

MIL-V-24474 (SHIPS)
27 October 1972

MILITARY SPECIFICATION
VALUE ENGINEERING PROGRAM REQUIREMENTS
(NAVAL SHIP SYSTEMS COMMAND)

1. SCOPE

1.1 This specification establishes the minimum requirements for a contractor's value engineering (VE) program when a VE program requirement is included in the contract (see 6.1, 6.3.1, and 6.3.2).

2. APPLICABLE DOCUMENTS

2.1 This section is not applicable to this specification.

3. REQUIREMENTS

3.1 General requirements.

3.1.1 Cost information. Unless otherwise specified (see 6.2), cost reductions developed in the VE program shall be evaluated on the basis of overall (see 6.3.5), or life cycle costs to the Government. Cost analysis should be based on such methods as function and cost (F/C) analysis (see 6.3.6), work package breakdown and cost models setting forth the major cost elements and their contributions to total costs. Target costs and specific areas of value improvement shall be identified and quantified.

3.2 Purpose and objectives.

3.2.1 Purpose. Except as otherwise specified (see 6.2), the purpose of the VE program is to apply effectively the principles and techniques of VE starting as early as practicable in an item's development in order to achieve the objectives specified in 3.2.2. Another purpose is to reap the collateral benefits in areas such as product simplification, improved reliability, logistic support maintainability and performance, which also result from VE.

3.2.2 Objectives. Except as otherwise specified (see 6.2), the objectives of the VE program include the following:

- (a) To provide assurance to the procuring activity that the item(s) being developed/developed/constructed together with their associated needs (e.g., facilities, software, training) can be acquired, installed, utilized/operated and supported for the most economical life cycle costs.
- (b) To achieve, at least, those specific cost reductions and other achievements, as specified (see 6.2) and as agreed upon in the approved program plan.
- (c) To provide the procuring activity with an analysis of the costs in a project and what is being done to achieve only those functions needed for economical life cycle costs.
- (d) To identify to the procuring activity, together with the rationale therefor, any areas where it is considered that additional effort (either within or beyond the scope of the instant contract) should be expended to further improve the value (see 6.3.8) of end items.

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3.3 Program plan. The program plan submitted to the procuring activity (see 6.2) must be comprehensive and specific in defining how the VE program will be conducted to achieve the program requirements and objectives. If deemed necessary and when so advised by the procuring activity after review of the program plan submitted, representatives of the contractor and the procuring activity shall resolve any program plan questions before any additional effort on the program is expended. The approved program plan is a contractual compliance document.

3.4 Program execution.

3.4.1 Organization.

3.4.1.1 Staffing. The contractor shall select a qualified individual to head the VE organization and direct the management of the VE program. Personnel in the VE organization should have a wide range of experience in various fields of engineering and in areas such as manufacturing, design, testing, purchasing, etc. In addition, it is desirable that they should have been trained in a formal VE training course of at least 40 hours or shall have demonstrated, by performance, the equivalence of such training. Personnel assigned to the VE organization should be qualified engineers with demonstrated ability to work constructively and harmoniously with the various organizational elements. It is the intent that the VE personnel in the program will provide initiative, guidance and support, as necessary, in VE and will act as catalysts in stimulating personnel of all organizational elements concerned to perform their assigned duties with more effective attention to the achievement of optimum value in the end item(s) covered.

3.4.1.2 Programming. VE program efforts shall be scheduled and accomplished to achieve the objectives, requirements, and optimum benefits consistent with all contractual obligations. Heavy emphasis shall be placed on early achievement of VE results, when implementation is easiest. VE efforts shall continue through the contract phases specified (see 6.2) and to the extent covered in the approved program plan. The contractor shall provide all the services and materials necessary to conduct the VE program.

3.4.2 Coverage. VE activity under this program shall cover any features of the end item(s) and its associated requirements for which significantly improved value can be achieved while providing the essential functions. This activity shall include, but not be limited to the following:

- (a) **Contract requirements.** There must be emphasis to impress all contractor personnel working on the end item(s) to remain continually alert to the need for good value and to challenge and propose a change to any requirement if it cannot be substantiated as being essential or if a less costly way can satisfy what is needed (see 3.4.3.1).
- (b) **Hardware (procured and fabricated),** including such factors as proprietary items and installation of Government-furnished equipment.
- (c) **Software,** including specifications, drawings, technical and logistic data, manuals and publications.
- (d) **Testing and test equipment.**
- (e) **Facilities and other costs** required for installation, operation or support of the end item(s) in service, including consideration of such areas such as manning and training
- (f) **Preservation, packaging, and packing.**

3.4.3 Studies to be conducted.

3.4.3.1 Determination of areas of VE opportunity. One of the earliest efforts in the program

shall be a thorough, critical review and analysis, involving line personnel concerned, of the contractually specified provisions and requirements for the end item(s) concerned. The purpose of this effort is to determine which requirements or provisions are judged to be unrealistic, superfluous, over-specified, obsolete, overly complex, of doubtful military value or to cause excessive cost for the needed function. A VE change proposal shall be prepared and submitted for deleting or changing each such requirement if determined to be economically advantageous to the procuring activity. Another effort to be conducted early in the program is the determination of those areas which offer the greatest potential for developing significant improvements in value by reducing costs of the end item(s) concerned. A cost analysis shall be conducted and a chart prepared showing the F/C breakdown of the end item(s) and its related contract provisions. This breakdown shall be made to at least the equipment level unless otherwise specified (see 6.2). Each area broken out shall be identified as to function, estimated cost and a realistic target for cost improvement. Based upon the data developed in the F/C analysis and the items for VE study proposed in the bid or proposal, if applicable (see 6.2), the contractor shall identify the specified number of areas of high VE potential recommended for VE study (see 6.2). The contractor shall assemble these items and any study areas specified by the procuring activity into a priority-rated list of items recommended for VE study. For each item, identify pertinent information including, as a minimum (a) description of study proposed, (b) rationale for selection, (c) benefits expected from VE study, (d) estimate of time and costs to conduct study, (e) estimated decision date to permit orderly implementation and (f) probability of successful completion. The list of recommended VE studies and the F/C breakdown shall be submitted to the procuring activity for approval within 30 days after date of contract unless otherwise specified (see 6.2). This data shall be a part of the VE program plan if such a plan is required.

3.4.3.2 Areas of study The contractor shall conduct VE studies according to the order shown on the priority-rated list, as approved by the procuring activity. While the VE program is being conducted, additional studies or other changes determined to be desirable shall be submitted for consideration and revision of the priority list of VE studies, if applicable.

3.4.4 Performance.

3.4.4.1 General. Work under this program shall be a systematic, effectively-managed effort in accordance with the approved program plan, the approved list of study items and any program changes subsequently made by the procuring activity. The principles and techniques of VE shall be employed in this program. In view of its effectiveness, the VE team approach shall be used wherever practicable. A value engineer shall be chairman of each VE study team and he shall work with management to determine the most effective number and types of personnel who will make up each team. It is the intent that the VE tool will be used to assist personnel in performing their assigned duties with a significant impact on achieving improved value in the end item covered. Procedures shall be established which will assure the effective integration of the results of the VE effort into the overall program effort.

3.4.4.2 Design review. The VE organization shall participate in design reviews to assist in the attainment of only essential functions at economical overall cost. VE recommendations and the results of such recommendations shall be documented. When formal design reviews are not conducted, a value review of hardware designs shall be held prior to release for production. Value reviews should also be conducted on such features of the overall program as the reliability, maintainability, and inspection programs where a significant cost improvement appears likely (see 4.2).

3.4.4.3 Production. VE studies shall be conducted on appropriate items after production release, if applicable. Where the contract contains a prototype evaluation phase, the program should include a VE effort directed toward improvements which are capable of being incorporated in the prototype.

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3.4.4.4 Guidance materials. Personnel concerned shall be given guidance materials to assist them in the achievement of good value in the end item concerned. Such materials shall also include VE check-off lists for factors such as design, production and purchasing to insure basic value considerations at appropriate stages.

3.4.4.5 Purchasing considerations. As applicable, the contractor shall encourage subcontractors and vendors to challenge and propose changes to those elements of design and specifications which they feel can be modified or eliminated without degrading essential characteristics (see 6.3.3). The contractor shall consider the use of incentives to encourage such participation in the program from subcontractors and vendors (note the paragraph in the program requirement clause of the applicable contract which concerns the reimbursement for such incentives). The contractor shall encourage, assist, and monitor subcontracts in the area of VE. Deliberations of "make-or-buy" shall reflect the application of VE techniques as a basis for decisions. The contractor should include purchasing representatives in design and hardware value reviews.

3.4.5 Value engineering changes. VE studies conducted shall be well documented to permit ready evaluation or decision, as applicable. Monetary cost reductions shall be stated in dollars rather than percentage of improvement. VE changes developed shall also indicate the improvement in other characteristics such as reliability, maintainability, logistic support, etc. which can result from the changes. In addition to the project report, each VE study (see 6.3.7) shall be summarized on a NAVSHIPS Form 4856-1 (see 6.2) or a duplicate thereof. Copies of this form may be obtained from the contracting officer or the Naval Ship Systems Command, Value Engineering Branch, Washington, D.C. 20360. If the project is revised, updated project summary forms shall be submitted. VE changes shall be identified as to whether they are class 1, value engineering change proposals (VECP's) (see 6.3.4) or class 2.

3.4.5.1 Class 1 changes (VECP's). Class 1 changes are VE-generated changes which require issuance of a contract change in order to be applied. When the results of a VE study or determination warrant and promise a reduction in overall costs to the Government, the contractor shall submit a VECP for acceptance. The specific requirements for submitting VECP's and any incentive rewards which may apply thereto are contained in the applicable contract. Each VECP submitted shall be identified by a unique VECP number and the applicable contract number.

3.4.5.2 Class 2 changes. Class 2 changes are the result of those studies performed under the VE program which do not require the issuance of a contract change since they fall within the contractor's funded expenses pertaining to such approved changes and are subject to review by Government (see 4.1). The cost reduction effect of these changes on the end item should be documented and reported in the periodic progress reports and in the final report (see 6.2). Each class 2 change shall be identified by a unique VE project number and the applicable contract number.

3.5 Program control. The contractor shall institute procedures which will be effect in assuring achievement of the VE program's objectives and requirements. As a minimum these procedures shall assure the following:

- (a) The program is properly staffed and functioning effectively to satisfy the requirements of the VE program.
- (b) All employees concerned are kept informed on the VE program and of their roles in achieving the program's objectives.
- (c) The results of the VE efforts are effectively integrated into the overall program efforts. The contractor shall assign the head technical official of the project, or other management official of equal or higher authority, the responsibility to assure that the final work product of the VE program is compatibly interfaced with all other work elements.

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- (d) The program progress is measured and evaluated quantitatively against the program's objectives and requirements.
- (e) Early corrective actions are taken when program adjustments become necessary.
- (f) The procuring activity is informed in a timely manner of problems which will affect the program's accomplishments significantly or important developments which should be handled promptly.

3.6 Data requirements.

3.6.1 Documentation and records. Each study conducted, regardless of whether or not it is an item of deliverable data, shall be identified by a different identification number (see 3.4.5.1 and 3.4.5.2) and documented in a narrative report. The report shall include significant details of the study. The contractor shall maintain the records and documentation of all work done under the program readily available for review by the procuring activity's contracting officer or his representatives.

3.6.2 Data to be delivered. Data to be delivered by the contractor shall be those items shown on DD Form 1423 (see 6.2).

4. QUALITY ASSURANCE PROVISIONS

4.1 Documentation and records. The documentation and records (see 3.6.1) shall be kept current and, upon request by the contracting officer or his representative, shall be made available for their review.

4.2 Attendance at reviews. Unless otherwise specified (see 3.4.4.2 and 6.2), the procuring activity shall receive notification from the contractor at least 14 days in advance of scheduled reviews, such as; major design, hardware and value reviews to permit attendance by personnel of the procuring activity or its representatives, if desired.

4.3 Program review. Personnel of the procuring activity or its authorized representatives shall conduct an on-site review of the contractor's VE program when considered necessary.

5. PREPARATION FOR DELIVERY

5.1 This section is not applicable to this specification unless otherwise specified (see 6.2).

6. NOTES

6.1 Intended use. This specification is intended to establish minimum requirements and to set a minimum standard of contractor performance for a funded VE program. It is intended that the application of VE efforts in accordance with the requirements of this specification will achieve, at least, the specified purposes and objectives.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Total scope of the program, identifying the contract phase(s) (see 3.4.1.2), the time period covered and any specific areas to be studied, if known (see 6.2(g)). Also, the number of such areas required to be identified by the contractor after award (see 3.4.3.1).
- (c) The number of man-days (or other appropriate units) of effort to be applied (see 6.2(g)).

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- (d) The recommended time-phased distribution of effort for each VE program phase or element, if applicable (see 6.2 (g)).
- (e) The amount of cost reductions and other specific benefits which are expected to result from the VE program (see 3.1.1). Also, any changes in the purpose or objectives of the VE program, if different from those in 3.2. The basis (e.g., life cycle cost, quantity of end items, estimated life) to be used for determining achievements should be identified (see 6.2(g)).
- (f) Whether any arrangements other than those in 4.2, concerning notification of contractor reviews, is required.
- (g) Whether any data is required to be submitted with bids or proposals, as applicable (see 3.4.3.1). (Note: In cases where (1) there is insufficient data available to specify requirements such as in (b) through (e) above or (2) it is desired to evaluate such factors as offerors' VE capabilities, proposed approaches and expected program achievements, offerors should be required to submit, with their bids or proposals, their preliminary VE program plans together with any specific areas which they recommend for VE study and their potential (see 3.3). (D.I.D. No. UDI-S-23658 shall be used for guidance in the preparation of the preliminary VE program plan.)
- (h) Deliverable data requirements. The data, such as drawings, exhibits, test plans and reports, which are required to be furnished in support of this specification, shall be listed on the Contract Data Requirement List (DD Form 1423) attached to the request for proposal, the invitation for bid or the contract, as appropriate (see 3.4.5.2 and 3.6.2). The following and any other items of data, if required, should be listed on DD Form 1423. Each data item shall be in accordance with its Data Item Description (D.I.D.), as shown on DD Form 1664 in the NAVSHIPS Authorized Data List (SADL), NAVSHIPS 0900-050-5010. Any changes from that required by the D.I.D.'s shall be specified in block 16 of DD Form 1423.
 - (1) Value engineering program plan (see D.I.D. No. UDI-S-23658). The contractor shall be required to submit the program plan to the procuring activity for approval within 30 days after date of contract unless the procuring activity considers that additional time is necessary for its preparation (see 3.4.3.1). This time shall be shown on DD Form 1423. See 3.3 and 6.2(g) regarding submission of a preliminary program plan with bids or proposals, as applicable.
 - (2) Value engineering individual project report (see D.I.D. No. UDI-S-23659). Each item studied shall be documented in this report which consists of a narrative of the findings and recommendations of the study, complete with the necessary detailed substantiation, as well as a summary thereof on NAVSHIPS Form 4856-1 (see 3.4.5).
 - (3) Value engineering program periodic progress report (see D.I.D. No. UDI-S-23660). The purpose of this report is to gain visibility regarding the achievements, status and effectiveness of the VE program so that any program adjustments determined to be necessary can be undertaken. Unless another reporting schedule is desired, a progress report every 2 months is recommended. However, monthly reporting may be desired for a short duration program.
 - (4) Value engineering program final report (see D.I.D. No. UDI-S-23661). This report will summarize the program accomplishments versus resources expended and will identify any additional areas considered worthy of further study for value improvement.
- (i) Whether the F/C analysis is to be performed to a level other than that specified in 3.4.3.1.
- (j) Whether any particular preparation is required for delivery of items under this contract or order (see 5.1).

6.3 Definitions. For the purpose of this specification, the following definitions shall apply:

6.3.1 Value engineering. VE is defined as a systematic, creative effort directed at analyzing the functional requirements of systems, equipments, facilities, procedures and supplies for the purpose of identifying and achieving only needed functions for economical overall cost (see 6.3.5), consistent with essential levels for requirements such as performance, reliability, maintainability and quality.

6.3.2 Value engineering program. VE program is defined as the contractually-required value engineering efforts directed toward development, design and, as applicable, delivery of items (supplies and materials) which will have the essential characteristics and provide the essential functions for the specified items at economical overall costs.

6.3.3 Essential characteristics. Essential characteristics are defined as the minimum operational, functional, maintenance, safety, and reliability needs of the user which must be fulfilled.

6.3.4 Value engineering change proposal. VECP is defined as a formal recommendation to the procuring activity, resulting from VE activity, which clearly sets forth a proposed change in contractual requirements with an analysis of any resultant effects on other areas affected and which offers the procuring activity a price reduction.

6.3.5 Overall costs. Overall costs are defined as a combination of acquisition and user supporting costs. The acquisition cost is the total price, of a complete production item including royalties, packaging, maintenance parts, accessories, drawings, and technical manuals. User supporting costs are those which represent the installation, operating, maintenance, replacement (as applicable), personnel training and logistics expense to the user throughout the useful life of the end item concerned.

6.3.6 Function and cost (F/C) analysis. A function and cost analysis is a detailed study of an end item, including a breakdown into its components down to a specified level of indenture. From this F/C model, each component identified is evaluated as to function, the worth of the basic function (worth = the lowest cost for which the basic function can be achieved) and the actual (if known) or estimated cost of achieving its function. Once broken down, those components having a high cost-to-worth ratio are more easily identified for detailed cost analysis (by various techniques, e.g., evaluate by function, evaluate by comparison) and for value improvement by VE studies.

6.3.7 Value engineering study. A VE study is defined as a systematic, function-oriented analysis, utilizing VE techniques, of all the elements of an item or process in order to achieve only essential characteristics at economical overall costs. The term "economical" cost refers to the lowest cost which can be achieved with the expenditure of reasonable efforts within the available time and funding limitations.

6.3.8 Value. Value is a characteristic of an item or service which concerns the relationship between the lowest cost for which it is possible to provide the needed function and the actual cost to provide it. Optimum value is obtained when only needed function is provided for the least cost.

6.4 Department of Defense Handbook 5010.8-H, available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, is an informative guide on VE in the Department of Defense.

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Preparing activity:
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