

CHAPTER 23-3 VALUE ENGINEERING

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23-3.1 OVERVIEW

A. Purpose

This technical handbook chapter provides guidelines and procedures for the implementation and application of Value Engineering (VE) on Indian Health Service (IHS) facilities design and construction projects. These instructions are in conformance with Federal requirements contained in Office of Management and Budget Circular A-131, Value Engineering, June 14, 1993.

B. Scope

IHS will evaluate all projects for VE potential. Those projects (or designs) judged to have significant potential for life cycle cost (LCC) reduction shall be formally value engineered. These analyses will result in designs providing the essential functions at the lowest LCC consistent with required performance, reliability, quality, and safety.

Each office involved with the management of architect/engineer (A/E) design or construction contracts or directly performing design shall designate a Value Engineering Coordinator (VEC) who has received Society of American Value Engineers (SAVE) 40 hour approved training to coordinate the office's VE activities. The contracting officer (CO) is responsible for determining which contracts are subject to formal VE and for formally accepting or rejecting value engineering proposals (VEP).

C. Definitions

(1) **Base Year:** The base year is the first year of the VE study period.

(2) **Funds Invested:** Estimates should include salaries and overhead expenses of value engineering, value engineering training costs, costs for contracting for value engineering services, VEP

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development and implementation costs, and any other costs directly associated with the VE program.

(3) **Internal Rate of Return:** The internal ratio of return is the compound rate of interest which, when used to discount cash flows of an alternative building system, will result in zero net savings.

(4) **Life Cycle Cost (LCC):** The life cycle cost is the sum of all costs over the useful life of a building, system or product. It includes the costs of design, construction, acquisition, operation, maintenance, and salvage value, if any, using present worth (PW) costs. Annualized cost may be determined for additional clarity. For evaluating proposed capital investment projects the modes of analysis to be used include:

- a) Total LCC
- b) Net Savings (NS)
- c) Savings-to-Investment Ratio (SIR)
- d) Payback Period (PB)
- e) Internal Rate of Return (IRR)

Modes of analysis a), b), c), and e) are fully consistent with a LCC approach, because they take into account all relevant values over the entire study period and discount them to a common time basis. Item d) is not fully consistent with a LCC approach because it includes only those values up to the time of payback and, in its simple version, does not adjust them for time differences. It is used in the LCC only as a supplementary measure to the life-cycle costing measures. A discussion of these five LCC applications is provided in the Department of Energy NBS Handbook 135, Life-Cycle Costing Manual by Rosalie T. Ruegg.

(5) **Net Savings (NS):** The net savings is the time-adjusted savings less time-adjusted costs taken over the study period.

(6) **Present Worth (PW):** The time-equivalent value of past, present, or future cash flows as of the beginning of the base year.

(7) **Savings to Investment Ratio (SIR):** A ratio of the total savings to the increased cost to implement these savings.

(8) **Society of American Value Engineers (SAVE):** A professional society dedicated to the advancement of value management through education to provide a better understanding of the principles, methods, and concepts of value technology.

(9) **Value Engineering (VE):** 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 LCC consistent with required performance, reliability, quality, and safety.

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(10) **Value Engineering Change Proposal (VECP):** A proposal developed by a construction contractor under a VE clause in its construction contract. The proposal involves changes in the drawings and specifications directed at reducing the construction costs or LCC without impairing the project's essential functions or characteristics.

(11) **Value Engineering Proposal (VEP):** A document which recommends an alternative concept, design, or solution to a specific functional element of a project. The VEP is developed by the A/E design firm, employees of the Federal Government, or a specialized VE consulting firm. The proposal will not affect an essential function of the design but will provide for the lowest LCC consistent with required performance, reliability, quality, and safety.

(12) **Value Engineering Rating Index (VERI):** A criteria based on construction cost, type of project, number of disciplines involved, and the complexity of the project which is used to select those projects in the \$1.0 million to \$5.0 million construction cost which shall be subject to a formal VE analysis.

23-3.2 REGULATIONS, GUIDELINES, AND POLICY

Below is a list of Federal regulations, guidelines, and policies governing VE for IHS projects:

(1) OMB Circular A-131, Value Engineering, Federal Register, Volume 58, No. 112, June 14, 1993, from pages 32964 to 32967 ;

(2) FAR, subpart 48.102(h);

(3) FAR, subpart 48.104-1(c);

(4) FAR, subpart 48.201(f);

(5) FAR, subpart 52.248-2; and

(6) Department of Health and Human Services (HHS), Value Engineering Guide For HHS Contractors, September 30, 1991.

23-3.3 VALUE ENGINEERING REQUIREMENTS

A. Procurement

The FAR, subpart 48.201, authorize the contracting officer to include a VE clause in solicitations and contracts for architect/engineer (A/E) services when the Government concludes that substantial savings might result from a VE effort. Before including the VE clause in solicitations or contracts, the contracting officer shall consult with the VE coordinator. A sample VE scope of work is contained in Appendix A on page (23-3) A-1.

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The Indian Health Care Improvement Act authorizes IHS to make grants to tribes or tribal organizations to renovate existing facilities. If IHS makes grants as authorized under sections 306 and 307, the recipient (s) must comply with the applicable regulations, including those related to VE as listed in section 1-5, Federal Regulations/Policies for Value Engineering.

B. Funding

The payment for VE services performed by nongovernment employees is an authorized expense of project design funds. These services must be separately priced in the A/E contract, and are in addition to the six percent fee for A/E design services.

The cost of VE activities conducted by Government employees, in most instances, will be paid by the program operating expenses rather than the project design funds. In general, VE services will be quantified in terms of "level of effort," rather than as a deliverable.

C. Project Selection Criteria

Projects will be selected for formal VE analysis before award of the A/E design contract or delivery order, or before the beginning of an in-house design. The VE coordinator will be responsible in the application of the selection criteria. The following criteria provide a guide for determining whether formal VE analysis is required:

- (1) A formal VE analysis is mandatory for projects with construction costs of \$5 million or greater.
- (2) A formal VE analysis is optional for projects having a construction cost less than \$1 million; and
- (3) For projects with an estimated cost of between \$1 million and \$5 million the VE coordinator will complete a preliminary review of the project and complete a value engineering project selection form, see Appendix B on page (23-3) B-1. This form assists the VE coordinator with selection based on analysis of the estimated project construction cost, the type of construction, the number of disciplines involved and the design complexity.

D. Value Engineering Checklist

The common functional areas where VE potential is frequently identified are listed below:

Foundations	Conveying System
Substructure	Mechanical System
Superstructure	Electrical System
Exterior Closure	General Conditions/Overhead/Profits
Roofing	Equipment

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Interior Construction Site Work

An expanded listing of the 12 functional areas is provided in the Appendix C on page (23-3) C-1.

E. A/E Design Value Engineering Requirements

A formal value engineering analysis should be performed on all projects selected for VE analysis when the schematic design stage is 50 to 95 percent complete and before overall design is 35 percent complete. This analysis may be performed by the A/E VE team, a VE consultant or a Government VE team.

The contracting officer, VE coordinator, project manager, customer representative, and technical representative for each discipline may be involved in determining the scope of the VE analysis.

A VE team shall consist of a minimum of three members with expertise in value engineering. One team member shall be the team leader and shall have a formal VE training.

F. Value Engineering Requirements During Construction

The FAR, subpart 48.201, require the contracting officer to include a VE clause in solicitations and contracts for construction services with estimated costs equal to or greater than \$100,000. It also permits the contracting officer to include a VE clause in contracts for construction projects with an estimated cost less than \$100,000 when the Government concludes that substantial savings might result.

The contracting officer and the project manager must review and accept or reject the VE change proposals in accordance with the policies and procedures outlined in the FAR, subpart 48.103(b). These procedures also require the contracting officer to accept or reject VE change proposals within 45 days of their receipt or advise the contractor in writing of the anticipated decision date.

For VE change proposals that are accepted, the Government and the contractor shall share the savings, as outlined in the FAR, subpart 48.104.

G. Value Engineering Report

Reports Prepared for Each VE Analysis - The team performing the value engineering analysis will prepare two reports. The first, completed at the completion of the VE analysis, should include the following:

- (1) A summary of the actions recommended by the value engineering team.

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- (2) A VE proposal for each recommended changes to the reviewed design. A sample VE proposal form is included in the Appendix D on page (23-3) D-1.
- (3) A description of the differences between the existing and proposed designs, including:
 - a) a comparison of the advantages and disadvantages of implementing each VE proposal,
 - b) an explanation of the recommended functional areas changes; and
 - c) an analysis of the effect of the changes on system or facility performance and a review of any test data.

This description may include sketches, calculations, and models.

- (4) A list of design criteria and specifications that must be changed if the VE proposals are accepted, with an analysis of how each change will affect project cost and the building life cycle cost.
- (5) A summary of the estimate of costs the Government may incur by implementing the VE proposals, including costs to modify or revise the existing design, perform necessary tests and evaluate the efficiency of the new design.
- (6) A list of effects that the proposed changes may have on the life cycle cost of the various functional areas. It is recommended that all costs comparisons use the normal life of the functional areas under review and the discount rate on the composite yield of the current six month Treasury Bonds.
- (7) A list of effects of the VE proposals on design and construction schedules.
- (8) A description of the VE team including a statement of each individual member's qualifications.

The VE analysis might determine that increasing the estimated construction and/or capitalization costs of a project could result in savings over the lifetime of the facility. A VE analysis evaluates and compares all costs associated with the useful life of the building, including operation, maintenance and other life cycle costs. Should the VE analysis indicate, that by increasing initial construction costs, savings could be achieved over the useful life that would offset the higher initial costs, the VE report would recommend that the project budget would be amended to reflect the higher construction cost.

The second report prepared by the team performing the value engineering analysis will document the accepted VE proposals and VE

change proposals. These will be grouped by functional area, and will be made available to IHS staff and A/E performing work on new IHS facilities. This information may be included on the VE cost estimate form Appendix E on page (23-3) E-1. The purpose of this report is to collate information, to document functional areas where cost savings are accomplished, and make recommendations for modifications and revisions to plans, designs, construction techniques, etc., that might result in cost savings over the life of the building.

23-3.4 RESPONSIBILITIES

A. Staffing

Each office involved with managing design or construction contracts or directly performing design shall designate a VE coordinator to coordinate the office's VE activities.

B. Training

Each office should ensure that the VEC has a formal VE training. This includes ensuring that the VEC attends the 40 hour SAVE course. Each office will also ensure that technical staff training emphasizes courses in new technology with the potential for greater efficiency and effectiveness that might translate into cost savings. Also, each office should provide training in VE techniques to technical staff responsible for coordinating and monitoring VE efforts, and for developing, reviewing, analyzing, and carrying out VE proposals, change proposals, and reports.

C. Coordination

The contracting officer is responsible for determining which contracts are subject to formal VE and for formally accepting or rejecting VE proposals. The program responsibilities are as follow:

- (1) The IHS Headquarters Director, Division of Facilities Planning and Construction and the Area Facilities Engineers, will monitor, manage, and maintain data for the VE program.
- (2) The IHS Engineering Services (ES) - Seattle and Dallas are responsible for the performance of the VE analysis on selected projects associated with IHS health facilities. Each regional office VE coordinator is the point of contact for VE concerns or questions related to these projects.
 - ES-Dallas - Eastern Branch VE Coordinator
Western Branch VE Coordinator
 - ES-Seattle - Program VE Coordinator

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Northwestern Branch VE Coordinator
Northern Plains Branch VE Coordinator

D. Reporting

VE Reports - The team performing a VE analysis is responsible for developing all reports required to complete the VE.

Annual Reports - Each year, ES and Area Office VE coordinators must prepare a report on all VE activities for which they had lead responsibility. The responsible ES office or Area Office prepares a report summarizing the value engineering activities. This report should be submitted to IHS Headquarters on December 1 every calendar year. The reporting requirement has three parts:

- (1) Part I must describe the net life-cycle cost savings achieved through VE proposals and VE change proposals.
- (2) Part II must describe the top 20 fiscal year VE projects (or all projects if there are fewer than 20).
- (3) Part III must provide a detailed schedule of year-by-year cost savings, cost avoidance, and cost sharing with contractors for each program/project for which the IHS is reporting cost savings or cost avoidance.

For details on what this annual report should include, refer to Office of Management and Budget (OMB) Circular A-31.

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APPENDIX B - VALUE ENGINEERING PROJECT SELECTION FORM

PROJECT: _____ CONSTRUCTION AMOUNT: _____

PROJECT MANAGER: _____ DATE: _____

YES ___ Formal Value Engineering analysis required when

(1) Project construction amount is \$ 5.0 Million or greater.

(2) VE Rating Index (VERI) is 25 points or greater.
 (See calculation below)

NO ___ VE Rating Index (VERI) is less than 25 points.

		VE RATING INDEX (VERI)							SCORE
PROJECT COST (Construction)	\$Millions	0	0.3	1	3	4	5		
	Pts.	0	2	4	8	9	25	_____	
NUMBER OF DISCIPLINES	No.	1	2	3	4	5	6		
	Pts.	2	5	8	9	10	10	_____	
TYPE OF PROJECT (see note below)	ROUTINE								
	Pts.	0	2	4	6	8	10	_____	
DESIGN COMPLEXITY	ROUTINE								
	Pts.	2	4	5	7	9	10	_____	
VEC	Date				VERI TOTAL SCORE			_____	

Note: "Type of Project" refers to the type of work during construction, i.e., renovation of an existing facility, environmental abatement, equipment installation such as x-ray, new health care facility, etc. This effort can vary from routine to intricate.

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APPENDIX A - SAMPLE VE SCOPE OF WORK

1. GENERAL

Value Engineering is 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 (LCC) consistent with required performance, reliability, quality, and safety.

The Value Engineering Architect/Engineer shall perform VE studies of projects under design and prepare summary reports using design documents and information more specifically identified in the work order. Submittal schedules and number of copies of the studies, sketches, plans, or reports to be furnished to the Government will also be set forth in each work order.

2. STATEMENT OF ARCHITECT/ENGINEER SERVICES

- A. VE Reviews - The A/E shall perform Value Engineering Review Services for a prenegotiated fixed fee, identify areas of potential VE savings for construction projects under design, and prepare a report describing potential VE items and estimated amount of potential cost savings in each project reviewed. Project descriptions and details will be as provided in project reports, concept design documents and estimates. All items identified with estimated potential VE savings shall be documented in the report. If no potential VE item is identified, the report shall indicate the effort and areas considered.
- B. VE Studies - The A/E shall perform the VE studies using accepted Value Engineering methodology and qualified personnel, including state of the art methods, and to recommend alternative concepts, designs, or solutions. VE studies shall be accomplished using a functional analysis approach. The determination of functions(s) is a requisite for all VE studies. No cost reduction actions cannot be labeled "Value Engineering" unless the action includes identifying the function, brainstorming to determine alternatives, and selecting the alternative that will perform the required function at the lowest total cost considering performance, reliability, quality, length of useful life, and maintainability. The key features separating the VE Proposal from other cost reduction techniques are functional analysis, use of creativity to develop multiple alternatives, and the principle of maintaining the quality needed by the user. The VE Proposal is a result of the following five-phase effort:
- (1) Information/Investigate
Collect required information to prepare VE Report.
 - (2) Speculative/Create
Prepare alternatives to existing functional solutions.

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- (3) Analytical
Evaluate possible alternatives.
 - (4) Proposal/Presentation
Discuss alternatives with Project Manager and presentation to customer.
 - (5) Report/Implement
Final report details proposal to be implemented.
- C. VE Team Member Requirement - A VE team shall be established consisting of three or more members, one of which shall be designated and qualified as team leader. The number of team members shall be based on the number of disciplined personnel required to provide expertise on all design disciplines in the study. VE team membership may also include one representative each from the user, the Government, and the original design group. The team leader's minimum qualification requirements are:
- (1) Completed a minimum of 40 hours VE workshop training.
 - (2) Five years combined college education and practical VE experience. VE experience is considered to be employed as an employee, supervisor, manager, instructor, or a consultant in VE activities.
 - (3) Be certified a VE specialist by the Society of American Value Engineers.
- D. Approval of VE Team - The list of team members with the various respective discipline to be covered, together with the team leader's qualifications and discipline, shall be submitted at the time of negotiations for each work order. Any later changes of the team members shall be submitted in writing to the Contracting Officer for approval.
- E. VE Study Report - At the conclusion of each study, the A/E will submit a written summary report in that will include, but not limited to, the following:
- (1) Results of functional analysis.
 - (2) Technical data supporting selection of the alternatives(s).
 - (3) Cost data supporting the alternative(s) including life cycle cost analysis if applicable.
 - (4) Explanation of advantages and disadvantages and reasons for accepting the alternatives.
 - (5) Recommended alternative(s) with a listing of design criteria, specifications, and drawings that must be changed for this alternative.

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- (6) Sketches of proposed design clearly depicting proposed changes.
- (7) Problems and cost of implementation.

The VE report shall be prepared and submitted on A4 bond paper. Sketches may be A4 paper or foldout. The A/E shall submit six copies of the final VE report with the appropriate support materials, in accordance with the project schedule.

- F. Conferences - Attend conferences at the direction of the Government, with representatives of the Contracting Officer and the User, together with key personnel and consultants as may be necessary to produce acceptable studies and reports.

3. GOVERNMENT-FURNISHED DATA

The Government will furnish data for information, guidance, and use as described in the work order.

4. GENERAL REQUIREMENTS

- A. Project Manager - Promptly following award of contract, the A/E shall designate a Project Manager who shall be responsible for prosecution of the work orders and who shall be the contact person with the Government.
- B. Contracting Officer's Technical Representative (COTR) - Government will designate a Contracting Officer's Representative who will provide all liaison, supply Government-furnished data, provide and confirm all decisions, and forward minutes of meetings/conferences and other necessary documents. The COR may be assisted by a Project Manager and Negotiator, as required.
- C. Extra Services - The A/E is advised not to perform any services under this contract, requested by any person in the IHS Office, orally or in writing, which he considers to be a change of work or services required by this contract necessitating an adjustment in contract price, until he has made a proposal to the Contracting Officer covering such extra services; has negotiated a mutually satisfactory fee; and has received a notice to proceed in writing.
- D. Extent of Service - The Government makes no guarantee as to the total amount of services to be required and reserves the right to obtain similar services from other sources.
- E. Conflict of Interest
 - (1) A/E firm and consultants shall not perform VE studies for projects which they were involved in the preparation of the original design. Exception: A/E firms/consultants involved with the original design may use the services of subcontractors specializing in VE, or design organization

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staff specializing in VE and not part of the initial "key" design team, to perform VE studies on project plans and specifications.

- (2) A/E shall not furnish information or services pertaining to this contract to any individual or firm other than Contracting Officer or authorized representative, except as noted (1) above and as required to obtain quotations for materials and supplies for subcontract work.

F. A/E Evaluation - An evaluation will be made of the A/E's performance after contract completion. The A/E's ability to meet all submittal dates in full accord with professional quality work will be addressed in the performance evaluation and will be used in consideration of the A/E for future Government work.

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APPENDIX D - SAMPLE VALUE ENGINEERING PROPOSAL

PROJECT: _____ DATE: _____

PROPOSAL TITLE: _____

PREPARED BY: _____

PRESENT CONCEPT: _____

PROPOSED CHANGE: _____

ADVANTAGES/DISADVANTAGES: _____

COST SUMMARY:	PRESENT CHANGE	PROPOSED CHANGE	SAVINGS
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TOTAL FIRST COST	\$ _____	\$ _____	\$ _____
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LIFE CYCLE COST	\$ _____	\$ _____	\$ _____
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- (1) **FOUNDATIONS**
 - (a) Standard
 - Wall Foundation
 - Column Foundation & Pile Caps
 - (b) Special Foundation Conditions
 - Pile Foundations
 - Caissons
 - Underpinning
 - Dewatering
 - Raft Foundations
 - Other Special Foundation Conditions
- (2) **SUBSTRUCTURE**
 - (a) Slab on Grade
 - Standard Slab on Grade
 - Structural Slab on Grade
 - Inclined Slab on Grade
 - Trenches, Pits, and Grade Foundation Drainage
 - (b) Basement Excavation
 - Excavation for Basement
 - Structure Fill and Compact Shoring
 - (c) Basement Walls
 - Basement Wall Construction
 - Moisture Protection
 - Basement Wall Insulation
- (3) **SUPERSTRUCTURE**
 - (a) Floor Construction
 - Suspended Basement Floor
 - Upper Floors
 - Balcony Construction
 - Ramps
 - Special Floors
 - (b) Roof Construction
 - Flat Roof
 - Pitched Roof
 - Canopies
 - Special Roof
 - (c) Stair Construction
- (4) **EXTERIOR CLOSURE**
 - (a) Exterior Walls
 - Exterior Walls
 - Exterior Louvers and Screens
 - Sun Control Devices(Exterior)
 - Balcony Walls and Handrails
 - Exterior Soffits
 - (b) Exterior Doors and Windows
 - Windows
 - Curtain Walls
 - Exterior Doors
 - Storefronts
- (5) **ROOFING**
 - (a) Roof Coverings
 - (b) Traffic Topping and Paving Membrane
- (c) Roof Insulation and Fill
- (d) Flashing and Trim
- (6) **INTERIOR CONSTRUCTION**
 - (a) Partitions
 - Fixed
 - Demountable
 - Retractable
 - Compartments and Cubicles
 - Balustrades and Screens
 - Doors and Frames
 - Storefronts
 - (b) Interior Finishes
 - Wall Finishes
 - Floor
 - Ceiling Finishes
 - (c) Specialties
 - General Specialties
 - Built-In Fittings
- (7) **CONVEYING SYSTEMS**
 - (a) Elevators
 - (b) Dumbwaiters
 - (c) Moving Stair and Walks
 - (d) Pneumatic Tube Systems
 - (e) Other Conveying Systems
 - (f) General Construction Items
- (8) **MECHANICAL**
 - (a) Plumbing
 - Domestic Water Supply System
 - Sanitary Waste/Vent Systems
 - Rainwater Drainage System
 - Plumbing Fixtures
 - (b) H.V.A.C.
 - Energy Supply
 - Heat Generating System
 - Cooling Generating System
 - Distribution System
 - Terminal and Package Units
 - Controls and Instrumentation
 - System Testing/Balancing
 - (c) Fire Protection
 - Water Supply(Fire Protection)
 - Sprinklers
 - Standpipe Systems
 - Fire Extinguishers
 - (d) Special Mechanical Systems
 - Special Plumbing Systems
 - Special Fire Protection Systems
 - Miscellaneous Special Sys/Devices
 - General Construction Items
- (9) **ELECTRICAL**
 - (a) Service and Distribution
 - High Tension Service & Distribution
 - Low Tension Service & Distribution
 - (b) Lighting and Power
 - Branch Wiring
 - Lighting Equipment
- (c) Special Electrical Systems
 - Communication & Alarm Systems
 - Grounding Systems
 - Emergency Light & Power
 - Electric Heating
 - Floor Raceway Systems
 - Others Special Systems & Devices
 - General Construction Items
- (10) **GENERAL CONDITIONS, OVERHEAD & PROFIT**
 - (a) Mobilization and Initial Expenses
 - (b) Site Overheads
 - (c) Demobilization
 - (d) Main Office Expense and Profit
- (11) **EQUIPMENT**
 - (a) Fixed and Movable Equipment
 - Built-In Maintenance Equipment
 - Checkroom Equipment
 - Food Service Equipment
 - Vending Equipment
 - Waste handling Equipment
 - Loading Dock Equipment
 - Parking Equipment
 - Detention Equipment
 - Postal Equipment
 - Other Specialized Equipment
 - (b) Furnishings
 - Artwork
 - Window Treatment
 - Seating
 - Furniture
 - Rugs/Mats/Furniture Accessories
 - (c) Special Construction
 - Vaults
 - Interior Swimming Pools
 - Modular Prefab Assembles
 - Special Purpose Rooms
 - Other Special Construction
- (12) **SITE WORK**
 - (a) Site Preparation
 - Clearing
 - Demolition
 - Site Earthwork
 - (b) Site Improvement
 - Parking Lots
 - Roads, Walks, Terraces
 - Site Development
- Landscaping
- (c) Site Utilities
 - Water Supply and Distribution System
 - Drainage and Sewage Systems
 - Heating & Cooling Distr.System
 - Elec. Distr. & Lighting System
 - Snow Melting Systems
 - Service Tunnels
 - (d) Off-Site Work
 - Railroad Work
 - Marine Work
 - Tunneling
 - Other Off-Site Work