the final report and each VEP. All VEPs, even if submitted earlier as an individual submission, shall be contained in the final report.

(d) ***VEP preparation.*** As a minimum, the contractor shall include the following information in each VEP:

(1) A description of the difference between the existing and proposed design, the comparative advantages and disadvantages of each, a justification when an item's function is being altered, the effect of the change on system or facility performance.

(2) A list and analysis of design criteria or specifications that must be changed if the VEP is accepted.

(3) A separate detailed estimate of the impact on project cost of each VEP, if accepted and implemented by the Government.

(4) A description and estimate of costs the Government may occur implementing the VEP, such as design change cost and test and evaluation cost.

(5) A prediction of any effects the proposed change may have on life cycle cost.

(6) The effect of the VEP will have on the design or construction schedules.

(e) ***VEP acceptance.*** Approved VEPs shall be implemented by bilateral modification to this contract.

(End of clause)

52.248-3 Value Engineering-Construction

As prescribed in **48.202,** insert the following clause:
Value Engineering-Construction
(March 1989)

(a) ***General.*** The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECPs) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECPs, in accordance with paragraph ***(f)*** below.

(b) ***Definitions.*** "Collateral costs," as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.

"Collateral savings," as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exclusive of acquisition savings, whether or not the acquisition cost changes.

"Contractor's development and implementation costs," as used in this clause, means those casts the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the contractual changes required by Government acceptance of a VECP.

"Government costs," as used in this clause, means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistical support. The term does not include the normal administrative costs of processing the VECP.

"Instant contract savings," as used in this clause, means the estimated reduction in Contract cost of performance resulting from acceptance of the VECP, minus the allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) below).

"Value engineering change proposal (VECP)" means a proposal that-

(1) Requires a change to this, the instant contract, to implement; and

(2) Results in reducing the contract price or estimate cost Life Cycle without impairing essential functions or characteristics ***provided,*** that it does not involve a change-

(i) In deliverable end item quantities only; or

(ii) To the contract type only.

(c) ***VECPpreparation.As*** a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through

(7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effects of the change on the end item's performance.

(2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revision.

(3) A separate, detailed cost estimate for (i) the affected portions of the existing contract requirements and (ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) below.

(4) A description and estimate of costs the Government may incur implementing the VECP, such as test and evaluation and operating and support costs.

(5) A prediction of any effects the proposed change would have on collateral costs to the agency.

(6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

(d) *Submission.* The Contractor shall submit VECPs to the Resident Engineer at the worksite, with a copy to the Contracting Officer.

(e) *Government Action.*

(1) The Contracting Officer shall notify the Contractor of the status of the VECP within 45 calendar days after the contracting officer receives it. If additional time is required, the Contracting Officer shall notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The Government will

process VECPs expeditiously; however, it shall not be liable for any delay in acting upon a VECP.

(2) If the VECP is not accepted, the Contracting Officer shall notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

(3) Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may, accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The Contracting Officer's decision to accept or reject all or any part of any VECP shall be final and not subject to the Disputes clause or otherwise subject to litigation under the Contract Disputes Act of 1978(41U.S.C.601-613).

(f) *Sharing.*

(1) Rates. The Government's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by

(i) 45 percent for fixed-price contracts or

(ii) 75 percent for cost-reimbursement contracts.

(2) *Payment.* Payment of my share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to-

(i) Accept the VECP

(ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(iii) Provide the Contractor's share of savings by adding the amount calculated to the contract price or fee.

(g) *Collateral savings.* If a VECP is accepted, the instant contract amount shall be increased by 20 percent of any projected collateral savings determined to be realized in a typical year of use after subtracting any Government costs not previously offset. However,

the Contractor's share of collateral savings shall not exceed (1) the contract's firm-fixed-price or estimated cost, at the time the VEPC is accepted, or (2) $100,000, whichever is greater. The Contracting Officer shall be the sole determiner of the amount of collateral savings, and that amount shall not be subject to the Disputes clause or otherwise subject to litigation under 41U.S.C.601-613.

(h) *Subcontracts.* The Contractor shall include an appropriate value engineering clause in any subcontract of $50,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contracts price under paragraph *(f)* above, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments; provided that these payments shall not reduce the Government's share of the savings resulting from the VECP.

(i) *Data.* The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

"These data, furnished under the Value Engineering—Construction clause of contract..... shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations."

If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in Part 27 of the Federal Acquisition Regulation.)

(End of clause)

Alternate I (APR 1984). When the head of contracting activity determines that the cost of calculating and tracking collateral savings will exceed the benefits to be derived in a construction contract, delete paragraph (g) from the basic clause and redesignate the remaining paragraphs accordingly.

Design Build - Special Clause

(Deviation from FAR Standard) - Reserved