Designation: E 1699 – 00

An American National Standard

Standard Practice for Performing Value Analysis (VA) of Buildings and Building Systems[1,2]

This standard is issued under the fixed designation E 1699; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers a procedure for defining and satisfying the requirements of the user's/owner's project.

1.2 A multidisciplinary team uses the procedure to convert design criteria and specifications into descriptions of project functions and then relates these functions to revenues and cost.

1.3 Examples of costs are all revelant costs over a designated study period, including the costs of obtaining funds, designing, purchasing/leasing, constructing/installing, operating, maintaining, repairing, replacing and disposing of the particular building design or system (see Terminology E 833). While not the only criteria, cost is an important basis for comparison in a value analysis study of a building. Therefore, accurate and comprehensive cost data is an important element of the analysis.

1.4 This is a procedure to develop alternatives that meet the building's required functions. Estimate the costs for each alternative. Provide the user/owner with specific, technically accurate alternatives, appropriate to the stage of project development, which can be implemented. The user/owner selects the alternative(s) that best satisfies his needs and requirements.

1.5 Apply this practice to an entire project or to any subsystem. The user/owner can utilize the VA procedure to select the element or scope of the project to be studied.

2. Referenced Documents

2.1 *ASTM Standards:*

E 833 Terminology of Building Economics[3]

E 917 Practice for Measuring Life-Cycle Costs of Buildings and Building Systems[3]

E 1369 Guide for Selecting Techniques for Treating Uncertainty and Risk in the Economic Evaluation of Buildings and Building Systems[3]

E 1557 Classification for Building Elements and Related Sitework—UNIFORMAT II[3]

E 2013 Practice for Constructing FAST Diagrams and Performing Function Analysis During Value Analysis Study[3]

3. Summary of Practice

3.1 This practice outlines the procedures for developing alternatives to a proposed design that best fulfill the needs and requirements of the user/owner of the building or building system. The practice shows how to identify the functions of the building and its systems; develop alternatives to fulfill the user's/owner's needs and requirements; and evaluate the alternatives in their ability to meet defined criteria.

4. Significance and Use

4.1 Perform VA during the planning, design, and construction phases of a building.

4.2 The most effective application of value analysis is early in the design phase of a project. Changes or redirection in the design can be accommodated without extensive redesign at this point, thereby saving the user/owner time and money.

4.3 During the earliest stages of design, refer to value analysis as value planning. Use the procedure to analyze predesign documents, for example, program documents and space planning documents. At the predesign stage, perform VA to define the project's functions, and to achieve consensus on the project's direction and approach by the project team, for example, the owner, the design professional, the user, and the construction manager. By participating in this early VA exercise, members of the project team communicate their needs to the other team members and identify those needs in the common language of functions. By expressing the project in these terms early in the design process, the project team minimizes miscommunication and redesign, which are costly in both labor expenditures and schedule delays.

4.4 Also perform value analysis during schematic design (up to 15 % design completion), design development (up to 45 % design completion), and construction documents (up to 100 % design completion). Conduct VA studies at several stages of design completion to define or confirm project functions, to verify technical and management approaches, to analyze selection of equipment and materials, and to assess the project's economics and technical feasibility. Perform VA studies concurrently with the user's/owner's design review

[1] This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.81 on Building Economics.

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[2] Value analysis (VA) is also referred to as value engineering.

[3] *Annual Book of ASTM Standards*, Vol. 04.11.

schedules to maintain the project schedule. Through the schematic design and design development stages, the VA team analyzes the drawings and specifications from each technical discipline. During the construction documents stage, the VA team analyzes the design drawings and specifications, as well as the details, and equipment selection, which are more clearly defined at this later stage.

4.5 A value analysis study performed at a 90 to 100 % completion stage, just prior to bidding, concentrates on economics and technical feasibility. Consider methods of construction, phasing of construction, and procurement. The goals at this stage of design are to minimize construction costs and the potential for claims; analyze management and administration; and review the design, equipment, and materials used.

4.6 During construction, analyze value analysis change proposals (VACP) of the contractor. VACPs reduce the cost or duration of construction or present alternative methods of construction, without reducing performance, acceptance, or quality. At this stage the alternatives presented to the user/owner are called value analysis change proposals. To encourage the contractor to propose worthwhile VACPs, the owner and the contractor share the resultant savings when permitted by contract.

4.7 The number and timing of VA studies varies for every project. The user/owner, the design professional, and the value analyst determine the best approach jointly. A complex or expensive facility, or a design that will be used repeatedly, warrants a minimum of two VA studies, performed at the predesign and design development stages.

5. VA Team

5.1 The Value Analysis Team Leader (VATL) plays a key role in the success of a VA study and is responsible for managing all aspects of the effort. A VA team leader needs training in value analysis and experience as a team member, leader, or facilitator on previous studies. Seek a person with strong leadership, management, and communications skills.

5.2 The size and composition of the VA team depends on the project being studied and the stage of design development.

5.3 Select persons of diverse backgrounds having a range of expertise and experience that incorporates all the knowledge necessary to address the issues the VA team is charged to address.

5.4 Select technical disciplines for a VA team that are similar to the technical disciplines on the design team for the stage of completion being reviewed. Include professionals who are knowledgeable in the financing, cost, management, procurement, construction, and operation of similar buildings or systems.

5.5 The user/owner decides whether to create the VA team using members of the project team, that is, the user/owner, the planner, the design professional, and the construction manager, or using professionals who have not been involved in the design and have no preconceived ideas.

5.6 The user/owner and the VATL agree upon the team composition.

5.7 Determine the duration of each team member's participation based upon the design completion stage, the amount of information available to the VA team, and the interrelationship among the disciplines.

5.8 Decisions reached from the standpoint of one discipline frequently have a major impact on the approach the designer will take for another discipline. Thus, the multidisciplinary interaction is necessary. The collective knowledge and experience of the multidisciplinary team create the synergy that helps this procedure to be successful. The team is dynamic, marked by continuous productive activity which promotes positive change. Individual's personalities are important to the success of the VA team, as well. Positive attitudes, technical knowledge, education, and experience are important to the outcome of the study.

5.9 Make final the team composition and level of participation after receiving the project documents and knowing specifically what information is available for the Workshop Effort.

6. Procedure

6.1 A value analysis study has three sequential periods of activity—Preparation Effort, Workshop Effort, and Post-Workshop Effort. Within these activities, the VA team follows a formal plan, as shown in Fig. 1, and as described in the following:

6.1.1 *Preparation Effort*.

6.1.2 *Workshop Effort*:

6.1.2.1 Information phase.

6.1.2.2 Function identification and analysis phase.

6.1.2.3 Creative phase.

6.1.2.4 Evaluation phase.

6.1.2.5 Development phase.

6.1.2.6 Presentation phase.

6.1.3 *Post-Workshop Effort*:

6.1.3.1 Implementation phase.

6.2 *Preparation Effort*:

6.2.1 The VA team prepares for the Workshop Effort to ensure that events are coordinated; that appropriate information is available for the VA team to review; and that the design professional is prepared to present a description of the project on the first day of the workshop.

6.2.2 The design professional is an integral part of the value analysis process, whether the design professional participates throughout the process, or becomes involved at specific milestones. The VA team is only effective when it communicates with the design professional and the user/owner, and presents alternatives for their consideration.

6.2.3 Preparing for the Workshop Effort, the VATL coordinates the VA study schedule with the design professional and the user/owner to accommodate the project schedule.

6.2.4 The VATL, the user/owner, the design professional, and the construction manager, as appropriate, meet to discuss the scope of the workshop, the objectives of the workshop, and the constraints that have been imposed on the project by the user/owner or regulatory agencies.

6.2.5 The user/owner, the design professional, and the construction manager, as appropriate, establish performance and acceptance requirements for evaluating alternatives during the evaluation phase of the Workshop Effort. Select these

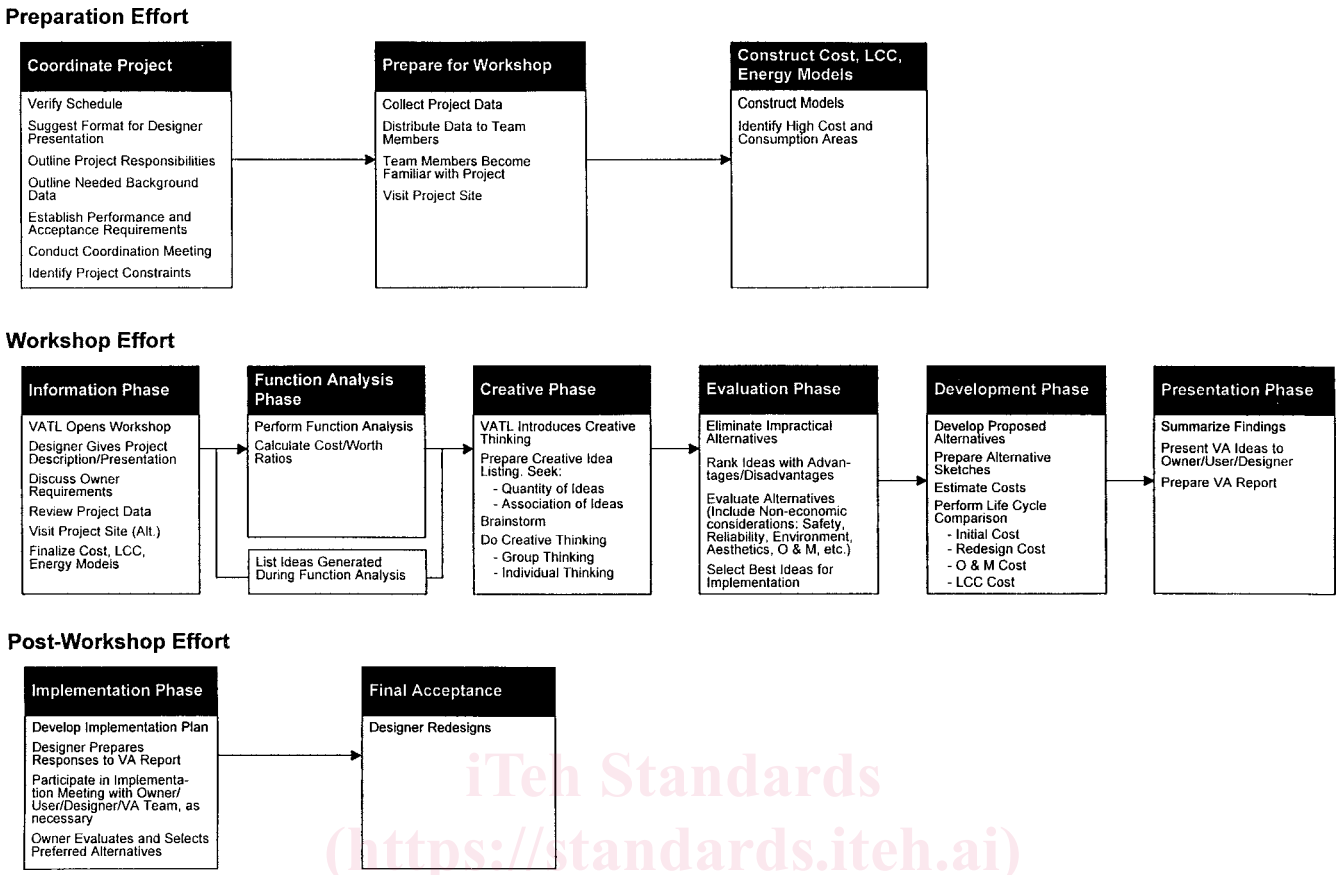

FIG. 1 Value Analysis Study Plan

criteria from items such as initial construction cost, life-cycle cost, aesthetics, ease of operation and maintenance, safety, and schedule adherence.

6.2.6 The user/owner, the VATL, the design professional, and the construction manager, as appropriate, determine the need for a site visit by one or more team members and establish the schedule for this tour. If the Workshop Effort is not going to occur near the project site, it is appropriate to schedule this effort prior to the workshop effort.

6.2.7 The VATL collects the project study material from the design professional. Examples of information needed from the design professional include, but are not limited to:

Owner's design standards
Design criteria
Project budget
Design calculations
Alternatives considered
Technical memoranda, as appropriate
Permit requirements
Regulations governing construction
Maintenance requirements
Equipment data sheets
Estimate of construction cost
Quantity take-off
Applicable building codes
Architectural concepts
Construction phasing
Soil borings
Operations requirements
Project schedules
Pre-purchase and accelerated purchase documents

6.2.8 Using the most current, preliminary estimate presented by the project team, the VATL develops the capital cost model, which organizes initial construction costs by element and trade to determine where high costs are expended (see Classification E 1557). Display the estimated construction costs graphically on this cost model by system and subsystem. The VA team will use this cost model during the Workshop Effort to assign target initial construction cost estimates for each element and trade.

6.2.9 With information provided by the user/owner and the design professional from historical data or projected energy consumption, the VATL or a knowledgeable team member designated by the VATL, prepares an energy model to display energy consumption for the building system, subsystem, or functional area. The model[4] visually identifies energy intensive areas. Prepare an energy model for projects that present a potential for high energy consumption. The VA team assigns target energy consumption estimates during the Workshop Effort, if time is available and as deemed appropriate by the VATL.

6.2.10 With information provided by the user/owner and the design professional from historical data or projected life-cycle costs, the VATL, or a knowledgeable team member designated

[4] The model expresses energy in units of kwh per year or other appropriate systems of measurement.