

COMPILING CONSTRUCTION
COST ESTIMATES,
SPECIFICATION FOR

ENGINEERING DEVELOPMENT DIRECTORATE

National Aeronautics and
Space Administration

John F. Kennedy Space Center



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SPECIFICATION FOR
COMPILING CONSTRUCTION COST ESTIMATES

1. SCOPE

This specification has been approved by the Engineering Development Directorate of the John F. Kennedy Space Center (KSC) and is mandatory for use by KSC and associated contractors.

This specification covers preparation of cost estimates for NASA projects at KSC. Requirements and guidelines herein provide the details required for cost breakdown and uniformity of cost presentation in estimates compiled for each of the codes listed in paragraph 2.

2. CLASSIFICATION

Cost estimates shall be classified as follows:

- | | |
|---------------|------------------------------------------------------------------------------------------------|
| a. Code A1 | Budget |
| b. Code A2 | Preliminary Engineering Report |
| c. Code B | Labor and Materials Unit |
| d. Code C | Detailed Construction |
| e. Code C-95 | Detailed Construction (incorporated comments and changes from a 90-percent design review) |
| f. Code C-100 | Final Construction (consists of the approved C-95 estimate and cost factors added by NASA/KSC) |
| g. Code D | Change Order |
| h. Code E | Government Cost Estimate for Arch/Engineer Work |
| i. Code F | Other |

3. REFERENCES

The following references (latest issue) provide materials for guidance in preparing cost estimates.

3.1 Federal Regulations.

- | | |
|--------|--------------------------------|
| a. FAR | Federal Acquisition Regulation |
|--------|--------------------------------|

3.2 Department of Defense.

- a. AR-415-17 Construction Empirical Cost Estimate for Military Construction and Cost Adjustment Factors (March 1980)
- b. TM-5-800-2 Department of Army Preparation of Cost Estimates, Military Construction, General Criteria (May 1966)

3.3 National Aeronautics and Space Administration.

3.3.1 Headquarters.

- a. NHB 5100.4 Federal Acquisition Regulation Supplement (NASA/FAR Supplement, April 1984)
- b. NHB 8820.2 Facility Project Implementation Handbook (March 1981)
- c. SPECSINTACT NASA Standard Construction Specification System. (October 1982)

3.3.2 Kennedy Space Center.

- a. DE-PD 5110.1 Government Estimates for Construction/Installation Procurements (February 10, 1977)
- b. KSC-SPEC-G-0003 Ground Support Equipment Cost Estimating (July 5, 1977)
- c. TR-1508 Budget Cost Data For Facility Construction Elements (November 18, 1985)
- d. TR-1511 KSC Monthly Facility Construction Cost Index (January 16, 1986)
- e. TR-1495 KSC - Estimating Orientation (November 2, 1976)

3.4 Department of Labor, Bureau of Labor Statistics.

- Bulletin 917 Handbook of Work and Output (June 1947)

3.5 Occupational Safety and Health Administration.

- Occupational Safety Construction Standards and Interpretations & Health Act, Vol. II. (May 31, 1985)

3.6 Other.

- a. American Association of Cost Engineers Annual Meeting Transactions - 1985
- b. Industrial Psychology and Its Social Foundation, Harper & Brothers

4. PRICING SOURCES

Estimators shall have ready access to reference books, catalogs, and other documents usable as sources of current price information. Source documents recommended for use in compiling cost estimates for NASA/KSC projects are provided in paragraphs 4.1 through 4.3.

4.1 General.

- a. Building Construction Cost Data, Robert Snow Means - 1986
- b. Building Cost File, Southern Edition, Construction Publishing Co., Inc. - 1985
- c. Compilation of Nationally Averaged Rental Rates for Construction Equipment, Associated Equipment Distributors - 1985
- d. Contractors' Equipment Ownership Expense, Associated General Contractors of America, Inc. - 1985
- e. McGraw-Hill Cost Information Systems/Dodge Cost Publications
 - 1985 Dodge Construction Systems Costs
 - 1985 Dodge Manual for Building Construction
 - 1985 Dodge Digest of Building Costs and Specifications
 - 1985 Dodge Guide to Public Works and Heavy Construction Costs
- f. Engineering News Record, McGraw-Hill, Inc. - 1986
- g. Estimators' Equipment and Installation Manhour Manual, John S. Page - 1978
- h. Estimators' General Construction Manhour Manual, John S. Page, Gulf Publishing Co. - 1977
- j. Net Prices Catalog, McMaster-Carr Supply Company - 1985
- k. Building Estimators Reference Book, Frank R. Walker Co. - 1986 (22nd ed).
- l. ORR System of Construction Cost Management Vol. I through IV - 1980-83

- m. Cost Engineering By AACE (monthly magazine)
- n. Cost and Optimization Engineering, Dr. S.C. Jelen - 1970

4.2 Mechanical.

- a. Cost Manual for Piping and Mechanical Construction, Herbert Herkimer, copyright: 1958, last printing: 1979. 1958 to 1986 units are the same.
- b. Estimators; Manhour Manual on Heating, Plumbing, Air Conditioning, and Ventilation, John S. Page, Gulf Publishing Company. Last printing: 1978
- c. Estimators' Piping Manhour Manual, Page and Nation, Gulf Publishing Company. Last printing: 1976
- d. Labor Calculator, National Association of Plumbing, heating, and Cooling Contractors. Last printing: 1971
- e. Mechanical Estimating Guidebook, John Gladstone, McGraw-hill. Last printing: 1981
- f. Tool Rental Guide, Mechanical Contractors Association of America, Inc. - 1985
- g. Machine Shop Estimating, W.A. Nordhoff, McGraw-Hill. Last printing: 1976
- h. Manufacturing Cost Eng. Handbook, E. Malstrom, Marcel Dekker. Last printing: 1984

4.3 Electrical.

- a. General Cable, General Cable Corporation - 1985
- b. Estimators' Electrical Manhours Manual, Gulf Publishing Company. Last printing: 1979
- c. GESCO Estimator, The General Electric Supply Company - 1985
- d. Graybar Catalog, Graybar Electric Company, Inc. - 1985
- e. National Price Service Monitor, Henderson-Hazel Corporation - 1985
- f. Unistrut General Engineering Catalog and Prices - 1985
- g. NECA Manual of Labor Units, National Electrical Contractors Assoc. - September 1985

- h. Electronic Industry/Cost Eng. Data, Fred G. Hartmyer, Ronald Press Co. - 1964

5. ESTIMATE PREPARATION

5.1 General Requirements. Cost estimates shall be prepared on NASA/KSC furnished forms. Legible originals shall be submitted so that the estimate can be reproduced by quality photocopy process. The original and three copies of the estimate shall be provided to the lead design engineer.

Cost estimates for all codes shall be prepared in the same careful manner as if bidding in competition with an experienced, qualified contractor engaged in similar construction work, and shall be based on a normal 40-hour work week. When a project has more than one building/structure, or when different types of funding must be accounted for, the cost estimate must be prepared for each part of the project, respectively. The latest cost data available shall be used or noted why not used.

The estimator/cost engineer shall obtain the necessary design information to estimate the project in the detail required, especially when working with performance specifications and Preliminary Engineering Reports (PER's) that require but do not define systems and equipment, such as sprinkler and Halon systems, cranes, hoists, electrical/electronic control systems, and program-oriented ground support equipment.

Detail material quantity takeoff and labor hours with respective pricing shall be summarized for each of the work elements and will be related to their respective 16 divisions of SPECINTACT. These work elements shall be carried forward to an overall project summary, broken down in the following major work elements:

- a. I Site work
- b. II Building and/or structures to the 5-foot line, including all interior architectural/structural, interior mechanical and interior electrical work
- c. III Utilities outside the 5-foot line
- d. IV Any specialized construction

Estimates shall cover all work shown on the plans, specifications and other pertinent documents. The lead design engineer will be notified, in writing, of conflicts in the plans and specifications or other unclear areas.

Appendices A through G contain the degree of detail required for each type of estimate and the required format. One Coff project has been selected to serve as an example, and illustrates the increase in detail expected as the design progresses from concept through completion.

5.2 Special Requirements.

5.2.1 Budget Cost Estimate (Code A1). This estimate is used to prepare a prospectus or other request for project authorization. It is the initial determination of the project scope that can be completed for a stipulated amount, and serves as a basis for overall program planning and control, for establishing equitable fees in negotiations with A/E firms, and for comparative cost analyses. The cost estimate shall be prepared using NASA/KSC Form 1510 or another form as specified by NASA/KSC, and formatted for submittal in accordance with appendix A.

5.2.2 Per Cost Estimate (Code A2). This estimate is the product of detailed analyses of user requirements determining a design that should result in lowest possible life cycle cost for the proposed project. The PER incorporates all information needed to formulate a basis for design and includes the basis for requirements, analyses of facility functions or work, evaluation of different approaches and recommended solutions, a cost estimate that accommodates additional and reasonable cost escalation and contingency factors, construction schedules, plot plans, drawings, schematics, equipment lists, and peripheral considerations (real estate requirements, erosion control, pollution control, environmental factors), as applicable. Cost estimates for PER's shall be prepared in accordance with NHB 8820.2, using KSC Form 21-193. The estimates shall be formatted for submittal in accordance with appendix B.

An example of the detail required in PER estimates is provided in appendix B. Units of measure and descriptions used in the estimate shall be as listed in TM-5-800-2, Measurements and Checklist. The development of the estimated cost for design and engineering services shall also be included with the estimate.

5.2.3 Labor and Materials Cost Estimate (Code B). This estimate combines costs for labor and material into single unit costs and may be required for preliminary design concepts and cost tradeoffs to support a preliminary design review. Code B estimates, when required, shall be prepared using KSC Form 21-224, and shall be detailed with costs broken down in accordance with appendix C.

5.2.4 Detailed Construction Cost Estimate (Code C). This estimate shows separate costs for labor and materials associated with each divisional task estimated for the construction project. Unless otherwise specified, they will be prepared for each design review milestone through 100 percent design completion, and updated at the midpoint of the bidding period or as often as directed by the cognizant lead design engineer. All code C estimates shall indicate the degree of completion of the design review milestone (C-30, C-60, C-90, as applicable). Code C estimates shall be prepared using KSC Form 21-243 and be detailed to the extent that all work is identified and costs are listed. The estimate shall be summarized and formatted for submittal in accordance with appendices D and/or E, as applicable. The code C estimate shall be prepared for each item that NASA/KSC designates for the bid schedule.

Supporting data is required for all code C estimates and shall be prepared on KSC Form 19-75 (figures F-3 and F-4) or on other suitable estimating forms, as shown in figures F-1 and F-2 (KSC Form 21-471). The supporting data shall provide identification of:

- a. Detail material quantity takeoff, labor hours, and related price computations or quoted prices
- b. Price sources and direct quotations from at least three sources for all major material and equipment cost items to verify estimated cost (i.e., type, size, and quantity) and showing the date, source, address and the expected delivery time required for each item
- c. Government-furnished equipment value in today's dollars and related contractor handling costs, if applicable
- d. The estimator's review comments on the drawings and specifications related to value engineering cost reduction, exotic and costly material, or fabrication and erection methods, as applicable

Information in supporting data sheets shall be referenced to the estimating sheet number(s) where corresponding cost figures appear.

Items b, c, and d shall be submitted with each estimate (see appendix F for examples and required format). Item a, such as detail material, quantity takeoff, labor hours and related price calculations, minor price data and analysis, and minor cost studies, shall be retained by the contractor and submitted, if required, by the lead design engineer.

5.2.5 Construction Cost Estimate (Code C-95). This estimate represents the 100 percent design package and incorporates changes and comments approved during a 90 percent design review. It reflects the final estimate of project cost and may not include any special conditions. The special conditions will be included in the C-100 estimate. No contingencies other than the government contingency specified shall appear in the estimate. The C-95 estimate shall be formatted for submittal in accordance with appendix D.

5.2.6 Bid Cost Estimate (Code C-100). This estimate, often called the government estimate, is a refined C-95 cost estimate. It must reflect any amendments to the bid package, special conditions, or any other changes since the C-95 estimate was delivered to the government. The final estimate shall be based on all bid documents, including Invitation for Bid (IFB), Request for Proposal (RFP), and Solicitation Offer & Award (SOA). This estimate will be used as the government estimate. The estimate shall be summarized and formatted for submittal in accordance with appendix E and shall contain as backup the refined C-95 estimate. If the government estimate is 15 percent or more above or below the lowest bidder, the agency/firm responsible for the estimate shall provide written rationale, to the lead design engineer, including a revised government estimate for the variance between the bid and the government estimate.

When errors are uncovered, or when the scope of work changes subsequent to NASA/KSC approval, the estimate shall be revised. Portions of the estimate that undergo revision shall be identified as REVISED and shall indicate the date the revisions were incorporated.

5.2.7 Change Order Cost Estimates (Code D). These estimates are prepared for proposed changes to existing contracts, and are used to negotiate these changes in scope of work. Code D cost estimates require greater detail than estimates prepared for new construction and facilities modification projects. It may be desirable to organize the NASA/KSC estimate in accordance with the format used by the contractor to facilitate rapid resolution of cost differences existing between the two estimates. To the extent possible, code D cost estimates shall conform to format requirements specified in paragraph 5.3. The code designation shall indicate the review milestone (D-30, D-60, D-95), as applicable. When engineering releases a change showing the "WAS" and "IS" views, this does not necessarily mean the "WAS" condition was actually accomplished. The cost engineer/estimator shall verify the site condition.

Timing and issuance of contract change orders initiating preparation of code D cost estimates are important factors. All facets of the work shall be studied, including construction tasks, status of materials procurement by the contractor, change order impact on the contractor's work progress program, and others that influence overall project costs. Examples of cost elements to be evaluated are:

- a. Demolition or modification of work in place
- b. Salvage value and cancellation charges for material
- c. Abnormal work hours for which premium pay rate is paid
- d. Reworking drawings
- e. Reprogramming work schedule
- f. Temporary work to permit orderly progress in adjacent areas

5.2.8 Government Cost Estimate for Architect - Engineer Work (Code E). An independent government cost estimate for architect engineer services shall be prepared and furnished to the contracting officer before commencing negotiations for each proposed contract or contract modification expected to exceed \$25,000. The estimate shall be prepared on the basis of a detailed analysis of the required work as though the government were submitting a proposal. See figure B-4, A&E Design, Cost Estimate, Drawing and Manhour Cost, for sample detail breakdown of drawing and man-hour cost.

5.2.9 Other Cost Estimates (Code F). These estimates are compiled as specified by NASA/KSC to support special studies, surveys, program analyses, and effective project construction cost management. Format, item identification, pricing, organization and coverage shall be as specified by NASA/KSC.

5.2.10 Current Cost Estimate (CCE). This estimate is the cost that reflects the latest and best total project estimated cost available based on design or construction progress. The CCE constitutes the most realistic estimate of ultimate final project costs. It includes the engineering cost to build the project in today's dollars, plus contingencies; escalation to the midpoint of construction; and Supervision, Inspection, and Engineering Services (SI&ES). This is also related to the budget cost as we define it in studies and PER's.

5.2.11 Comparison of Budget and Estimate Costs. Differences in budgeted and estimated costs require early identification. In order to maintain continuous monitoring of costs, each code C estimate project summary shall be marked up to reflect escalation to the midpoint of construction, SI&ES, and government contingency in accordance with appendix G, so that a comparison of budget and estimated project costs can be assessed. This summary shall be included in each estimate over \$100,000. Form number: KSC Form 21-368

5.3 Format. Cost estimate submittals shall be formatted and contain the information specified in paragraphs 5.3.1 and 5.3.2.

5.3.1 Cover Sheet. This sheet shall identify the project title and location; drawing number, project control number (PCN), work order (WO) number and contract number as applicable; appropriate estimate code identification (see paragraph 1.2); and date of submittal. The preparing organization shall be identified by name, address, phone number, and signature of approving official (see appendices D and E for required format). Form number: KSC Form 21-565

5.3.2 Estimate Sheet Headings. The information on the cover sheet shall be inserted in the appropriate heading blocks of each sheet in the estimate. The name and position of the estimator(s) and checker(s) shall appear in the heading of each sheet. Headings in trades' summaries shall indicate the numbers of the drawing sheets used for takeoffs, as well as the drawing number and total sheets (see appendix D for required format).

5.3.3 Summaries.

5.3.3.1 Work Element Summary. This summary is required for all estimates and shall provide cost breakdown of labor, material, equipment, and markup for each work element of the cost estimate (see appendix D, figures D-4, D-5, D-6, D-7, and D-8 for required format).

5.3.3.2 Project Summary. This summary is required for all estimates and shall be summarized into the four major work elements reflecting building square foot costs and system cost by units of measure (cubic yards, tons, linear feet, square feet, pounds), as applicable (see appendix D, figure D-2 for required format).

5.3.3.3 General Conditions and Overhead Summary. This summary is required for all code C estimates and shall identify costs of prime contractor overhead items, such as field supervision, quality assurance, compliance with requirements of volume III of OSHA and home office administration (see appendix D, figure D-3 for required format).

5.3.3.4 Special Conditions Summary. This summary is required for all code C-100 estimates. It summarizes costs resulting from imposition of bid documents and conditions under which the project work will be performed (see appendix E, figure E-5).

5.3.3.5 System Summary. This summary recaps all summaries by work element according to the 16 divisions of SPECSINTACT. The system summaries, when required, shall list the respective division and related corresponding quantities and unit costs. Required for all estimates over \$100,000 with C-90, C-95 submittals (see appendix G, figure G-1 for required format). Form number: KSC Form 21-371

5.3.3.6 Labor Material Cost Summary. This summary, when required, shall list labor and material costs, marked up with taxes, insurance, contractor overhead, profit and bond for each work element of the cost estimate. Required for all estimates over \$100,000 with C-90, C-95 submittal (see appendix G, figure G-2 for required format). Form number: KSC Form 21-369

6. ACCEPTANCE CRITERIA

Cost estimates shall be prepared and formatted in accordance with paragraphs 5.1 through 5.3 and delivered to the lead design engineer. Written waivers to these requirements may be granted jointly by the NASA/KSC lead design engineer and lead cost engineer.

7. ESTIMATE PRACTICES

General estimating practices to be used for construction estimates are as follows:

- a. Cost Breakdowns. Estimates should be broken down in as much detail as possible. As design nears 100 percent, the greater the detail required in the cost breakdown. Cost breakdowns should indicate materials by individual type, kind, and size priced by units of measure listed in TM-5-800-2, Measurements and Checklist. For example, a structural concrete cost breakdown should show, as applicable, separate concrete costs for footings, columns, beams, walls, and slabs; the cost for each type of reinforcing steel; the cost for each type of formwork material; and costs for other associated tasks and materials.

- b. Price Comparisons. A comparison of all major labor and material prices should be made against current prices for similar features of work and adjusted for differences in site, local vendors, and subcontractor prices. The date and source of comparison should be noted on the estimate sheet. If quoted prices or studies of conditions in the geographical area show labor and material costs varying considerably from those in published pricing guides, costs resulting from specific evaluation of job site conditions should be used. Excessive price variations should be justified.
- c. Costs Summary. A summary consisting of the total accumulation of all like costs (i.e., material and labor) should be provided. Direct and indirect costs should be included as a part of the summary. Costs of subcontracted items should be separately identified.
- d. Mechanical and Electrical. Detailed mechanical and electrical estimates should have quantity of materials required and labor in man-hours, with total manhours multiplied by current pricing rates. This should be compared with the KSC cost index. The estimate should include a concise listing of all parts of a project to which units of material and labor costs are assigned.

Estimates for mechanical and electrical installation should be coordinated with other trades, so that all essential items or work are accounted for.

- e. Alternate Work. Estimated costs for alternate work, when applicable, should be identified and priced out. Each alternate should be summarized separately and should not be included in the basic project cost summary.
- f. Price Guides and Quotations. Prices obtained from pricing guides and direct quotation should be used solely to verify the estimator's prices for labor, materials, and equipment. The estimator should break down, in detail, prices obtained from pricing guides and quotes into labor, material, equipment, and other contractor costs (see structural steel price breakdown, (appendix F, figures F-2 and F-3). A specific quotation should supersede published prices and shall be identified as such. The latest cost data available shall be used in evaluation prices. TR 1508 and 1511 are normally more appropriate and current for KSC projects. A detailed cost analysis may be required when quotes appear to be too high or too low.
- g. Sales Tax. The current sales tax in the area local to the project site should be added to the material costs and, if applicable, to equipment rental costs.

- h. Payroll Taxes and Insurance. A percentage should be added to labor dollar totals to cover payroll taxes and insurance (PT&I) items, such as social security (FICA), unemployment insurance (state and federal), workman's compensation, public liability and property damage (including vehicles), and allowances for hazardous trades. TR-1508 and TR-1511 should be used for current percentage rates to be applied to the labor dollar totals.
- i. Labor Rates. Labor rates estimates should be based on information in the KSC construction cost index, latest issue, or other NASA-approved sources.
- j. Markups. Prime contractor and subcontractor costs should be separately identified. The percentage for prime contractor markup for subcontractor work should appear in the individual summary sheets, as applicable.
- k. Profit and Bond. Contractor profit and bond (bid, payment, performance) should be identified.
- l. Separation of Work. Estimates for work beyond the 5-foot line of the building/structure should be separately developed.
- m. The value of government furnished equipment (GFE) shall be estimated in accordance with figure F-4, Method 1, GFE Estimating, on KSC Form 19-75, in lieu of KSC Form 242. The GFE handling, insurance, and storage factor costs shall be included and summarized with the appropriate trades.

The value of GFE shall be listed on the project summary and system summary for funding and budget purposes, but not in project totals.

7.1 General Construction. Labor, material, equipment, (including mill cost, shop fabrication costs, and erection cost for structural steel), should be clearly identified. Applicable taxes, overhead, markup, subcontractor profit and bond associated with installation should be identified, as applicable. All labor costs should be estimated in manhours before converting to dollars.

7.2 Specialized Construction. Because of the specialized nature of NASA/KSC activities, facility projects often require construction of exotic systems, such as hypergolic fuel distribution, which are not normally encountered in routine construction projects. Such specialized construction tasks should be titled, sequenced, priced, and identified so as to be clearly defined in the estimate.

7.3 Facilities Modifications. For repair and modification of existing facilities, estimators should take into consideration existing conditions as determined through study of as-built drawings and visits to the job site. Inherent in this class of project are lost time for demolition prior to starting new work, and joint occupancy conditions which materially reduce labor productivity. These items should be considered when assigning labor costs. To estimate modification cost accurately, estimators shall address the following:

- a. What mechanical, electrical, or other systems and equipment are to be removed or relocated?
- b. At what point does the new work join the existing system?
- c. How will the new work be installed in terms of existing and proposed architectural and structural design?
- d. What restrictions are imposed as to working hours?
- e. What temporary work is required to keep certain areas and functions in operation during the course of the work?
- f. What disposition is to be made of materials and equipment scheduled to be removed, relocated, turned over to NASA/KSC, or become the property of the contractor?

Identification of demolition work required by contractors should be identified in estimates.

8. WITHHELD WORK ALLOWANCES

If a portion of the total project work is to be performed by a separate contract or other means and is to be withheld from the final design, request for bids, or contract award, the estimated cost of this portion of the work should be titled WITHHELD WORK ALLOWANCE in the cost estimate summary. Withheld work allowance costs shall not be included in the sum of project costs titled estimated construction bid cost, but should be identified separately below this title. Summary sheets, when required, shall be inserted at the end of the estimate.

9. SAFEGUARDING

Preparation of estimates for NASA/KSC shall be considered private data. Records, interdepartmental and interagency correspondence, or material that in any way relates to preparation of estimates for NASA/KSC shall be considered administratively confidential and accessible only to authorized NASA/KSC personnel or representatives. Codes C, D, and E -90, -95 and -100 cost estimates shall be stamped FOR OFFICIAL USE ONLY. Supporting data not

attached to the bid schedule estimates should be retained by KSC Engineering Development. After bid opening, a copy of the supporting data will be made available to the NASA/KSC Procurement Office.

9.1 Security of Government Estimates. Use new salmon-colored cost estimate cover sheet see (figures D-1 and E-1) on all original codes C, D, E, and G cost estimates. Order KSC Form 21-565 to cover all estimates.

Control of government estimates:

- a. Estimates distributed on a "need-to-know" basis, only.
- b. Limited copies - minimum required for: Lead Design Engineer (LDE), Lead Cost Engineer (LCE), Project Engineer (PE), System Engineers (SE), Construction Activation & Tests Office (DE-CAT), PROCUREMENT. Each copy should be numbered as required.
- c. C/G 90-95-100 shall be signed and handcarried.
- d. C/G 90-95-100 shall be kept in a secure manner.

9.2 Cancellation of Protective Markings. Protective markings on cost estimates may be cancelled with written permission from DD-FED immediately after the announcement of the successful bidder or at the completion of the project.

9.3 Estimates and Negotiations. Only the latest available NASA-approved cost estimates shall be used as aids in negotiations.

10. ABSTRACT AND STUDY DOCUMENTS

KSC abstract and study documents shall record NASA/KSC estimating performance and facility design costs, and shall be compiled and maintained by a NASA designee as follows:

- a. The KSC Abstract of Construction Bid Costs shall list all construction projects released for bid by NASA/KSC and shall record the project title, PCN, and work order number; bid opening date, number of bidders, name of awarded contractor, and amount of the low, average, and high bids; amount of NASA/KSC estimate, percentage difference between low bidder and NASA/KSC estimate, the position of the NASA/KSC estimate relative to all other bids, remarks concerning differences between the NASA/KSC estimates and amount of the bids; and other information as specified by NASA/KSC.

- b. A cost study to determine the actual design and estimating costs related to the construction costs, when requested, shall list for the projects under consideration the PCN number, work order number, job title, and description. The study results for design and estimating costs shall be summarized as follows:

(1) Design Costs:

- (a) The total manhours to achieve the design
- (b) The total number of design drawings
- (c) The average manhours per design drawing
- (d) The average cost per drawing
- (e) The average cost per manhour
- (f) The design cost as a percent of construction cost

(2) Estimating Costs:

The cost of estimating the project will be summarized in the same manner as design costs.

11. RESPONSIBILITY

When government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:

NASA-John F. Kennedy Space Center
Kennedy Space Center, FL 32899

Preparing Activities:

John F. Kennedy Space Center
Engineering Development Directorate
Facilities Engineering Division

APPENDIX A
BUDGET COST ESTIMATE
(CODE A1)

NASA National Aeronautics and Space Administration		Facility Project Cost Estimate			
INSTALLATION/PROGRAM OFFICE KSC LC-39 Shuttle		DATE May 1, 1983			
PROJECT TITLE Construct Ordnance Building (PSCL)		SUBMISSION/REVISION			
BASIS OF COST ESTIMATE Previous Apollo Project		PROJECT CODE A-1			
		PROJECT NO PCN 77406			
I SUMMARY OF COST ESTIMATE					
DESCRIPTION		AMOUNT a	PERCENT b		
1 ENGINEERING ESTIMATE		\$1,038,200			
2 COST ADJUSTMENT (Enter percentage of item 1a to right in col 2b)		\$ 355,300	34.22		
3 SUBTOTAL (1 + 2)		1,393,500			
4 CONTINGENCIES (Enter percentage of item 3 to right in col 4b)		139,400	10		
5 SUPERVISION INSPECTION AND ENGINEERING SERVICES (Enter percentage of items 3a and 4a to right in col 5b)		153,300	10		
6 OTHER BURDEN COSTS					
7 TOTAL BUDGET ESTIMATE (3 + 4 + 5 + 6)		\$1,686,200	62.43		
8 IDENTIFICATION OF COST ADJUSTMENT (Item 2 above) AND OTHER BURDEN COSTS (Item 6 above) Based on Jan. 83 Cost with escalator 8-1/2% per year compounded annually from Jan. 83 to Aug 86 = 43 months (Mid Point Construction) Cost Adj Factor, use 34.22 $1.085 \times 1.085 \times 1.085 \times 1.0508 = 1.34217$ Use 1.3422 or 34.22					
II PLANNING AND DESIGN					
DESCRIPTION	STATUS				
	NEEDED a	IN-WORK b	COMPLETE c	IN HOUSE AE d	COST e
1 PRELIMINARY ENGINEERING REPORT				A&E	\$ 56,800
2 SPECIAL STUDIES (Specify)				A&E	\$113,600
3 FINAL DESIGN					
4 SUPERVISION AND ADMINISTRATION OF DESIGN SERVICES					
5 TOTAL PLANNING AND DESIGN COST					\$170,400
III RELATED COST DATA (Not included in this Approved Facility Cost Estimate but required to make the facility initially operable)					
1 RELATED COSTS INVOLVED <input type="checkbox"/> a YES (Identify in Items 2 through 10) <input type="checkbox"/> b NONE		2 PER (Amount) \$56,800		3 DESIGN (Amount) \$113,600	
OTHER RELATED EQUIPMENT	4 TO BE PURCHASED	AMOUNT	ITEM	AMOUNT	
	5 TRANSFER TO EXCESS		6 ACTIVATION		
	6 EXISTING		9 OTHER REAL ESTATE		
	7 FUTURE FUNDING		10 OTHER (Specify)		

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PAGE 1 OF 2 PAGES

Figure A-1. Project Cost Estimate, Summary (Sheet 1 of 2)

INSTALLATION/PROGRAM OFFICE		PROJECT CODE		DATE			
KSC, LC-39 Shuttle		PCN 39143		May 1, 1983			
IV FACILITY PROJECT COST ESTIMATE							
DESCRIPTION	UNIT OF MEASURE (1)	QUANTITY (2)	UNIT COST		TOTAL COST		
			ENGRG (3)	BUDGET (4)	ENGRG (5)	BUDGET (6)	
1 INTEREST IN REAL ESTATE							
2 SITE DEVELOPMENT & UTILITIES OUTSIDE 5 FOOT LINE (Summary)	Site Work - Fill, Demol. Grass	CY	7,000	7.90	20.54	88,500	143,800
	Paving 1-1/2" Bitum. 6" L.R. Base	SY	3,300	10.00	16.30	33,000	53,600
	Utilities, Sew. Water MTHW	LF	2,500	30.00	48.72	75,000	121,800
3 BUILDING/STRUCTURE WITHIN 5 FOOT LINE (Summary)	Building - Arch. Struct.	SF	4,100	45.46	73.85	186,400	302,800
	Reinf. Concr. Frame Rebar	CY	220	110.00		24,200	
	Form Work	SFCA	7,000	2.30		16,400	
	Masonry Block 8X8X16	SF	10,000	2.50		25,000	
	Struct St. Misc & Bar Joist	TONS	10	25.00		25,000	
	Roofing Insulation & SM	SF	4,100	3.50		14,350	
	Doors, Window, Hardware	SF	300	30.00		9,000	
	Finishes - Paint, Floor, Ceiling etc	SF	4,100	3.65		14,950	
	Conveying System Bridge Crane	TON	15	2,500.00		37,500	
	Mechanical	SF	4,100	13.66	22.17	56,000	90,900
	Plumbing & Compress. Air	FIXTURES	16	1,000.00		16,000	
	Air Cond Heat & Ventilation	TON	20	2,000.00		40,000	
	* Electrical	SF	4,100	135.20	219.59	554,300	900,300
Power Lights, Ground Mis	SF	4,100	23.00		94,300		
Exterior Sub Station M.H.	KVA	2,000	230.00		460,000		
Specialized-GN ₂ Pneu. Syst. S.S.	LF	50	200.00	324.00	10,000	16,200	
Equip & Solar Heat		A/R	350.00	56,800.00	35,000	56,800	
6 SOURCE OF COST DATA		7		TOTALS		1,038,200	1,686,200
KSC Cost Index & Ordnance Fac. 1966							
V RELATED ITEMS/ACTIONS (Explain as appropriate. Use extra sheets, as necessary, for this block and above)							
***NO COLATERAL EQUIP IS REQUIRED - FORM HAS BEEN MODIFIED TO ACCOMMODATE ADDITION LINE ITEMS FOR MORE ACCURATE EST.							
ESTIMATE OF THE BUDGET CONFIDENCE CONFIDENCE FACTOR			A. OFF-THE-SHELF +15		D. R&D +100		
			B. PREPRODUCTION +50		D. OTHER _____		

Figure A-1. Project Cost Estimate, Summary (Sheet 2 of 2)

APPENDIX B
PRELIMINARY ENGINEERING REPORT COST ESTIMATE
(CODE A2)

Preliminary Engineering Report. Code A-2

PCN: 39143

DATE: May 1, 1984

SECTION III - COST ESTIMATE SUMMARYA. Engineering Estimate:

The cost figures in the Engineering Estimate were arrived at by using KSC Cost Index TR-1511 and January 1984 cost data for building construction, including applicable taxes and insurance and Contractor's markup and bond.

B. Budget Estimate:

The cost figures in the Budget Estimate indicated on the following standard format pages were arrived at by applying the following formula as required by NMI 7330.2A:

$$\text{Budget estimate} = E (1+C) (1+F) (1+G)$$

E is the engineering estimate

C is the contingency factor = 10%

F is the cost-rise factor based on 9% for 1984, 9% for 1985, 8 months of 1986 @ 9% = 6% for 1986 compounded annually from January 1984 to the mid-point of construction, assumed to be August 1986 = $1.26 \times 1.09 \times 1.09 \times 1.06 = 1.259$ Use 1.26

G is the outside agency administrative cost factor-estimated cost for outside agency and/or AE firm contract supervision and inspection including any design required during construction phase = 10%

The Budget Estimate markup therefore is: $1.10 \times 1.26 \times 1.10 = 1.525$. Round to and use 1.53 on the Engineering Estimate.

C. Design and Engineering Services:

Total costs of the design phase including Professional Fees for the preparation of Plans and Specifications, the making of Surveys and Field Studies, and any outside Agency supervision of design are estimated to be \$97,200 (see figure B-4).

In the estimate, grand totals for categories are underlined, subtotals within the categories appear in brackets, and sub-subtotals within the categories appear in parentheses.

1		2		3		4		5		6		7		8	
								UNIT COST		BUDGET		ENGINEERING		BUDGET	
ESTIMATOR	CHECKER	CONSTRUCTION OF FACILITIES - ESTIMATE OF COST												TOTAL COST	
DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET	
a	Interest in Real Estate														
b	Site Development and Util. outside 5' line Special Const. GM2 line	6,700 SF	90.60 .80	138.61 275.40			607,000 9,600	928,710 13,770							
c	Building/Structure to 5' Line Arch Structural	4,100 SF	105.85 63.41	161.96			434,000 [260,000]	664,020							
	Mechanical	4,100 SF	19.27				(79,000)								
	Plumbing	14 Fixture	864.29				(12,100)								
	Compressed Air	5 Outlet	5.50				(2,750)								
	Air Cond. Sys	20 Tons	3,207.50				(64,150)								
	Electrical	4,100 SF	23.17				(95,000)								
d	All other collateral EQ	1 EA	3,600.00	55,080.00			36,000	55,080							
e	Special feature, Solar Heat	4,100 SF	.98	1.49			4,000	6,120							
f	TOTAL		265.85	406.74			1,090,000	1,667,640							

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Figure B-2. Construction of Facilities, Estimate of Cost, Engineering and Budget Costs

1		2		3		4		5		6		7		8	
								UNIT COST		BUDGET		ENGINEERING		BUDGET	
ESTIMATOR VARNDELL, PRC-2421 CHECKER WRIGHT, PRC-2421		CONSTRUCTION OF FACILITIES - ESTIMATE OF COST KSC SHUTTLE OPERANCY BUILDING, I.C.-39												May 1, 1984 PCN 77406	
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENG.	INFPENG.	BUDGET	ENGINEERING	BUDGET	ENGINEERING	TOTAL COST	TOTAL COST	BUDGET	ENGINEERING	BUDGET	ENGINEERING
a	Interest in Real Estate														
b	Site Development & Utilities Outside 5' Line	4,100	SF			148.05		226.51		607,000		928,710			
	Site Work														
	Demolition - Paving		4,100	SF		25.37		38.81		[104,600]		[159,120]			
	Earth Work - Fill		610	CY		3.80				2,320					
	Paving - 1-1/2" Bitum		6,700	CY		8.00				53,600					
	6" Rock Base		3,100	SY		5.65				17,510					
	Grassing		3,100	SY		9.08				28,150					
	Utilities		5,600	SY		1.85				10,360					
	Utilities		1,700	LF		36.47		5,580.00		[62,000]		[94,860]			
	Sewer Line 4" - 6"		200	LF		25.00		5,000.00							
	Water Lines & Wet Tap 6" - 10"		1,000	LF		32.00		3,200.00							
	High Temp. Hot Water 1-1/2" Sup & Ret.		500	LF		50.00		2,500.00							
	Exterior Utilities		2,000	KVA		220.50		337.37		[441,000]		[674,730]			
	Sub Station - Pad-Fence Ground, WP		2,000	KVA		120.00				240,000					
	Manholes		?	EA		506.00				10,000					
	Duct Bank - 4M4, 2M4, 2M3		700	LF		30.00				21,000					
	Power Lines 3C -4/0 P11(M) 15KV		1,000	LF		2.50				2,500					
	13.8 KV LB Switch		?	EA		10,000.00				20,000					
	3000A Secondary Mains		?	EA		20,000.00				40,000					

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Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 1 of 6)

ESTIMATOR - VARNEFILL, PRC-2471 CHECKER - WRIGHT, PRC-2471		CONSTRUCTION OF FACILITIES - ESTIMATE OF COST KSC SHUTTLE ORDNANCE BUILDING, I.C.-39						May 1, 1984 PCN 77406	
1	2	3	4	5	6	7	8		
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT COST		ENGINEERING	BUDGET		
				ENGINEERING	BUDGET				
	Exterior Utilities (cont) 3000A Tie Breaker 3000A Feeder Breaker 600A Feeder Breaker	FA FA FA	1 3 8	200,000.00 12,500.00 5,000.00		200,000 37,500 40,000			
	Specialized Const. GN ₂ S.S	LF	50	180.00		9,000			
c	Building - Structural to 5' Line	SF	4,100	105.85	161.96	434,000	664,020		
	Arch/Structural Earth Work Concrete	SF CY	4,100 200	63.41 14.60		[260,000] 2,920	[397,800]		
	Footing 3000# Structural, Columns 3000 # Tie Beam 3000#	CY CY CY	32 85 10	90.00 150.00 165.00		2,880 12,750 1,650			
	Form Work Footing and Slab Structural Columns Tie Beams	SFCA SFCA SFCA	900 5,500 350	2.50 3.50 3.50		2,250 19,250 1,225			
	Rebar - Reinf. Steel MM6X6 6/6 Conc Slab - Finish, Cure, Harden Gypsum Roof Deck on 1" Insul Board Masonry, Conc Block Inter & Exter	LBS SF SF SF FA	9,000 4,500 4,100 4,100 11,000	.85 .45 2.00 2.50 2.10		7,650 2,025 8,200 10,250 23,100			

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Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 2 of 6)

ESTIMATOR CHECKER		CONSTRUCTION OF FACILITIES - ESTIMATE OF COST KSC SHUTTLE ORDNANCE BUILDING, LC-39		MAY 1, 1984 PCN 77406			
1	2	3	4	5	6	7	8
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET
	Masonry, Conc Block Inter & Exter (cont)						
	Mortar	CY	22	86.00		1,890	
	Wall Reinforcing	LF	8,000	.15		1,200	
	Struct. Steel - Bar Joist Etc.	LBS	10,000	1.85		18,500	
	Beams, Columns & Misc.	LBS	11,000	1.85		20,350	
	Roofing - 5 Ply HOT & G	SF	4,100	1.70		6,970	
	Roofing Insulation	SF	4,100	1.60		6,560	
	Wall Insulation	SF	4,100	1.50		6,150	
	Membrane Waterproof 3 Ply Hot Mod	SF	4,100	1.50		6,150	
	Sheet Metal - Alum/Copper	SF	570	5.15		2,935	
	Caulking - Polysulfided	LF	2,000	2.20		4,400	
	Doors, Frame Hardware	EA	4	2,500.00		10,000	
	Special Vertical Lift - 3 Ea (11")	SF	260	40.00		10,400	
	Inflatable Seals	LF	150	35.00		5,250	
	Painting - Ext Conc/Masonry	SF	7,500	.20		9,000	
	Exterior Conc/Masonry	SF	11,000	.35		3,850	
	Struct & Misc Steel	SF	10.5	345.24		3,625	
	Conveying Sys. OH Crane Bridge STL.	LR	1,800	2.00		3,600	
	Hoist Drums - 10 HP & Trolley 5 HP	TON	15	3,000.00		45,000	

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Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 3 of 6)

1		2		3		4		5		6		7		8	
						QUANTITY	UNIT OF MEASURE	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET
CONSTRUCTION OF FACILITIES - ESTIMATE OF COST KSC SHUTTLE ORDNANCE BUILDING, I.C.-39															
ESTIMATOR - VARDELL, PRC-2421 CHECKER - WRIGHT, PRC-2421															
May 1, 1984 PCN 77406															
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET	ENGINEERING	BUDGET
	Mechanical	SF	4,100	19.27	24.48	[79,000]		[79,000]				[12,100]			
	Plumbing & Fixture	FIXTURES	14	864.29								(2,750)			
	Compressed Air	OUTLETS	5	550.00											
	Air Conditioning, Heating & Ventilation	TUNS	20	3,207.50								(64,150)			
	A/C Compressor 25 H.P.	TON	20	1,000.00								20,000			
	Air Cooled Condensor	FA	1	7,780.00								5,760			
	Air Handling Unit DX Coils	FA	1	5,760.00								515			
	Piping Fitting & Misc	LF	100	5.15								10,500			
	Ductwork Alum & Galv.	LRS	3,000	3.50								5,440			
	Duct Insulation 1" Fiberglass	SF	3,200	1.70								3,675			
	Grills & Diffuser	EA	35	60.00								3,600			
	Misc. Test & Bal. Crane	HR	60	60.00								6,880			
	Power Roof Ventilator, 300 CFM	FA	4	1,720.00											
	Electrical	SF	4,100	23.17	35.45	[95,000]		[95,000]				1,140			
	Air Terminal 5/8" O X 24	EA	12	95.00								1,295			
	Outlet Boxes & Control	EA	37	35.00								525			
	Switches	EA	15	35.00								3,000			
	Recept. 3W, 2P, 120-EP	EA	20	150.00								22,000			
	Wire - #2-14 AWG 1C.	LF	11,000	2.00								5,590			
	#2-0	LF	1,300	4.30								860			
	Conduit 3-3-1/2" Galv. Rigid & Fitting	LF	50	17.20								2,400			
	1-1/2-2" Galv. Rigid & Fitting	LF	400	6.00								4,370			
	1/2-1" Galv. Rigid & Fitting	LF	2,300	1.90											

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Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 4 of 6)

ESTIMATOR VARNDELL, PRC-2421 CHECKER WRIGHT, PRC-2421		CONSTRUCTION OF FACILITIES - ESTIMATE OF COST KSC SHUTTLE ORDNANCE BUILDING, I.C.-19						May 1, 1984 PCN 77406	
1	2	3	4	5		6	7	8	
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	TOTAL COST	BUDGET	
	Light Fixtures 200W VGA Vapor 100W VGA-1HR 2x4 - 41P Fluor Mercury Vap 400W Emergency Bal.	EA EA EA EA EA	6 32 6 20 2	170.00 260.00 345.00 260.00 1,030.00		1,020 8,320 2,070 5,200 2,060			
	Panels, A/C, ITC, PCIA, FCP	EA	5	2,065.00		10,325			
	Misc. Lamps, Test & C/O Motor Control Center Grounding Sys, Rods Recp Flood Light Mounting Poles	HR EA EA EA	200 1 20 5	20.00 12,200.00 345.00 345.00		4,000 12,200 6,900 1,775			
d	All Other Collateral Equipment Not Included in Above	EA	1	36,000.00	55,905	36,000	55,905		
e	Special Features Solar Water Sys - Collectors 100 Gal Insul. Tank Galv. Piping & Misc	SF SF EA HR	4,100 40 1 25	.08 35.00 1,475.00 45.00	1.49	4,000 1,400 1,475 1,125	6,120		
f	TOTALS	SF	4,100	265.85	406.74	1,090,000	1,667,640		

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Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 5 of 6)

ESTIMATOR VARNDELI, PRC-2471 CHECKER WPTIGHT, PRC-2471		CONSTRUCTION OF FACILITIES - ESTIMATE OF COST KSC SHUTTLE ORDNANCE BUILDING, LC-19						May 1, 1984 PLN 77406	
1	2	3	4	5	6	7	8		
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT COST		TOTAL COST			
				ENGINEERING	BUDGET	ENGINEERING	BUDGET		
	Quotes: (1) 2,000 KVA substation Gx 2/1/85 Ms. Brown, Atlanta (2) Copper Wire - Anaconda 3/5/85 Mr. Ed Walters - Orlando, FL (3) IBM 460-4/3/85 Mrs. H. Marchino Jacksonville, FL (4) A/C Compressor Condensers, Air Handling Unit Trane 1/30/85 Mr. Walt Harris Miami, FL (5) 3000A Secondary Mains GF 4/21/85 Mr. Bill Mills, Tampa, FL								

KSC FORM 21-193 (REV. 8/75)

Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 6 of 6)

COST ESTIMATE FOR A&E DESIGN

ESTIMATOR: Joe A. Brown

DATE: May 1, 1984

CHECKER:

PCN: 39143

TITLE: KSC SHUTTLE ORDNANCE BUILDING, LC-39

	<u>Estimated Drawings</u>	<u>Estimated Hours Per Drawing</u> (1)	<u>Total Hours</u>
Civil	4	60	240
Architectural	8	60	480
Structural	6	70	420
Mechanical	6	80	480
Electrical	6	90	540
Utilities	6	90	250
Special Systems			
GN ₂ SS	2	95	190
Solar System	<u>1</u>	75	<u>150</u>
Total	39		2,800

Specifications 300 pages @ 1 hour 300

(3) Special Field Studies 5 Man-week = 200 hr. 200

Cost Estimate - 30%, 60%, 90%, 100% & Final = 5 Estimates
60 Hr. ea x 5 Estimates = 300 Hrs

39 Dwg Sht's @ 7-1/2 Hrs per sheet = 292.5 Hrs

Therefore, use 300 hours to prepare cost estimates

300
~~3600~~ Hrs

(4)

3600 Hrs @ \$27.00 per hour = \$97,200 Estimated Cost. (Enter this cost in Section III C of PER Design and Engineering Services).

Project Budget Cost Estimated \$1,090,500 without Data Processing Equip (c.)

Cost per drawing = $\frac{97,200}{39} = 2492$ Design Cost as a Percentage of Budget Cost = $\frac{97,200}{1,667,640} = 5.8\%$ (2)

- (1) Hours/Drawing is total for Drafting Engineering, Printing, Conferencing and Local Travel.
- (2) Percentage increase due to additional Design Engineering, on new and existing drawings, which also required additional Field Studies.
- (3) When special studies or other services are required they should be listed separately.
- (4) Submit breakdown of how M/H cost is developed.

Figure B-4. A&E Design, Cost Estimate, Drawing and Manhour Cost

APPENDIX C
LABOR AND MATERIALS COST ESTIMATE
(CODE B)

KSC PRELIMINARY COST ESTIMATE WORK SHEET					
W O NO	ECN	DATE PREPARED	SHEET <u>17</u> of <u>17</u>		
0299-0576	32009-39143	Nov 1, 1984			
PROJECT ORDNANCE BUILDING					
LOCATION KGC LC 39				CODE B 30	
ARCHITECT ENGINEER J. B. SMITH INC		1400 APOLLO BLVD. ROCKET CITY, UTAH		ESTIMATOR J. A. BROWN CCE	
DRAWING NO 79K67392-E1-5		CHECKED BY WMBARNDEN		APPROVED BY J B SMITH PRES	
ITEM NO	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
16 ELECTRICAL EXTERIOR					
A TRENCHING - BACKFILL					
	EXCAV & BACK - HAND	18	CY	15.14	273
	CONC. PAD 4" 3000 PSI	100	SF	7.57	757
	FENCE 6" DIAM. 3 BARS WIRE	50	LF	10.00	500
B MED & HI-VOL POWER LINES					
	4" CONDUIT FEW 8 COMM	310	LF	10.00	3100
	4" CONDUIT EL & FITTINGS	10	EA	39.35	394
	3C 3/8" PILE NJ 15KV CABLE	360	LF	7.22	2599
	PRIMARY CABLES PRICED TERM	3	EA	272.33	817
	GROUNDING SUB-STATION	20	SF	45.40	908
	C 300KVA POWER CTR DBLE ENDED	300	KVA	219.47	65,841
	225 & 1000 AMP CRMT BKRS	7	EA		QUOTE FROM GE
	METER & INSTRU PANEL	10			4-15-85
	300KVA X FORMER	2			GEO EDITION
	HY AIR SWITCH (600 AMP)	1			OKL.
	X-FORMER 138/480	2	EA		NO 3 41920
	TOTAL LAB & MATL				75,189
	TAXES & INSURANCE		7%		5263
				SUB TOTAL	80,452
	OVERHEAD		15%		12,068
				SUB TOTAL	92,520
	PROFIT		10%		9,252
				SUB TOTAL	101,772
	PRIME MARK UP		10%		10,177
				SUB TOTAL	111,949
	BOND		1%		1,119
	TOTAL EXTERIOR ELECTRICAL	TO SHEET 2	4100 SF	@ 25.58	113,068
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KSC FORM 21-224 10/74

NASA/KSC AUG/74

Figure C-1. KSC Preliminary Cost Estimate Work Sheet, Unit Cost

APPENDIX D
CONSTRUCTION COST ESTIMATE
(CODE C-95)

COST ESTIMATE COVER SHEET

GOVERNMENT ESTIMATES ARE ADMINISTRATIVELY CONFIDENTIAL
ACCESSIBLE TO AUTHORIZED NASA/KSC PERSONNEL OR REPRESENTATIVES ONLY

PROJECT ORDNANCE BUILDING 4100 SF
 LOCATION KSC - LC 39 - VAB AREA
 IFB NO _____ N/A
 BID DATE _____ N/A
 AMENDMENT _____ N/A
 ESTIMATE CODE C 95
 PCN 77406
 CONTRACT W O 6005

DRAWING NO 79K67392 SHT 80

PREPARED BY J.B. SMITH ABE FCC KSC
1400 A POLLO BLVD.
 FIRM/ADDRESS ROCKET CITY, UTAH

LOCATION UTAH

MODEL NO. N/A

SUBMITTAL DATE MAY 1, 1985

NASA DD-FED-31
 LEAD DESIGNER ALICE JONES - / KL GEDDGE

ESTIMATED BY KOLB ABE VARDELL TRC

KSC COST ENGINEER JOE A. BROWN NASA

PHONE NO. 305-867-2725

NASA DF FED-2
 PROJECT ENGINEER D.R. RAINWOOD / K.B. FRENCH

REVIEWED BY I. SEYMORE

APPROVED BY JUSTIN CASE

PHONE NO. 305-867-3994

Cost Estimating for procurement requires special handling in accordance with DE ID-1142.23, KSC SPEC-G-0002 and KSC SPEC-G-0003 for GSE.

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Figure D-1. Cost Estimate Cover Sheet

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input type="checkbox"/> CONSTRUCTION				
CODE C-95		DATE COMPLETED MAY 1, 1985		SHEET 2 OF 42 SHEET _____ OF _____				
PROJECT/NO TITLE ORDNANCE BUILDING LC 39				DRAWING NO(S) 79K67392				
STATION SET LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.				SHEET NO C-1 THRU C-9				
ARCHITECT OR ENGINEER J. B. SMITH INC				PCN 77406				
ESTIMATOR VARDELL PRC 2421				WORK ORDER OR CONTRACT NO 6005				
CHECKER WRIGHT PRC 2421				APPROVED JUSTIN CASE OF J. B. SMITH				
PROJECT SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		TOTAL COST	
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL FROM		
I SITE WORK								
2A DEMOLITION PAVING	610	SY	@	3.082		4	1,880	
2E EARTH WORK	6500	CY	@	7.73		4	50,273	
2P BIT PAVING	3100	SY	@	15.31		4	47,469	
2T GRASSING	5600	SY	@	1.96		4	10,984	
2V STORM DRAINAGE	132	LF	@	104.97		4	13,856	
SUB TOTAL								124,467
II BLDG STRUCT. TO 5'-0" LINE								
21A ARCH STRUCT	4100	SF	@	74.34		15	304,780	
-15 MECHANICAL (INT)	4100	SF	@	25.84		23	105,949	
-16 ELECTRICAL (INT)	4100	SF	@	24.86		29	101,923	
SUB TOTAL								512,652
III UTILITIES OUTSIDE 5'-0" LINE								
15F STEAM DISTRIBUTION	1,000	LF	@	34.72		35	34,715	
15G SANITARY SEWERS	160	LF	@	36.54		35	5,846	
15Y WATER SUPPLY	1014	LF	@	37.31		35	37,831	
16A EXTERIOR ELEC	2,000	KVA	@	214.78		39	429,569	
SUB TOTAL								507,961
IV SPECIALIZED CONSTRUCTION								
13F SPECIALIZED SYS. (N ₂ 4/304)	50	LF	@	197.76		42	9,888	
GFE-VALUE PANELS @ 50,000	150,000							
EST CONST. BID COST	4100	SF	@	281.70			1,154,963	
SPECIAL COND. ESCALATION	14	MO	@	1% MO		14%	161,695	
EST CONST BID COST W/ ESCALATION								1,316,658
SQA DURING CONSTRUCTION	10%						131,666	
CONTINGENCIES	10%						144,835	
CURRENT COST ESTIMATE								1,593,159

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Figure D-2. Construction Cost Estimate, Project Summary

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 3 OF 52		SHEET _____ OF _____	
PROJECT/NO TITLE ORD NANCE BUILDINGS LC 39		DRAWING NO(S) 79K6739Z	SHEET NO C-1 THRU C-9		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA	PCN 77406	PD/CCBD		
ARCHITECT OR ENGINEER J. B SMITH INC		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR VARDELL PRC2501	CHECKER BLALOCK PRC2421	APPROVED			

GENERAL CONDITIONS & OVERHEAD SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
SUPERINTENDENT	13	WK	600	7800	100	1,300	OFFICIAL USE ONLY
CONSTRUCTION ENGINEER	7	WK	500	3500	-	-	
QC-SAFETY ENGINEER	7	WK	300	2,100	-	-	
PAYROLL CLERK & TYPIST	13	WK	300	3,900	-	-	
OFFICE TRAILER	3	MO	-	-	125	375	
OFFICE SUPPLIES	4	MO	-	-	30	120	
METERED WATER	4	MO	-	-	40	160	
METERED ELECTRICITY	4	MO	-	-	60	240	
PORTO LETS	4	MO	-	-	50	200	
GENERAL CLEANING	120	HR	9.25	1,110	-	-	
CFM-UPDATE ACTIVITIES	100	EA	10.00	1,000	-	-	
HOME OFFICE	4	MO	-	-	500	2,000	
TOOL SHED	1	EA	-	-	200	200	
OSHA INSPECTION	50	HR	10.00	500	-	-	
HAUL DEBRIS	24	HR	10.00	240	-	-	
PROJECT SIGN		A/R	-	-	100	100	
MOB & DEMOB	100	HR	12.00	1,200	-	-	
TOOLS & EQUIPMENT		A/R	-	-	380	380	
TRAVEL-TO HOME OFFICE	3	TRIP	-	-	200	600	
FIRST-AID EXPENSE	4	MO	-	-	30	120	
MISCELLANEOUS SUPPLIES		A/R	-	-	100	100	
TELEPHONES	4	MO	-	-	100	400	
SUBTOTAL				21,350		6,295	
PT&I AND SALES TAX			20%	4,270	5	315	
				25,620		6,610	
32,230 - 214,798 = 15% OVERHEAD SEE SHT 15							
TOTAL EXPENSE ÷ LABOR & MATERIAL COST = OVERHEAD							
* SEE SHT 15							

KSC FORM 21-243 REV 6/80

Figure D-3. Construction Cost Estimate, General Conditions and Overhead Summary

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET 4 OF 42 SHEET C-1 OF _____			
PROJECT/NO TITLE ORENANCE BUILDING LC 39				DRAWING NO(S) 79K67392		SHEET NO C-1 THRU C-9	
STATION SET		LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.		PCN 77406		PD/CCBD	
ARCHITECT OR ENGINEER J.B SMITH INC.				WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR VARDELL PRC 2501		CHECKER BLALOCK PRC 2421		APPROVED			
SITE WORK ELEMENTS SUMMARY	QUANTITY		LABOR (\$ HR)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> P&B	PER UNIT	TOTAL FROM	
						SHT	
2A DEMOLISH EXIST PAVMT.	610	SY	@	3.08		5	1880
2E EARTH WORK							
CLEAR & GRUB	3	AC					
EXCAVATION	2500	CY	6500	CY @	773	5	50,273
FILL (BORROW)	4,000	CY					
2P BITUMINOUS PAVING	4350	SY	@	11.00		11	47,469
256 TON							
2T GRASSING	5600	SY	@	1.97		6	10,984
2V SITE STORM DRAINAGE	132	LF	@	104.97		7	13,856
TOTAL SITE WORK	4350	SY	@	28.70			124,462
TOTAL TO SHT 2							124,462
REF SHTS 8 THRU 10 FOR COMPUTATION							
OFFICIAL USE ONLY							

KSC FORM 21-243 (REV 4/80)

Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 1 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET 5 OF 42		SHEET C-2 OF _____	
PROJECT/NO TITLE ORDNANCE BUILDING LC39				DRAWING NO IS 79K67392		SHEET NO C-1 THRU C-9	
STATION SET		LOCATION JOHN F. KENNEDY SPACE CENTER, FLA		PCN 77406		PD/CCBG	
ARCHITECT OR ENGINEER J.B. SMITH INC				OFFICIAL USE ONLY		WORK ORDER OR CONTRACT NO 6005	
ESTIMATOR VARDELL PRC 2501		CHECKER BLALOCK PRC 2421		APPROVED			

SITE WORK SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		TOTAL COST
	NO UNITS	UNIT MEAS	PER UNIT	FIELD TOTAL	PER UNIT	TOTAL	
2A DEMOLISH EXIST PAVING	610	SY	1.25	763	.60	366	
P&I AND SALES TAX			25%	191	5%	18	
SUBTOTAL				954		384	1,338
SUB CONTRACT OVERHEAD	15	%					20
						SUBTOTAL	1,539
SUB CONTRACT PROFIT	10	%					154
						SUBTOTAL	1,693
PRIME CONTRACT MARK-UP	10	%					169
						SUBTOTAL	1,862
BOND	1	%					19
TOTAL TO SHT 4	610	SY	@	308			1,880
2E EARTH WORK							
CLEAR & GRUB	3	ACR	945	2835	600	1,800	
EXCAVATION	2,500	CY	1.34	3,350	1.20	3,000	
FILL BORROW	4,000	CY	2.50	10,000	250	10,000	
SUBTOTAL				16,185		14,800	
P&I AND SALES TAX			25%	4,046	5%	740	
SUBTOTAL				20,231		15,540	35,771
SUB CONTRACT OVERHEAD	15	%					5,366
						SUBTOTAL	41,137
SUB CONTRACT PROFIT	10	%					4,114
						SUBTOTAL	45,250
PRIME CONTRACT MARK UP	10	%					4,525
						SUBTOTAL	49,775
BOND	1	%					498
TOTAL TO SHT 4	2,500	CY	@	2011			50,273

KSC FORM 21-243 (REV 8/80)

Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 2 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET 6 OF 42 SHEET C-3 OF			
PROJECT/WO TITLE ORLANDO BUILDING LC 39				DRAWING NO: 79K67392			
STATION SET		LOCATION JOHN F. KENNEDY SPACE CENTER, FLA		PCN 77406			
ARCHITECT OR ENGINEER J.B. SMITH INC.				WORK ORDER OR CONTRACT NO 6003			
ESTIMATOR VARDELL PRC 2501		CHECKER BLALOCK PRC 2421		APPROVED			
SITE WORK CONT. SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
2T GRASSING							
SOD	20	SY	1.91	38	1.40	28	
SEED	1500	SY	35	525	.15	225	
SEED & MULCH	5600	SY	.40	2240	.20	1,120	
2" MARL WORKED IN	500	SY	.20	1,120	4.50	1,420	
SUBTOTAL				3923		2773	
FBI AND SALES TAX			25%	981	5%	139	
SUBTOTAL				4904		2912	7816
SUBCONTRACT OVERHEAD	15%						1,172
						SUBTOTAL	8988
SUBCONTRACT PROFIT	10%						899
						SUBTOTAL	9887
PRIME CONTRACT MARK-UP	10%						989
						SUBTOTAL	10,875
BOND	1%						109
TOTAL TO SHT. 4	5600	SY	1.96				10,984
OFFICIAL USE ONLY							

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 3 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET 1 OF 42 SHEET C-4 OF			
PROJECT/WO TITLE ORDNANCE BUILDING LC 39				DRAWING NO/1 79K6739Z			
STATION SET LOCATION JOHN F. KENNEDY SPACE CENTER, FLA				SHEET NO C1 THRU C-9			
ARCHITECT OR ENGINEER J. B. SMITH INC				PCN 77406			
ESTIMATOR VARDELL PRC 2501				WORK ORDER OR CONTRACT NO 6005			
CHECKER BLALOCK PRC 2421				APPROVED			
SITE WORK CONT. SUMMARY	QUANTITY		LABOR (\$ <input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT		PER UNIT	TOTAL	
.2V SITE STORM DRAINAGE							
CONC CURB & GUTTER	335	L.F	3.50	1,173	350	1,173	
CONCRETE FLUME	1	EA	200	200	150	150	
BCCMP 24" Ø	96	L.F	4.00	384	18.00	1,728	
BCCMP 22" x 13"	36	LF	4.50	162	14.00	504	
CONC. HEAD WALLS TYP C	6	EA	350	2100	175	1,050	
SUBTOTAL				4,019		4,605	
P&I AND SALES TAX			25%	1,005	5%	230	
SUBTOTAL				5,024		4,835	9,859
SUBCONTRACT OVERHEAD	15	%					1,479
						SUBTOTAL	11,338
SUBCONTRACT PROFIT	10	%					1,134
						SUBTOTAL	12,472
PRIME CONTRACT MARK-UP	10	%					1,247
						SUBTOTAL	13,719
BOND	1	%					137
TOTAL	132	LF	@	104.97			13,856
OFFICIAL USE ONLY							

KSC FORM 21-243 REV 4 80

Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 4 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 8 OF 42	SHEET C-5 OF 		
PROJECT/NO TITLE ORDNANCE BUILDING LC 39		DRAWING NO. IS 79K67392	SHEET NO C-1 THRU C-9		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CCBD		
ARCHITECT OR ENGINEER J. B. SMITH INC.		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR VARNDELL FRC 2501	CHECKER BLALOCK FRC 2421	APPROVED			

EARTH WORK SUMMARY	QUANTITY		LABOR (\$ PER)		MATERIAL		TOTAL COST
	NO UNITS	UNIT MEAS	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> PAD	PER UNIT	TOTAL	
2E UNCLASSIFIED EXCAVATION							
A ASSUMPTIONS							
1. TOTAL EXCAVATION FOR THREE BUILDINGS SITES WILL BE USED TO ESTABLISH A UNIT COST.							
2. SUB CONTRACTORS WILL HAVE A MINIMUM OF 4- TO 10 HOUR DAY TO COMPLETE TOTAL EXCAVATION.							
3. SIX (6) CY SCRAPERS WILL BE USED WITH 2-D8 DOZERS ONE AS A FISHER & ONE AS A SPREADER							
B EQUIPMENT							
1. FOR ECONOMICAL OPERATION USE 3- 6CY SCRAPERS							
2. SCRAPER CAP- ASSUME 600' HAUL CAP- 71CY/HR (REF TRG 62TMS-252)							
3. TIME REQUIRED = $3720 / (3 \times 71 \times 10) = 1.75$ USE 2-DAYS							
C COST SUMMARY							
1. EQUIPMENT							
a. 3- 6CY SCRAPERS	60	HR	—	—	15.25	915	
b. 2-D8 DOZERS	40	HR	—	—	13.30	532	
c. 1- MAINT. TRUCK	30	HR	—	—	3.52	106	
2 LABOR							
a. SCRAPER OPERATOR	60	HR	15.85	951	—	—	
b. DOZER OPERATOR	40	HR	15.85	634	—	—	
c. OILER	20	HR	12.22	244	—	—	
3 MOB & DEMOB							
a. SCRAPERS	3	EA	—	—	100	300	
b. DOZERS	2	EA	—	—	125	250	
SUB TOTAL TO SHT.					1,829	2,103	

KSC FORM 21-243 (REV 4/80)

Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 5 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C-95	DATE COMPLETED MAY 1, 1985	SHEET 9 OF 42		SHEET NO C-6 OF	
PROJECT/B.O. TITLE ORDNANCE BUILDING LC 39		DRAWING NO'S 79K67392	SHEET NO C-1 THRU C-9		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CCBC		
ARCHITECT OR ENGINEER J. B. SMITH INC		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR VARDELL RC 2501	CHECKER BLALOCK RC 2421	APPROVED			

EARTHWORK SUMMARY	QUANTITY		LABOR (\$ PER HOUR)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	FIELD TOTAL / PAD	PER UNIT	TOTAL	
2E BORROW (FILL)							
A ASSUMPTIONS							
1. 1-2 CY. DRAG LINE WILL BE USED AT THE BORROW PIT.							
2. HAUL DISTANCE = 5 MILE							
3. 12 CY. DUMP TRUCKS WILL BE USED FOR HAULING.							
4. TOTAL QUANTITY OF BORROW FOR 3-BLDG SITES WILL BE USED IN ESTABLISHING A UNIT PRICE.							
5. CONTRACTOR WILL WORK A- 10-HR-DAY.							
B EQUIPMENT							
1. DRAG LINE CAPACITY.							
ASSUME		EFF FACTOR =	.80				
		BUCKET FACTOR =	.80				
		CYCLE TIME =	33 SEC				
CAPACITY 2X. 80X.80X.3600/33 = 140 CY/HR (140X10HR-DAY = 1400)							
2. NO. DAYS REQ'D = 10 900/1400 = 7.8 USE 8 DAYS							
3. NO TRUCKS REQ'D (ASSUME WORKING CAP = 11 CY.)							
a CYCLE TIME							
LOADING TIME = (11/60) 60 = 5 MIN.							
TRAVEL TIME = 10 MI @ 30 MPH = 30 MIN							
LOADING TIME = 5 MIN							
TOTAL = 40 MIN.							
8 TRIPS/HR = 60/40 = 1.5							
C NO TRUCKS = 140/1.5X11 = 8.5 USE 9 TRUCKS							
4. OTHER EQUIPMENT 1 D8 DOZER 1 ROLLER 1 MAINT TRUCK							
1 GRADER 1 SPRINKLER TRUCK							

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KSC FORM 21-243 REV 4 80

Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 6 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95	DATE COMPLETED MAY 1, 1985		SHEET <u>10</u> OF <u>42</u> SHEET <u>C7</u> OF _____				
PROJECT/NO TITLE ORDNANCE BUILDING LC 39			DRAWING NO'S 79K67392		SHEET NO		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA		PCN 77406		PD/CCBC		
ARCHITECT OR ENGINEER J. B. SMITH INC.			WORK ORDER OR CONTRACT NO 6005				
ESTIMATOR VARDELL PRC2501		CHECKER BLALOCK PRC2421			APPROVED		
EARTH WORK SUMMARY	QUANTITY		LABOR (\$/HR)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> PAB	PER UNIT	TOTAL	
2E BORROW CONTINUED							
C COST SUMMARY							
1. EQUIPMENT							
A	1-2 CY	DRAGLINE	80	HR	-	-	15.80 1264
B	9-12 CY	DUMP TRUCK	720	HR	-	-	10.35 7,452
C	1-D8	DOZER	80	HR	-	-	13.35 1,068
D	1-	GRADER	80	HR	-	-	15.25 1,220
E	1-	ROLLER	80	HR	-	-	6.15 492
F	1-	MAINT. TRUCK	80	HR	-	-	3.51 281
G	1-	SPRINKLER TRUCK	80	HR	-	-	4.02 322
2. LABOR							
A		DRAGLINE OPERATOR	80	HR	17.57	1,390	- -
B		DOZER	80	HR	15.85	1,268	- -
C		GRADER	80	HR	15.85	1,268	- -
D		ROLLER	80	HR	13.21	1,057	- -
E		DUMP TRUCK	720	HR	15.18	10,930	- -
F		TRUCK DRIVERS	160	HR	15.18	2,429	- -
G		LABORERS	160	HR	10.20	1,632	- -
H		OILER	80	HR	12.26	981	- -
I		MECHANIC	80	HR	17.37	1,390	- -
J		FOREMAN	80	HR	20.69	1,655	- -
3 MOB & DEMOB							
A		DRAGLINE	1	EA	-	-	350 350
B		DOZER	1	EA	-	-	150 150
C		GRADER	1	EA	-	-	100 100
D		ROLLER	1	EA	-	-	150 150
SUB TOTAL TO SHT.						24,000	12,849

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 7 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C-95	DATE COMPLETED MAY 1, 1985	SHEET C-8 OF 42		SHEET C-8 OF 42	
PROJECT/NO TITLE ORDINANCE BUILDING LC 39		DRAWING NO/1 77K67392	SHEET NO C-1 THRU C-9		
STATION SET	LOCATION JOHN F KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CCBD		
ARCHITECT OR ENGINEER JOHN B SMITH, INC		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR VARNDELL PRC 2501	CHECKER BIALOCK PRC 2421	APPROVED			

FLEX PAVEMENT SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		FROM SHEET
	NO UNITS	UNIT MEAS	PER UNIT	FIELD TOTAL FAB	PER UNIT	TOTAL	
2P BITUMINOUS PAVING							
A STABILIZATION							
1 MATERIAL	332	CY	-	-	12.50	4,150	2
2 PROCESSING	4350	SF	.40	1,740	-	-	
B LIME ROCK BASE 6"	3100	CY	.40	1,240	4.35	13,485	13
C BITUMINOUS PAVING							
1 BITUMINOUS CONC	256	TON	4.50	1,152	33.00	8,448	14
2 BITUMINOUS TACK COAT	930	GAL	.07	65	1.07	977	14
D TRAFFIC STRIPES	680	LF	.08	54	.04	27	14
TOTAL				4,251		27,107	
PT&I AND SALES TAX			25%	1,063	5%	1,355	
				5,314		28,462	33,776
OVERHEAD	15	%					5,066
						SUBTOTAL	38,842
PROFIT	10	%					3,884
						SUBTOTAL	42,726
PRIME MARK UP	10	%					4,273
						SUBTOTAL	46,999
BOND	1	%					470
TOTAL FLEXIBLE PAVEMENT	4,350	SF	@	11.00	TOTAL TO SHEET		47,469

OFFICIAL USE ONLY

KBC FORM 21-243 (REV 4 80)

Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 8 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET <u>12</u> OF <u>42</u>		SHEET <u>C 9</u> OF _____			
PROJECT/WO TITLE ORDINANCE BUILDING LC 39		DRAWING NO. I: 79K67392		SHEET NO G1 THRU G9			
STATION SET	LOCATION JOHN F. KENNEDY SPAL CENTER, FLA	PCN 77406		PD/CCBD			
ARCHITECT OR ENGINEER J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6009		APPROVED			
ESTIMATOR VARDELL PRC 2501		CHECKER BLALOCK PRC 2421		APPROVED			
FLEXIBLE PAVING SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		TOTAL TO SHEET
	NO UNITS	UNIT MEAS	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> PAB	PER UNIT	TOTAL	
FLEXIBLE PAVING BACK UP DATA							
1. OCALA LIME ROCK	1	CY	-	-	680	680	
2. TRUCK HAUL	25	MI	-	-	.20	5.00	
3. UNLOAD & SPREAD	1	CY	-	-	.20	.20	
4. COMPACT & SHAPE	1	CY	-	-	.50	.50	
[BASED ON 20 CY TRUCK]							
COST PER CY @ SITE	1	CY	-	-	-	12.50	11
STABILIZATION QUANTITY							
1. 3" UNDER ROADWAY			$\frac{3}{12} \times \frac{9}{1} \times \frac{3100 \text{ SY}}{27 \text{ CY}}$	=		258 CY	
2. 3" STABIL SHOULDERS			$\frac{3}{12} \times \frac{9}{1} \times \frac{1250}{27 \text{ CY}}$	=		104 CY	
			362	x	120%	COMPACTON	649 = 435
TOTAL STABILIZATION	435	CY	-	-	12.50	5438	
TOTAL PROCESSING							
1250 + 3100	4350	SY	.40	1740	-	-	
SUBTOTAL				1740		5438	

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KSC FORM 21-243 (REV 4 80)

Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 9 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 96		DATE COMPLETED MAY 1, 1985		SHEET <u>13</u> OF <u>42</u> SHEET <u>C-10</u> OF _____			
PROJECT/W O TITLE ORDINANCE BUILDING LC 39				DRAWING NO(S) 79K67392		SHEET NO C1-THRU-C9	
STATION SET		LOCATION JOHN FKENNEDY SPACE CENTER, FLA		PCN 77406		PD/CCBD	
ARCHITECT OR ENGINEER J. B. SMITH INC				WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR VARDELL PRC 2501		CHECKER BLALOCK PRC 2421		APPROVED			
FLEXIBLE PAVEMENT SUMMARY	QUANTITY		LABOR (\$ PER HOUR)		MATERIAL		TOTAL COST
	NO UNITS	UNIT MEAS	PER UNIT	FIELD TOTAL PAB	PER UNIT	TOTAL	
BI LIME ROCK BASE COST							
1. LIME ROCK FOR RT/TON							
					4.50	4.50	
2. FREIGHT TO TITUSVILLE							
					3.70	3.70	
3. UNLOAD / TON							
					.30	.30	
4. TRUCK HAUL / TON							
		25 MI	-	-	.20	5.00	
TOTAL COST PER TON @ SITE						13.50	
BII LIME ROCK BASE-QUANTITY							
1. 6" BASE MATERIAL $\frac{6}{12} \times \frac{9}{12} \times 3100 \times 1.25\% = 645$ COMPACTION LAYS							
2. COST PER SY $\frac{645}{2000} \times 1350$							
						4.35	
3. PROCESSING COST							
	1	SY			.40		
SUBTOTAL TO SHT. 11							
	1	SY			.40	4.35	4.73
OFFICIAL USE ONLY							

KSC FORM 21-249 (REV. 6.80)

Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 10 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 14 OF 42		SHEET C 11 OF			
PROJECT/WO TITLE ORDINANCE BUILDING LC 39		DRAWING NO. 79K67392		SHEET NO.			
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA	PCN 77406		PD-CCBD			
ARCHITECT OR ENGINEER J.B. SMITH INC		WORK ORDER OR CONTRACT NO. 6005		APPROVED			
ESTIMATOR VARDELL PRC 2501	CHECKER WRIGHT PRC 2421						

FLEXIBLE PAVEMENT SUMMARY	QUANTITY		LABOR (\$ PER HOUR)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD TOTAL <input type="checkbox"/> PAB	PER UNIT	TOTAL	
C I BITUMINOUS CONCRETE COST							
1. MATERIAL TON TO SITE	1	TON	—	—	33.00	33	WWG
2. PROCESsing	1	TON	4.50	4.50	—	—	
TOTAL COST TO SHT. 11	1	TON		4.50		33	37.50
C II BITUMINOUS CONCRETE-QUANTITY							
1. BITUMINOUS CONCRETE							
1.5 x 110 x 3100 ÷ 2000 =	256	TON	4.50	1152	33.00	8448	To SHT. 11
2. BITUMINOUS TACK COAT							
3 x 3100	930	GAL	.07	65	1.05	977	To SHT. 11
D TRAFFIC STRIPES	680	LF	.08	54	.04	27	To SHT. 11
OFFICIAL USE ONLY							

KSC FORM 21-245 (REV 4/80)

Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 11 of 11)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 15 OF 42	SHEET 2-1 OF _____		
PROJECT NO & TITLE ORDINANCE BUILDING LC 39		DRAWING NO'S 79K67392	SHEET NO		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CCBD		
ARCHITECT OR ENGINEER J. B. SMITH INC.		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR VARUDEL PRC 2501	CHECKER B. BLACK PRC 2421	APPROVED			

ELEMENT SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		TOTAL SMT.
	NO UNITS	UNIT MEAS.	PER UNIT	FIELD TOTAL PAB	PER UNIT	TOTAL	
OF ARCH/STRUCT							
1 GENERAL REQUIREMENTS	SEE	OVERHEAD FOR BACK UP DATA					16
2 SITE WORK	196	CY	11.01	2,158	9.80	1,921	16
3 CONCRETE	207	CY	102.73	21,265	109.95	22,759	16-17
4 BRICK & BLOCK MASON	9600	SF	1.28	12,524	1.03	9,894	17
5 METAL STRUCT. MISC.	20,753	LB	.60	12,496	.84	17,434	18
6 CARPENTRY	260	BF	.50	130	.40	104	19
7 MOISTURE PROTECTION	4100	SF	2.70	11,089	3.14	12,944	19
8 DOOR-WINDOW & GLASS	384	SF	11.37	4,366	18.89	7,255	20
9 FINISHES	21,343	SF	.28	5,927	.25	5,369	21
10 SPECIALTIES	NIC	-	-	-	-	-	-
11 EQUIPMENT	NIC	-	-	-	-	-	-
12 FURNISHINGS	NIC	-	-	-	-	-	-
13 SPECIAL CONSTRUCTION	NIC	-	-	-	-	-	-
14 CONVEYING SYS.	15	TON	1903.20	28,623	2159.87	32,398	22
SUBTOTAL					98,373	110,078	
P&I AND SALES TAX				25%	24,593	5%	5,504
					122,966	115,582	238,548
OVERHEAD				15%			35,782
							274,330
PROFIT				10%			27,433
							301,763
BOND				1%			3,017
SUBTOTAL				4,100 SF @	7,434		304,780
OFFICIAL USE ONLY							

KBC FORM 21-243 (REV. 4-80)

Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 1 of 8)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET <u>16</u> OF <u>42</u> SHEET <u>52</u> OF <u> </u>		DRAWING NO: 79K67392 SHEET NO C1-THRU-C9	
PROJECT/WO TITLE ORDNANCE BUILDING LC 39		PCN 77406	PD/CCBD		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.		WORK ORDER OR CONTRACT NO 6005		
ARCHITECT OR ENGINEER J.B. SMITH INC		CHECKER BLALOCK PRC 2421		APPROVED	
ESTIMATOR VARDELL PRC 2501					

ARCH & STRUCT SUMMARY	QUANTITY		LABOR (\$ PER HOUR)		MATERIAL		TOTAL COST
	NO UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> PAD	PER UNIT	TOTAL	
1. GENERAL REQUIREMENTS							
C CLEAN UP							
D LAY OUT							
TOTAL							5HT-3
2. SITEWORK							
D EXCAVATION 1/2 HAND	89	CY	8.50	757	1.20	107	
BACKFILL-COMPACTION	107	CY	4.55	487	.60	64	
FILL-SELECT-UNDER SLAB	500	CY	1.50	750	3.50	1,750	
FINE GRADING	4,100	SF	.04	164	-	-	
SUBTOTAL				2,158		1,921	
3 CONCRETE							
A FORM WORK							
FOOTING FORMS	800	SF	1.55	1240	.78	624	
STRUCTURAL FORMS	5450	SF	1.55	8447	.78	4251	
SLAB FORMS	80	SF	1.66	133	.78	62	
BOND BEAM FORMS	312	SF	1.80	562	1.14	356	
B REINF. MATERIALS							
REINF. BARS SIZE #3-6	8850	LB	.25	2213	.30	2655	
MESH 6X6 #6	4500	SF	.15	675	.12	540	
C CONCRETE							
EXPANSION JOINT 1/2X6	300	LF	.39	117	.45	135	
FOOTING 3000*	32	CY	15.00	480	45.00	1440	
STRUCTURAL 3000*	85	CY	15.00	1275	45.00	3825	
FLOOR SLAB 3,000*	80	CY	15.00	1200	45.00	3600	
BOND BEAM 4 3,000*	10	CY	20.00	200	45.00	450	
CRANE, BUCKET OR PUMP	95	CY	5.00	475	10.00	950	
SUB TOTAL TO 5HT 17				18,425		18,888	

KSC FORM 21-243 (REV. 6/80)

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 2 of 8)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C95	DATE COMPLETED MAY 1, 1985	SHEET 17 OF 46		SHEET 5-3 OF 	
PROJECT NO TITLE ORDNANCE BUILDING LC 39		DRAWING NO'S 79K67392	SHEET NO CATHRUC-9		
STATION SET	LOCATION JOHN KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CCBD		
ARCHITECT OR ENGINEER J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6009			
ESTIMATOR VARDELL PRC 2501		CHECKER BLALOCK PRC 2421		APPROVED	

ARCH STRUCT SUMMARY	QUANTITY		LABOR (\$ UNIT)		MATERIAL		TOTAL COST
	NO UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD TOTAL <input type="checkbox"/> PAD	PER UNIT	TOTAL	
3 CONCRETE FROM SHT 16	16			18,425		18,888	
A FINISH SLABS							
SCREED	540	SF	.05	27	.05	27	
TROWEL	4,100	SF	.10	410	.05	205	
CURING	4,100	SF	.13	533	.10	410	
HARDNER	4,100	SF	.14	574	.10	410	
D PRECAST GYP ROOF DECK							
GYP GUM-ON-1" INSULFORM	3240	SF	.40	1296	.87	2819	EAST COAST
TO SHT 15 SUBTOTAL	207	CY	102.73	21,265	10995	22,759	
E BRICK-BLOCK MASONRY							
A. ERECT MASONRY WALLS							
8" x 8" x 16" CONC BLOCK	790	EA	1.10	869	.63	498	DIXIE CONC
* 4" x 8" x 16" CONC BLOCK	9742	"	.96	9352	.50	4871	DIXIE CONC
12" x 8" x 16" CONC BLOCK	374	EA	1.40	524	.92	344	DIXIE CONC
HORIZ. BLOCK REINF	7,300	LF	.05	365	.07	511	
MORTAR	31	CY	20.	620	.55	1705	
CLEAN & POINT	9600	SF	.05	480	.20	1920	
SPLASH BLOCK	3	EA	8.00	24	15.00	45	
TO SHT 15 SUBTOTAL	9600	SF	1.28	12,324	1.03	9894	
OFFICIAL USE ONLY							
* LABOR ANALYSIS	4" x 8" x 16"						
BASED ON (1) CREW LAYING 600 BLOX PER DAY							
3 MASON @ 19.87	392.58						
2 HELPER @ 10.20	244.80						
TOTAL	577.18						
577.18 ÷ 600 = 96							

KSC FORM 21-261 (REV. 4-80)

Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 3 of 8)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 18 OF 42	SHEET 5-4 OF _____		
PROJECT/WO TITLE ORDNANCE BUILDING LC 39		DRAWING NO(S) 79K67892	SHEET NO C1-THRU-C9		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CCCD		
ARCHITECT OR ENGINEER J. B. SMITH INC		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR VANDOLL PRC 2501	CHECKER BLALOCK PRC 2421	APPROVED			

ARCH-STRUCT SUMMARY	QUANTITY		LABOR (\$ PER HOUR)			MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL		
5 METALS-STRU-MISC								
C-STEEL BAR JOINT MATERIAL	9,320	LB	-	-	.35	3262		
BAR JOINT FAB	9,320	LB	.25	2,330	.05	466		
BAR JOIST ERECT.	9,320	LB	.30	2,795	.15	1,398		
D-STRUCTURAL STEEL PURCHASE								
TRUSSES-MISC. WAREHOUSE	2,250	LB	-	-	.35	788	SEE STEEL	
* BEAMS MILL	5,221	LB	-	-	.40	2,088	BREAKDOWN	
COLUMNS MILL	2,610	LB	-	-	.35	914	F 5	
** SHOP FABRICATION COST								
TRUSSES & MISC.	2,250	LB	.30	675	.15	338		
BEAMS	5,221	LB	.30	1,566	.25	1,305		
COLUMNS	2,610	LB	.30	783	.15	392		
ERECTION COST	10,081	LB	.30	3,024	.26	2,520		
CRANE RENTAL	40	HR	20.0	800	70.00	2,800		
** CONSISTS OF ENG'DWG'S			-	-	-	-		
EQUIP. SHOP LABOR & TRAVEL			-	-	-	-		
K-MISC. METALS								
FURN. & ERECT ASCE RAIL	142	LF	1.50	213	5.50	781		
FURN. SET ANCHOR BOLTS	40	EA	1.50	60	.75	30		
FURN. FLARE A/W L'S	500	LB	.50	250	.70	350		
SUB TOTAL TO SNT. 15	20,753	LB	.60	12,496	.84	17,432		
* TYPICAL BREAK DOWN FOR BEAMS								
REF APPENDIX B FOR BREAK DOWN EACH ITEM.								

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 4 of 8)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 14	OF 42				
PROJECT/WO TITLE ORDNANCE BUILDING LC 39		DRAWING NO(S) 79K6739Z	SHEET NO C1-THRU-C9				
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CCBD				
ARCHITECT OR ENGINEER J.B. SMITH INC.		WORK ORDER OR CONTRACT NO 6005					
ESTIMATOR VARDELL PRC 2501	CHECKER BLALOCK PRC 2421	APPROVED					
ARCH-STRUCT SUMMARY	QUANTITY		LABOR (\$ HR)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
6 CARPENTRY							
A ROUGH CARPENTRY							
	BUILD & PLACE TREATED	260	BF	.50	130	.40	104
	SUBTOTAL				130		104
7 MOISTURE-PROTECTION							
A BUILT UP ROOF							
	BUILT UP 5-RY T & G	38	SQ	40.00	1520	75.00	2850 WEIDMAN
	INSUL. WALL 2" FIBERGLASS	4100	SF	.20	820	.65	2665 EAST COAST
	INSUL ROOF 1 1/2" RIGID FIBER	38	SQ	17.00	646	42.00	1596 B.F. SUPPLY
B SHEET METAL							
	MISC FLASHING COPPER 16oz	76	SF	.85	65	1.65	125
	LOW GRAVEL 4" TOP 4" ALUM	174	LF	1.13	196	2.70	470
	FACIA ALUM. 032	82	LF	1.22	100	3.10	254
	7X5 GUTTER ALUM	120	LF	1.37	164	1.00	120
	6X5 DOWN 4" FOOT ALUM	104	LF	1.60	166	1.50	156
	4X4 DOWN 4" FOOT	12	LF	1.17	14	1.12	13
E MEMBRANE WATER PROOF							
	VAPOR BARRIER - POLY	3780	SF	.15	567	.25	945 WEIDMAN
	MEMBRANE W.P 3-RY FELT	4100	SF	.35	1435	.50	2050
	BITUMEN V WALL BAR	4100	SF	1.08	4428	.06	246
H CAULKING-SEALING							
	NEOPRENE GASKET	620	LF	.82	508	1.90	1,178 McMASTER
	POLYSULFIDE 1/2 X 1/4	400	LF	1.15	460	.69	276 McMASTER
SUBTOTAL TO SHT. 15							
		4,100	SF	2.70	11,089	314	12,944

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 5 of 8)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 20 OF 42		SHEET 5-6 OF 			
PROJECT/WO TITLE ORDNANCE BUILDING LC39		DRAWING NO.S 79K67392	SHEET NO				
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PD. CCBC				
ARCHITECT OR ENGINEER J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6009					
ESTIMATOR VARDELL PRC 2501	CHECKER BLA LOCK PRC 2421	APPROVED					
ARCH-STRUCT SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		TOTAL COST
	NO UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
B DOORS & WINDOWS - GLASS							
G ALUMINUM DOOR							
HM 6'x7' DOUBLE W/FRAME	1	PR	95.00	95	602.	602	ENDURE LIFE
HM 3'x7' SINGLE W/FRAME	2	EA	60.00	120	325.	650	
VERTICAL LIFT DR. 3(10x10)	300	SF	6.50	1950	8.50	2550	MAHON
DOUBLE BUCK	1	EA	50.00	50	60	60	
SINGLE BUCK	2	EA	35.00	70	45	90	
F BUILDERS HARDWARE							
BUTTS T2152 U S 28	3	PR	10.00	30	24	72	
PANIC BOLTS 810K	2	EA	50	100	290	580	
CLOSER 300 IV	2	EA	18.50	37	55	110	
BUTTS T2112 U S 28	3	PR	10.	30	24	72	
LOCK SET 161 B 4	1	EA	16.	16	50	50	
FOOT BOLT F1023 AC 6	1	EA	5.	5	5	5	
CHAIN BOLT F1023 AC 6	1	EA	6.	6	3	3	
CUT FACE WEATHER STRIP	20	LF	1.25	25	6.15	123	
SET THRESHOLD	6	LF	4.50	27	4.05	24	
INFLATABLE SEAL	150	LF	12.00	1800	15.00	2250	
PAD LOCKS EPC	3	EA	1.50	5	4.50	14	
SUBTOTAL TO SHT. 15	384	SF	11.37	4,366	18.89	7,255	

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KSC FORM 21-245 (REV 4/80)

Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 6 of 8)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION				
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET 21 OF 42 SHEET 97 OF _____				
PROJECT/WO TITLE ORDNANCE BUILDING LC 39				DRAWING NO(S) 79K67392		SHEET NO C1-THRU C9		
STATION SET		LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.		PCN 77406		PD/CCBD		
ARCH TECT OR ENGINEER J.B SMITH INC				WORK ORDER OR CONTRACT NO 6005				
ESTIMATOR VARDELL RC 2501		CHECKER BALOCK RC 2421		APPROVED				
ARCH-STRUCT SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		TOTAL COST	
	NO UNITS	UNIT MEAS	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL		
9 FINISHES								
A PAINTING FINISHING								
METAL WORK								
	102	LF	.25	26	.95	97	OFFICIAL USE ONLY	
EXT-BLOCK-CONCRETE								
	7,376	SF	.22	1,623	.12	885		
INT-WALLS-CEILING								
	10,865	SF	.20	2,173	.10	1,087		
STRUCT STEEL-INORG								
	1,500	SF	.30	450	.50	750		
ZINC 2-COAT								
BAR JOISTS-INORG								
	1,500	SF	.30	450	.50	750		
ZINC 2-COAT								
SANDBLAST								
STRUCT STEEL								
	1,500	SF	.40	600	.60	900		
BAR JOISTS								
	1,500	SF	.40	600	.60	900		
SUBTOTAL								
	21,343	SF	.28	5,922	.25	5,369		
10 SPECIALTIES								
	NIC							
11 EQUIPMENT								
	NIC							
12 FINISHES								
	NIC							
13 SPECIAL CONST.								
	NIC							

KSC FORM 21-243 (REV 4 80)

Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 7 of 8)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 22 OF 42		SHEET 58 OF 	
PROJECT/NO TITLE ORDNANCE BUILDING LC 39		DRAWING NOIS. 79K67392	SHEET NO C1-THRU-C9		
STATION SET	LOCATION J.F. KENNEDY SPACE CENTER, FLA	PCN 77406	PD/CCBD		
ARCHITECT OR ENGINEER J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR VARDELL PRC 2501	CHECKER BALOCK PRC 2421	APPROVED			

ARCH-STRUCT SUMMARY	QUANTITY		LABOR (\$)		MATERIAL		TOTAL COST	
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL		
14 CONVEYING SYSTEM								
I ELEC. OVERHEAD CRANE	15	TON						
BRIDGE W/ 2 x 19 x 40' E-EL	1800	LB	.60	1080	1.40	2520		
HOIST DRUMS 3/4" 307-1 KEY ELEC	1450	EA	.52	750	10.	14,500	RANCO 8/24*	
HOIST DRUM MTR 10HP 4/24	800	LB	.688	550	6.88	5,500		
1800/600 RPM W/ ONE ELEC CO								
GEAR REDUCER 900-1	125	LB	6.0	750	6.80	850		
TROLLEY MOTOR 5HP 1/2	200	LB	4.25	850	8.50	1,700	KEY ELEC	
BRIDGE MOTOR 5HP 1/2	200	LB	5.00	1,000	9.25	1,850	KEY ELEC	
WIRING	500	LF	.75	375	3.50	1,750		
MANUFACTURING	100	HR	35	3,500	-	-		
STEEL ERECTION	4650	LB	.60	2,790	.40	1,860		
MISS. STEEL	450	LB	.50	225	1.40	630		
ENGINEERING [6-SHEET]	250	HR	35.0	8,750	-	-		
INSTALL 7-MAN CREW 6-DAY	350	HR	22.57	7,930	-	-		
WIRE ROPE 7-19 3/4	400	LF	1.50	600	2.57	1,028		
TO SNT. 15	SUBTOTAL	15	TON	1908.2	28,623	215487	32,398	61,021
* RANCO 8-24-84								
CLEVELAND, OHIO								
216-692-04070								
15 TON ELEC. OVERHEAD CRANE INSTALLED QUOTE 60,000								

KSC FORM 21-243 (REV 4/80)

Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 8 of 8)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION		
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET 23 OF 42 SHEET M-1 OF _____		
PROJECT/WO TITLE ORDNANCE BUILDING LC 39				DRAWING NO. / SHEET NO. 79K 67392		
STATION SET / LOCATION JOHN F. KENNEDY SPACE CENTER, FLA		PCN 77406		PD/CCBD		
ARCHITECT OR ENGINEER J.B. SMITH INC				WORK ORDER OR CONTRACT NO. 6005		
ESTIMATOR KOBS J.B. SMITH INC		CHECKER PURVIS J.B. SMITH INC		APPROVED J.A. BROWN DTD PED		
ELEMENT SUMMARY	QUANTITY		LABOR (MH)	MATERIAL		TOTAL COST
	NO. UNITS		<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> PAB	PER UNIT	FROM SHEET	
15A PLUMBING	14	FIXTURES	115.00		24	15,610
15C AIR COND. & HEATING	20	TON	3,680.00		26	73,600
15M COMPRESSOR AIR SYS	5	OUTLETS	1,240.60		27	6,203
15R VENTILATION	4	FRV	2,634.00		28	10,536
TOTAL INTERIOR MECHANICAL	4,100	4F	25.84		2	105,949
OFFICIAL USE ONLY						

KSC FORM 21-243 (REV 4/80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 1 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE				<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C-95		DATE COMPLETED MAY 1, 1985		SHEET 24 OF 42 SHEET M-2 OF _____			
PROJECT/TITLE ORDNANCE BUILDING LC39				DRAWING NO. 79K67992		SHEET NO. M-2 THRU M-7	
STATION SET JOHN F. KENNEDY SPACE CENTER, FLA.		LOCATION		PCN 77406		PD/CCBD	
ARCHITECT OR ENGINEER J. B. SMITH INC				WORK ORDER OR CONTRACT NO. 6005			
ESTIMATOR KOLB J B SMITH INC		CHECKER PURVIS J. B. SMITH INC		APPROVED J. A. BROWN DD-FED			
MECHANICAL INTERIOR SUMMARY	QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
OFFICIAL USE ONLY							
15 A PLUMBING							
3" C.I. SOIL PIPE	25	LF	.17	4.3	3.27	82	HUGHES
3" C.I. COMBINATION-Y	1	EA	2.0	2.0	11.92	12	
3" C.I. 1/8" BEND	2	EA	1.5	3.0	9.64	19	
3" C.I. P TRAP	2	EA	3.0	6.0	9.69	19	
3" C.I. FLOOR DRAIN	2	EA	2.0	4.0	54.94	110	
24" x 5' DRY WELL	1	EA	8.0	8.0	137.50	138	
ELEC. WATER COOLER 30 GAL	1	EA	6.0	6.0	568.70	569	
3/4" GALV. PIPE SCH. 40	60	LF	.19	11.4	1.10	66	
1" GALV. PIPE SCH. 40	170	LF	.20	34.0	1.47	250	
3/4" GALV. ELBOW	10	EA	.24	2.4	.96	10	
1" GALV. ELBOW	2	EA	.28	.6	1.96	4	
1" x 1" x 3/4" RED TEE	3	EA	.42	1.3	3.22	10	
081-0215 WATER CLOSET	6	EA	8.0	48.0	550.00	3304	
1-194 CRANE LAVATORY	4	EA	5.0	20.0	176.00	704	
161-1000 ELJER URINAL	2	EA	8.0	16.0	306.65	613	
242-DISS ELJER SERVICE SINK	1	EA	8.0	8.0	276.20	277	HUGHES
TOTAL				175.0		6187	843-9100
LABOR HOURS x RATE	175	HR	21.03	3689			ORL
PT & SALES TAX		%	25	922	5	309	
TOTAL					4611	6496	11,107
OVERHEAD	15	%					666
						SUBTOTAL	12,773
PROFIT & PRIME MARKUP	10-10	%					2682
						GRAND TOTAL	15,455
BOND	1	%					155
						SUBTOTAL	15,610
TOTAL PLUMBING TO SHEET 23	14	FIXT		1,115.00			15,610

KSC FORM 21-243 (REV 4/80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 2 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION		
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 25 OF 47		SHEET M-3 OF 		
PROJECT/NO TITLE ORDNANCE BUILDING LC 39		DRAWING NO(S) 79K67592	SHEET NO M-2 THROUGH 7			
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA	PCN 77406	PD/CCBD			
ARCHITECT OR ENGINEER J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6005				
ESTIMATOR KOLB J.B. SMITH INC		CHECKER RURVIT J.B. SMITH	APPROVED J.A. BROWN DD-FED			
MECHANICAL INTERIOR SUMMARY	QUANTITY		LABOR (MH)	MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	FIELD TOTAL FAB	PER UNIT	
OFFICIAL USE ONLY						
15 C AIR CONDITIONING & HEATING						
A/C COMPRESSOR 20 TON	1	EA	24.0	24.0	6026	6026 MCQUAY
25 HP MOTOR	1	EA	8.0	8.0	1065	1065
STARTER	1	EA	4.0	4.0	310	310
LIQ. RECEIVER W/FREON	1	EA	16.0	16.0	1042	1042
AIR COOLED CONDENSER	1	EA	16.0	16.0	8206	8206
AIR HANDLING UNIT WITH HEATING & COOLING DX COILS	1	EA	40.0	40.0	4987	4987 MC QUAY
3/4" PIPE GALV SCH 40	40	LF	.19	7.6	1.10	44 HUGHES
1" PIPE GALV SCH 40	40	LF	.20	8.0	1.47	59 B43-9100
1/2" COPPER TUBING	10	LF	.05	.5	.48	5
3/4" ELL 90° SCH 40	4	EA	.24	1.0	.96	4
1" ELL 90° SCH 40	4	EA	.28	1.1	1.96	8 HUGHES
1" GATE VALVE 150# BRONZE	1	EA	.96	1.0	59.75	60 SYSTEM COMPONENTS
3/4" GATE VALVE 150# BRONZE	1	EA	.96	1.0	53.17	53 783-1002
REFRIGERANT	1	BTBL	8.0	8.0	594.59	596 423-0684
DUCT WORK - GALV.	2433	LB	.087	211.7	1.25	3041 CLEMENTS
DUCT WORK - ALUM	500	LB	.26	130.0	2.75	1375 AMERICAN METAL CO
DUCT - 1" FIBERGLASS/UGUL	3100	SF	.034	105.4	.356	1104 NORTH BEND
GRILLS W/VOL CONTROL						2954221
10" X 24" ALUM	4	EA	1.0	4.0	37.11	148 R & R
6" X 18" ALUM	5	EA	.5	2.5	28.12	141 844-0660
4" X 12" ALUM	5	EA	.5	2.5	23.25	116
CEILING DIFFUSERS W/VOL CONT						AMERICAN METAL CO
12" DIA ALUM	4	EA	1.0	4.0	15.40	62 254-7364
16" DIA ALUM	4	EA	1.0	4.0	65.45	262
24" DIA ALUM	5	EA	1.0	5.0	115.50	578
TOTALS TO SHT. 26				605.3		29,291

KSC FORM 21-243 (REV. 6/80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 3 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET <u>26</u> OF <u>42</u> SHEET <u>M4</u> OF <u> </u>			
PROJECT/WO TITLE ORDNANCE BUILDING LC 39				DRAWING NO(S) 74K67392	SHEET NO M16 THRU M20		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA			PCN 77406	PD/CCBD		
ARCHITECT OR ENGINEER J.B. SMITH INC.				WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR KOLB J.B. SMITH INC		CHECKER PURVIS J.B. SMITH INC		APPROVED J.A. BROWN OD-FED			
MECHANICAL INTERIOR SUMMARY	QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
15C 1/2 & HEATING CONTINUED			OFFICIAL USE ONLY				
24" x 36" R.A. GRILLS ALUM	4	EA	2.5	10.0	76.04	304	R & R
28" x 30" LOUV. M.O.PAL	1	EA	4.0	4.0	76.04	76	"
THERMOSTAT T-651A	2	EA	1.0	2.0	53.90	108	HONEYWELL
RELAY	4	EA	1.0	4.0	133.10	532	894-3131 ORL
MOTORIZED DAMPER 24" x 10"	2	EA	1.5	3.0	269.50	539	R & R
CONTROL WIRE	600	LF	.02	12.0	.07	42	849-0660 ORL
1" INSUL. FIBERGLASS PIPE	40	LF	.09	3.6	.94	38	NORTH
3/4" INSUL. FIBERGLASS PIPE	40	LF	.09	3.6	.88	35	BROS
MISC. HARDWARE	100	EA	.15	15.0	2.09	209	295-9221
CRANE RENTAL 10 TON	1	EA	16.0	16.0	470.	470	ORL
TEST & ADJUST 5%.	1	EA	40.0	40.0	200.	200	
TOTAL THIS SHT.				113.2		2553	
TOTALS FROM SHT 25				605.3		29,291	
				718.5		31,844	
LABOR HOURS x RATE		718.5	HR	21.08	15,146		
PT & I AND SALES TAX			%	25	3,787	5	1,592
				18,933		33,436	52,369
OVERHEAD		15	%				7,855
						SUBTOTAL	60,224
PROFIT		10	%				6,022
						SUBTOTAL	66,246
PRIME MARK-UP		10	%				6,625
						SUBTOTAL	72,871
BOND		1	%				729
TOTAL 1/2 & HEATING		20	TON		3,680	To SHT 23	73,600

KSC FORM 21-245 (REV 4/80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 4 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 27 OF 42		SHEET M-5 OF 	
PROJECT/NO TITLE ORDNANCE BUILDING LC 39		DRAWING NO:1 79K67392	SHEET NO M-21 M-23		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA	PCN T1406	PD/CCBD		
ARCHITECT OR ENGINEER J.B. SMITH INC		OFFICIAL USE ONLY		WORK ORDER OR CONTRACT NO 6005	
ESTIMATOR KOLB J.B. SMITH INC	CHECKER PURVIS J.B. SMITH INC	APPROVED J.A. BROWN DD FED			

MECHANICAL INTERIOR SUMMARY	QUANTITY		LABOR (MH)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD TOTAL <input type="checkbox"/> P&B	PER UNIT	TOTAL	
15 M COMPRESSOR AIR SYS.	1	EA	56.0	56.0	1376	1,376	WORTHINGTON
AIR COMPRESSOR N/20 GA RECEIVER							295-2641
CONTROLS & SAFETY DEVICES							O.R.L.
3/8" BRASS PIPE	10	LF	.19	1.9	.60	6	HUGHES
1/2" COPPER TUBE-TYPE L	90	LF	.12	10.8	.49	44	
1/2" CX 3/8" FIP TEE	2	EA	.39	.8	1.43	3	
1/2" CX 3/8" FIP ELL	1	EA	.28	.3	1.40	1	
1/2" CX C FIP ELL	10	EA	.28	2.8	1.54	15	
3/8" BRASS UNION	3	EA	.20	.6	1.32	4	
1/2" COPPER UNION	1	EA	.28	.3	1.53	2	
1/2" C X MID ADAPTER	1	EA	.25	.3	1.54	2	HUGHES
1/2" AIR VALVE	1	EA	.38	.4	62.21	62	SYSTEM
3/8" SOLENOID VALVE	3	EA	.38	1.1	95.21	286	COMPANY
1/2" OUTLETS W/FILTERS	5	EA	.38	1.9	45.29	226	
1/2" CHECK VALVE	1	EA	.38	.4	58.08	58	
3/8" PRESS. RED. VALVE	1	EA	.38	.4	86.22	86	
1/2" HANGERS	10	EA	.25	2.5	1.25	13	785-1000
SUB TOTAL				80.5		2184	
LABOR HOURS * RATE	80.5	HR	21.08	1697			
PT&I AND SALES TAX		%	25	424	5	109	
SUB TOTAL				2121		2293	4414
OVERHEAD	15	%					662
							5076
PROFIT & PRIME MARK UP	10-10	%					1,066
							6,142
BOND	1	%					61
TOTAL COMP. AIR SYS.	5	OUTLETS		1240.60	TO SIT 23		6,203

KSC FORM 21-243 (REV 4/80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 5 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 28 OF 42		SHEET M-6 OF 	
PROJECT/WO TITLE ORDNANCE BUILDING LC39		DRAWING NO(S) 79K67392	SHEET NO M24 M27		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PDR/CBD		
ARCHITECT OR ENGINEER J.B. SMITH INC		OFFICIAL USE ONLY		WORK ORDER OR CONTRACT NO 6005	
ESTIMATOR KOLB J.B. SMITH INC	CHECKER PURVIS J.B. SMITH INC	APPROVED			

MECHANICAL INTERIOR SUMMARY	QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
15 R VENTILATION							
250 CFM FRV 1/8" GR CENT	2	EA	8.0	16.0	985.06	1970	Job & MAC
AL W/FIRE STAT & LOUVER							
850 CFM FRV 1/8" GR CENT	1	EA	10.0	10.0	1086.15	1086	
AL W/FIRE STAT & LOUVER							
1500 CFM FRV EXCH 1/4" GP	1	EA	8.0	8.0	1194.75	1195	
FAN W/BIRD SCREEN FIRE							
STAT. & LOUVER							
FLASHING	75	LPB	.15	11.3	1.94	146	
EXHAUST FAN 300 CFM W/MOTOR	1	EA	8.0	8.0	190.05	190	
RAINTITE LOUVER 24" X 10"	1	EA	6.0	6.0	284.41	284	
W/MOTORIZE DAMPER							
CEILING GRILL 12" X 8"	1	EA	1.5	1.5	43.00	43	Job & MAC
MISC. HARDWARE	10	EA	1.0	10.0	1.70	17	886-8405
CRANE RENTAL 10 TON	1	EA	8.0	8.0	232.00	232	OKL
TOTAL				78.8		5163	
LABOR HOURS x RATE	78.8	HR	21.08	1661			
PT & I AND SALES TAX		%	25	415	5	258	
TOTAL				2076		5421	7497
OVERHEAD	15	%					1,125
						SUB-TOTAL	8622
PROFIT	10	%					862
						SUB-TOTAL	9484
PRIME MARK UP	10	%					948
						SUB-TOTAL	10,432
BOND	1	%					104
TOTAL TO SMT. 23	4	FRV		2634			10,536

KSC FORM 21-263 (REV. 6.80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 6 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET <u>20</u> OF <u>42</u> SHEET <u>E-3</u> OF <u> </u>			
PROJECT/NO TITLE ORDNANCE BUILDING LC 39		DRAWING NO(S) 79K67392	SHEET NO E1-10		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CCBD		
ARCHITECT OR ENGINEER J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6005		APPROVED J.B. SMITH PRES	
ESTIMATOR BROWN J.B. SMITH INC	CHECKER KOLE J.B. SMITH INC				

ELECTRICAL INTERIOR SUMMARY	QUANTITY		LABOR (MM)		MATERIAL		FROM SHEET
	NO. UNITS	UNIT MEAS	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
16 N LOW VOLTAGE WIRING				183.3		4984	31
44 LIGHT FIXTURES				378.1		34,303	32
16 S SWITCH BO & PANEL BOYS				238.3		3,936	33
TOTALS				799.7		43,223	
LABOR HOURS x RATE	799.7	HR	18.50	14,794			
PT & I AND SALES TAX		%	25	3,699	5	2,161	
TOTALS				18,493		45,384	63,877
OVERHEAD	15	%					9,582
						SUB TOTAL	73,459
PROFIT	10	%					7,346
						SUB TOTAL	80,805
PRIME MARKUP	10	%					8,081
						SUB TOTAL	88,886
BOND	1	%					889
TOTAL TO GINT 29	44	FIXT		2040			89,775
OFFICIAL USE ONLY							

KSC FORM 21-243 (REV 4/80)

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 2 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET <u>31</u> OF <u>42</u> SHEET <u>E-3</u> OF <u> </u>			
PROJECT/WO TITLE ORDNANCE BUILDING LC 39		DRAWING NOIS 79K67392	SHEET NO E1-E10		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PO/CCBD		
ARCHITECT OR ENGINEER J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR KOLB J.B. SMITH INC		CHECKER PURVIS J.B. SMITH INC	APPROVED J.A. BROWN DD-FED		

ELECTRICAL INTERIOR SUMMARY	QUANTITY		LABOR (MHI)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	FIELD TOTAL PAB	PER UNIT	TOTAL	
16. N-LOW VOLT WIRING & CONT DEVICE							
J-Box 4"x6"x6" E.P	3	EA	15	45	1130	334	NPS
AIR TERMINAL 5/8"φ x 24	12	EA	.5	6.0	16.76	201	THOMPSON
AIR TERMINAL BASE & CLAMP	12	EA	1.0	12.0	10.50	126	THOMPSON
OUTLET BOX WP	14	EA	.8	11.2	8.60	120	
CONN CONTROL DEVICE	17	EA	1.0	17.0	5.00	85	
CONN ANNUNCIATOR ELEMENT	6	EA	1.0	6.0	5.50	33	
SPEAKER OUTLET	3	EA	1.0	3.0	4.50	14	
SWITCH 1P EP	2	EA	.5	1.0	53.42	107	4Q"D"
SWITCH MO-CTC EP	2	EA	.8	1.6	125.08	250	4Q"D"
SWITCH SPST	2	EA	.35	.7	4.30	9	CES
SWITCH 3P, 100A, N/F EP	1	EA	4.0	4.0	610.00	610	4Q"D"
RECEPT 3W, 2P, 120V EP	10	EA	.8	8.0	157.09	1371	GRAY BAR
RECEPT 3W, 2P, 120V	3	EA	.35	1.1	4.35	13	CES
LIMIT SW 4P, EP	3	EA	.8	2.4	108.72	324	4Q"D"
SWITCH 30A, 2P, N/F WP	9	EA	2.5	7.5	109.00	327	4Q"D"
THERMOSTAT WP	2	EA	.5	1.0	80.00	160	
THERMOSTAT	1	EA	.35	.4	26.00	26	NPS
CONDUIT FITTINGS GAL 1 1/2"	6	EA	.8	4.8	14.29	86	CES
1"	4	EA	.5	2.0	5.56	22	
3/4"	35	EA	.4	14.0	3.90	137	
1/2"	30	EA	.4	12.0	3.10	93	CES
SEALING FITTINGS GAL 2"	6	EA	3.0	18.0	18.65	112	HUGHES
1 1/2"	4	EA	2.4	9.6	14.34	57	
1"	2	EA	2.5	5.0	7.83	16	
3/4"	10	EA	1.25	12.5	6.06	61	
1/2"	14	EA	1.0	14.0	5.17	72	
SQUEEZE CONN 1/2"	10	EA	.4	4.0	1.20	12	HUGHES
SUBTOTAL TO GHT 30				183.3	4,978		

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 3 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE				<input checked="" type="checkbox"/> CONSTRUCTION		
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET <u>32</u> OF <u>42</u> SHEET <u>E-4</u> OF _____				
PROJECT/WO TITLE ORDNANCE BUILDING LC 39				DRAWING NO. 79K67392		SHEET NO. E 2-E 4		
STATION SET		LOCATION JOHN F. KENNEDY SPACE CENTER, FLA		PCN 77406		PD/CCBD		
ARCHITECT OR ENGINEER J.B. SMITH INC				WORK ORDER OR CONTRACT NO. 6005				
ESTIMATOR KOLB J.B. SMITH INC		CHECKER PURVIT J.B. SMITH INC		APPROVED J.A. BROWN DD-FED				
ELECTRICAL INTERIOR SUMMARY		QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST
		NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
16N #2 AWG 1/2 WIRE		700	LF	.02	14.0	.50	350	GEN CABLE
#6 AWG 1/2 WIRE		200	LF	.01	2.0	.17	34	
#10 AWG 1/2 WIRE		210	LF	.007	1.5	.08	17	
#12 AWG 1/2 WIRE		8980	LF	.006	53.9	.06	539	
#14 AWG 1/2 WIRE		550	LF	.006	3.3	.03	17	
#2/0 B7D WIRE		1000	LF	.03	30.0	.716	716	
#2 B7D WIRE		250	LF	.02	5.0	.359	90	GEN CABLE
#12 GALV 500' WIRE		1	9/16	.1	22.0	49.60	50	TRAVIS
#12 AWG 3/2 4Q CURD		30	LF	.02	.6	.99	30	NPS
CABLE CLAMP #2/0 WIRE		45	EA	.20	9.0	6.69	301	NPS
BALLAST WIREWAY 6"X6"		1	EA	1.4	1.4	29.68	30	CN
200W FIXT. TYPE V6A VAMPB		6	EA	.6	3.6	35.28	212	NPS
100W FIXT. TYPE 1-3		8	EA	.5	4.0	27.10	217	
100W FIXT. TYPE MV		18	EA	2.0	36.0	50.389	907	
100W FIXT. TYPE 1-HB		6	EA	1.6	9.6	43.68	262	
2X4 4LP FIXT. TYPE FLUOR		5	EA	4.0	20.0	123.20	616	
200W FIXT. TYPE RB ^{ROTATING BEACON}		1	EA	1.8	1.8	102.41	102	
LAMP INCAND 150W		6	EA	.02	.1	2.09	13	
200W		8	EA	.02	.2	2.89	23	
1000W		6	EA	.05	.3	15.62	94	
FLOODLIGHT MTG POLE		5	EA	5.0	25.0	88.40	442	
LAMPS MV 400 W		23	EA	.05	1.2	24.96	563	
BALLAST 400W MERC V		18	EA	2.0	36.0	81.54	1468	NPS
UNISTRUT FIXT. SUPPORT		250	EA	.06	15.0	1.56	390	UNISTRUT
EMERGENCY LIGHT		1	EA	1.5	1.5	164.64	165	GRAYBAR
EMERGENCY BATTERY SUPPLY		1	EA	4.5	4.5	94.00	94	
PHOTO CELL		1	EA	2.2	2.2	51.52	52	
MCC "AP"		1	EA	74.0	74.0	26.09	26.09	GX QUOTE
248 TOTALS TO SHT 30				378.1		34,503		

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 4 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 33 OF 42 SHEET E-5 OF					
PROJECT/WO TITLE ORDNANCE BUILDING LC 39		DRAWING NO(S) 79K67392	SHEET NO E5-E8				
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCK 77406	PD/CCBD				
ARCHITECT OR ENGINEER J.B. SMITH INC		OFFICIAL USE ONLY		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR KOLB J.B. SMITH INC	CHECKER PURVIS J.B. SMITH INC	APPROVED J A BROWN DD-FED					
ELECTRICAL INTERIOR SUMMARY	QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> PAD	PER UNIT	TOTAL	
16 ELECTRICAL INTERIOR							
G SWITCH BOARD - PANEL BOARD							
PANEL AC-1 BKR4	1	EA	20.5	20.5	408.80	409	NPS
PANEL TTC 30X24X6 5/8	1	EA	4.5	4.5	190.40	190	HOFFMAN
PANEL FC 16X12X6 5/8	1	EA	1.8	1.8	67.20	67	
PANEL FA 24X24X6 5/8	1	EA	1.0	1.0	146.36	146	
2DR PANEL FL 72X48X18	1	EA	4.0	4.0	676.40	676	
CABINET DOOR OPR.	3	EA	2.5	7.5	51.52	155	
PUSH BUTTON & SUPP	3	EA	2.0	6.0	4.91	15	HOFFMAN
PRESSURE GAGE	3	EA	1.0	3.0	18.20	55	JOHNSON
CRANK	3	EA	.02	.1	1.12	3	JOHNSON
L LOW VOLTAGE BUTWAYS							
CONDUIT 3 1/2" GALV. RIGID	20	LF	.35	7.0	4.80	96	YOUNGSTOWN
CONDUIT 3" GALV. RIGID	20	LF	.23	4.6	3.825	77	STEEL TUBE
CONDUIT 2" GALV. RIGID	175	LF	.14	17.5	1.81	226	
CONDUIT 1 1/2" GALV. RIGID	220	LF	.11	24.2	1.33	293	
CONDUIT 1 1/4" GALV. RIGID	20	LF	.09	1.8	1.19	23	
CONDUIT 1" GALV. RIGID	170	LF	.07	11.9	.86	146	
CONDUIT 3/4" GALV. RIGID	870	LF	.05	43.5	.60	557	
CONDUIT 1/2" GALV. RIGID	1230	LF	.04	49.2	.53	652	
CONDUIT ELLS 3 1/2"	2	EA	4.5	9.0	32.35	65	
CONDUIT ELLS 3"	2	EA	3.7	7.4	18.67	37	
CONDUIT ELLS 2"	4	EA	1.6	6.4	6.29	25	
CONDUIT ELLS 1 1/2"	3	EA	1.8	5.4	4.10	12	
CONDUIT ELLS 1 1/4"	2	EA	1.0	2.0	3.29	7	STEEL TUBE
TOTALS TO SHT. 30					238.3	3936	

KSC FORM 21-243 (REV. 4/80)

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 5 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET <u>34</u> OF <u>42</u>		SHEET <u>E-6</u> OF _____	
PROJECT/NO TITLE ORDNANCE BUILDING LC 39		DRAWING NO'S 79K67392	SHEET NO E9-E10		
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA	PCN 77406	PD/CCBD		
ARCHITECT OR ENGINEER J.B. SMITH INC.		OFFICIAL USE ONLY		WORK ORDER OR CONTRACT NO 6005	
ESTIMATOR KOLB J.B. SMITH INC	CHECKER KURVIT J.B. SMITH INC	APPROVED J.A. BROWN DD-FED			

ELECTRICAL INTERIOR SUMMARY	QUANTITY		LABOR (MH)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	<input type="checkbox"/> FIELD TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
16 GROUNDING SYSTEM							
GROUNDING RECEPTACLE	8	EA	1.0	8.0	25.09	201	NPS
GROUND ROD 5/8"	18	EA	2.0	36.0	49.27	887	NPS
MIX. GROUND CONN. WIRE		YR	200.0	200.0	896.00	896	
CONN. SMALL MOTOR 1/3 HP	3	EA	2.5	7.5	7.62	23	
CONN. MED MOTOR 1/2 HP	2	EA	3.0	6.0	10.08	20	
CONN. MED. LG. MOTOR 1 HP	1	EA	4.0	4.0	12.21	12	
CONN. LARGE MOTOR 15 HP	1	EA	6.0	6.0	35.84	36	
CONN. DUCT HEATERS	1	EA	2.0	2.0	7.28	7	
CONN. HUMIDIFIER	1	EA	2.0	2.0	7.28	7	
FLA STA. MAIN WP	1	EA	1.0	1.0	12.54	13	
6" FAB BELL W/WP HOUSING	1	EA	.8	.8	37.63	38	SYS GER
TEL OUTLET EWP	2	EA	.8	1.6	9.80	20	COOK
TEL OUTLET	1	EA	.6	.6	4.79	5	COOK
SUBTOTAL				275.5		2165	
LABOR HOURS * RATE	275.5	HR	18.50	5,097			
PT&I AND STATE TAX		%	25	1,274	5	108	
				6,371		2,273	8,644
OVERHEAD	15	%					1,297
						SUBTOTAL	9,941
PROFIT	10	%					994
						SUBTOTAL	10,935
PRIME MARK-UP	10	%					1,093
						SUBTOTAL	12,028
BOND	1	%					120
TOTAL TO GHT. 29	18	ROD		675.00			12,148

KSC FORM 21-248 (REV 4/80)

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 6 of 6)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION					
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET 35 OF 42 SHEET EM-1 OF _____					
PROJECT/NO TITLE ORDNANCE BUILDING LC 39				DRAWING NO(S) 79K 67392					
STATION SET LOCATION JOHN F. KENNEDY SPACE CENTER, FLA				SHEET NO M-28-29-30					
ARCHITECT OR ENGINEER JBSMITH INC				PCN 77406					
ESTIMATOR KOLB J.B SMITH INC				WORK ORDER OR CONTRACT NO 6005					
CHECKER PURVIS J.B SMITH INC				APPROVED J.A. BROWN DD.FED					
EXTERIOR UTILITIES		QUANTITY		LABOR (MH)		MATERIAL		TOTAL COST	
MECHANICAL SUMMARY ELEMENT		NO. UNITS UNIT MEAS		PER UNIT		<input type="checkbox"/> FIELD TOTAL <input type="checkbox"/> FAB			
15 F H.T.H.W DISTRIBUTION		1,000 LF		34.72				36 34,715	
G SANITARY SEWER		160 LF		36.54				37 5,846	
Y WATER SUPPLY LINES		1014 LF		37.309				38 37,83	
TOTAL EXTERIOR UTILITIES		2,174 LF		36.059		To G+M ?		78,392	
OFFICIAL USE ONLY									

KSC FORM 21-243 (REV 4/80)

Figure D-8. Construction Cost Estimate, Exterior Utilities - Mechanical Summary (Sheet 1 of 4)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE				<input checked="" type="checkbox"/> CONSTRUCTION		
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 36 OF 42		SHEET EM-2 OF				
PROJECT/TITLE ORDNANCE BUILDING LC 39		DRAWING NO(S) 79K67392		SHEET NO M 28				
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406		PD/CCBD				
ARCHITECT OR ENGINEER J.B. SMITH INC		OFFICIAL USE ONLY		WORK ORDER OR CONTRACT NO 6005				
ESTIMATOR KOLB J.B. SMITH INC.		CHECKER PURVIS J.B. SMITH INC		APPROVED J.A. BROWN DD-FED				
EXTERIOR UTILITIES MECHANICAL SUMMARY		QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST
		NO UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
15 F HTHW DISTRIBUTION								
1/2" PIPE BLK SEAMLESS SCH 40		400	LF	.16	640	2.09	836	MCJUNKIN
2" TH FOAM GLASS - FOR 1/2" PIPE		400	LF	.25	1000	2.64	1,056	NORTH BROS
12" PIPE-CASING SCH 40		200	LF	.92	1840	28.60	5720	MCJUNKIN
1/2" STR ELLS IN 12" CASING		8	EA	1.5	12.0	187.00	1,496	HUGHES
FOR EXPANSION LOOP								
ANCHOR		5	EA	1.0	5.0	21.56	108	
DEWATERING		200	LF	.235	470	11.55	2310	M & W PUMP
SEAL PLATE		25	EA	.20	5.0	5.50	138	
EXCAVATION & BACKFILL		37	CY	.30	111	6.60	244	
CRANE RENTAL		1	EA	160	160	470.00	470	
					444.1		12,378	
LABOR HOURS x RATE		444.1	HR	21.08	9362			
PT & I AND SALES			%	25	2341	5	619	
					11,703		12,997	24,700
OVERHEAD		15	%					3,705
							SUBTOTAL	28,405
PROFIT		10	%					2841
							SUBTOTAL	31,246
PRIME MARKUP		10	%					3,125
							SUBTOTAL	34,371
BOND		1	%					344
TOTAL TO SHT 35		1000	LF		34.72			34,715
MCJUNKIN 813-665-6331 LAKELAND								
NORTH BROS 293-9221 ORL								
HUGHES 843-9100 ORL								
M & W PUMP 723-0897 GRANT								

Figure D-8. Construction Cost Estimate, Exterior Utilities - Mechanical Summary (Sheet 2 of 4)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 37 OF 42 SHEET EM-3 OF		DRAWING NO: 79K67392 SHEET NO: M 29			
PROJECT/WO TITLE ORDNANCE BUILDING LC 39		STATION SET JOHN F. KENNEDY SPACE CENTER, FLA		PCN: 77406 PD-CCBD			
ARCHITECT OR ENGINEER J.B. SMITH INC		CHECKER PURVIS J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR KOLB J.B. SMITH INC		APPROVED J.A. BROWN DD-FED		OFFICIAL USE ONLY			
EXTERIOR UTILITIES MECHANICAL SUMMARY	QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
15 G SANITARY SEWERS							
6" SOIL PIPE	100	LF	.40	400	5.63	563	HUGHES
6" COMBINATION Y "	1	EA	2.0	20	35.38	35	
6" 1/4" BEND	1	EA	2.0	20	27.54	28	
6" 1/8" BEND	2	EA	2.0	40	18.46	37	
3" P TRAP	2	EA	3.0	60	40.04	80	
3" FLOOR DRAIN	2	EA	4.0	80	71.73	143	
CAULKING	40	LB	-	-	1.41	56	
OKUM	4	LB	-	-	8.58	34	
LPGAS	4	LB	-	-	6.50	26	
3" CHAUKING JOINTS	14	EA	.50	70	-	-	HUGHES
CONC. PIPE	1	EA	-	-	104.50	105	
DRY WELL 24" x 5'	1	EA	8.0	80	286.00	286	
4" ACID WASTE PIPE-PVC	60	LF	.30	180	3.07	184	HUGHES
				95.0		1,577	
LABOR HOURS x RATE	95.0	HR	21.08	2,003			
P&I AND SALES TAX		%	25	501	5	79	
				2,504		1,656	4,160
OVERHEAD	15	%					624
							4,784
PROFIT	10	%					478
							5,262
PRIME MARK-UP	10	%					526
							5,788
BOUND	1	%					58
							5,846
TOTAL SANITARY SEWERS TOTAL	35	160	LF	3654			5,846

KSC FORM 21-243 (REV 4/80)

Figure D-8. Construction Cost Estimate, Exterior Utilities - Mechanical Summary (Sheet 3 of 4)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION				
CODE C 95		DATE COMPLETED MAY 1, 1985		SHEET <u>38</u> OF <u>42</u> SHEET <u>EM-4</u> OF _____				
PROJECT/NO TITLE ORDNANCE BUILDING LC 39			DRAWING NO:1 79K67397	SHEET NO M-30				
STATION SET	LOCATION JOHN KENNEDY SPACE CENTER, FLA.		PCN 77406	PD/CCBD				
ARCHITECT OR ENGINEER J.B. SMITH INC.			OFFICIAL USE ONLY					
ESTIMATOR KOLB J.B. SMITH INC	CHECKER PURVIS J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6005					
			APPROVED J.A. BROWN DD-FED					
EXTERIOR UTILITIES		QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST
MECHANICAL SUMMARY		NO. UNITS	UNIT MEAS	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> PAD	PER UNIT	TOTAL	
15 Y WATER LINES-SUPPLY LINES								
10" TAPPING VALVE		1	EA	20.0	20.0	803.28	803	HUGHES
10" TAPPING SLEEVE		1	EA	20.0	20.0	738.00	738	
2" GATE VALVE W/BOX		1	EA	.7	.7	171.91	172	
FIRE HYDRANT & EXT.		3	EA	12.0	36.0	924.53	2,773	
10" C.I PIPE		475	LF	.28	133.0	13.75	6,531	
6" C.I PIPE		336	LF	17	57.1	9.37	3,148	
2" GALV STEEL PIPE		203	LF	.22	44.7	2.92	593	
10" C.I TEE		2	EA	9.0	18.0	497.39	995	
6" C.I TEE		2	EA	5.3	10.6	163.74	327	
2" GALV. TEE		4	EA	1.2	4.8	32.33	129	
10" X 6" C.I REDUCER		1	EA	3.0	3.0	423.40	423	
10" PLUG		1	EA	2.5	2.5	18.38	18	
6" 1/4 BEND		1	EA	2.85	2.9	27.54	28	
6" 1/8 BEND		1	EA	2.85	2.9	18.46	18	HUGHES
					356.2		16,696	
LABOR HOURS X RATE		356.2	HR	21.08	7,509			
PT&I AND SALES TAX			%	25	1877	5	835	
					9,386		17,531	26,917
OVERHEAD		15	%					4,038
								30,955
PROFIT		10	%					3,096
								34,051
PRIME MARK-UP		10	%					3,405
								37,456
BOND		1	%					375
WATER SUPPLY LINE TOTAL TO SHT. 35					1014	LF	37,809	37,831

KSC FORM 21-248 (REV. 6-80)

Figure D-8. Construction Cost Estimate, Exterior Utilities - Mechanical Summary (Sheet 4 of 4)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION		
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 57 OF 42		SHEET EE-1 OF		
PROJECT/NO TITLE ORDNANCE BUILDING LC 39		DRAWING NO/S 79K67392	SHEET NO E 15			
STATION SET	LOCATION JOHN F KENNEDY SPACE CENTER, FLA	PCN 77406	PD/CCBD			
ARCHITECT OR ENGINEER J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6005				
ESTIMATOR KOLB J B SMITH INC	CHECKER PURVIS J B SMITH INC	APPROVED J.A. BROWN DD-FED				
ELECTRICAL EXTERIOR SUMMARY	QUANTITY		LABOR (MM)	MATERIAL		TOTAL COST
	NO UNITS	UNIT MEAS	PER UNIT	FIELD TOTAL FAB	PER UNIT TOTAL	
16 A SITE WORK FROM	SHT.	40		2651.6	27,953	
16 B MED & HI-VOLT POWER LINES FROM	SHT	41		837.3	186,306	
				3488.9	214,259	
LABOR HOURS x RATE	3488.9	HR	1850	64,545		
PT & I AND SALES TAX		%	25	16,136	5	10,713
				80,681	224,972	305,653
OVERHEAD	15	%				45,845
						351,501
PROFIT	10	%				35,150
						386,651
PRIME MARK-UP	10	%				38,665
						425,316
BOND	1	%				4,253
TOTAL TO SH 2 ELEC. EXT	2000	KVA		21252		420,560
OFFICIAL USE ONLY						

KSC FORM 21-243 (REV 4/80)

Figure D-9. Construction Cost Estimate, Electrical Exterior Summary (Sheet 1 of 3)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE				<input checked="" type="checkbox"/> CONSTRUCTION	
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 40 OF 42		SHEET EE-2 OF			
PROJECT/WO TITLE ORDNANCE BUILDING LC 89		DRAWING NO(S) 79K67392		SHEET NO E11-E13			
STATION SET	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA	PCH 77406		PD/CCBD			
ARCHITECT OR ENGINEER J.B. SMITH INC		OFFICIAL USE ONLY		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR KOLB J.B. SMITH INC		CHECKER PURVIS J.B. SMITH INC		APPROVED J.A. BROWN DD-FED			
ELECTRICAL SITEWORK SUMMARY	QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST
	NO UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> PAD	PER UNIT	TOTAL	
16. A MANHOLE TYPE "C" POWER							
DEWATER HEADER	200	LF	3.77		754.0	22.17	4434
EXCAVATION	767	CY	.06		46.02	.83	637 BREWER REG.
CONCRETE 3000 PSI	56	CY	.25		14.0	45.00	2520 RINKER
FORMWORK	2151	SFCA	.14		301.1	.83	1785
REBAR	6255	LB	.01		62.6	.32	2002
FRAME & COVER TRAFFIC	1	EA	12.2		12.2	350.00	350 BROOKS PROF.
PULLING IRONS, STAIRS, ETC	95	LB	.1		9.5	.65	62
BACK FILL & COMPACTION	607	CY	.2		121.4	.70	425
INTERIOR RACKS W/ HOOKS	8	EA	1.25		10.0	31.00	248 HUGHES
INSULATORS	48	EA	.30		14.0	1.40	67 HUGHES
MANHOLE TYPE "D" COMM							
DEWATER	150	LF	4.03		604.5	22.17	3326
EXCAVATION	194	CY	.101		19.5	1.22	237
CONCRETE 3000 PSI	20	CY	.25		5.0	45.00	900 RINKER
FORMWORK	806	SFCA	.15		120.9	.83	669
REBAR	2234	LB	.015		33.5	.32	715
FRAME & COVER TRAFFIC	1	EA	12.2		12.2	350.00	350 BROOKS PROF.
PULLING IRONS, STAIRS	60	LB	.1		6.0	.65	39
BACK FILL & COMPACTION	166	CY	.2		33.2	.70	116
INTERIOR RACKS	6	EA	.75		4.5	31.00	186 HUGHES
INSULATORS	18	EA	.08		1.4	1.40	25 HUGHES
FORMER PAD 10x20x1	8	CY	8.6		68.6	45.00	360 RINKER
GRAVEL LOOSE & COMPACT BASE	10	CY	.84		8.4	12.00	120
GUARD CHAIN & HDW	1	EA	7.0		7.0	50.00	50
4W4 DUCT & CONCEALED	500	LF	.6		300.0	13.50	6750
2W4-2W3 DUCT CONC.	100	LF	.5		50.0	9.00	900
2W3- " " "	80	LF	.4		32.0	8.50	680
SITE WORK SUB TOTAL TO SHT 39					2451.6		27,953

Figure D-9. Construction Cost Estimate, Electrical Exterior Summary (Sheet 2 of 3)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 41	OF 42	SHEET EE-3			
PROJECT/WO TITLE ORDNANCE BUILDING LC39		DRAWING NOIS. 79K67392	SHEET NO E14-E19				
STATION SET	LOCATION JOHN KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CCBD				
ARCHITECT OR ENGINEER J.B. SMITH INC.		WORK ORDER OR CONTRACT NO 6005		APPROVED J. BROWN DD FED			
ESTIMATOR KOLB J.B. SMITH INC	CHECKER PURVIS J.B. SMITH INC						
ELECTRICAL EXTERIOR SUMMARY	QUANTITY		LABOR (MH)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
16 B MED & HI-VOLT POWER LINES							
CONDUIT RIGID ST 3/2"	140	LF	.35	49.0	4.55	637	CEG
CONDUIT RIGID ST. 3/4"	70	LF	.06	4.2	.62	43	
4" CONDUIT FLEX & EDBUM 4"	2	EA	5.8	11.6	90	180	
4" CONDUIT FLEX & END BUSH 3/2"	2	EA	4.5	9.0	82	164	
ADAPTOR 4 RIGID DUCT 4"	2	EA	1.3	2.6	4.50	9	
ADAPTOR 4 RIGID DUCT 3"	2	EA	1.0	2.0	3.80	8	CEG
1/2-4" CILE NJ-15KV CABLE	950	LF	12	114.0	8.55	8123	ANIXTER
15KV FILE SLICE	2	EA	24.0	48.0	75.00	150	HUGHES
15KV FILE END TERM	2	EA	24.0	48.0	250.00	500	HUGHES
THHN 350 MCM - 1/2-600V-CU	650	LF	.11	71.5	1.78	1157	CEG
THHN 70 AWG - 1/2-600V-CU	250	LF	.02	5.0	.07	18	CEG
3/4" X 30" CU-LAD GRD ROD	6	EA	2.0	12.0	57.50	345	CEG
#2/0 B50 WIRE GRD	80	LF	.03	2.4	.648	52	HUGHES
GROUND CONN	1	EA	8.0	8.0	20.00	20	
2000KVA DOUBLE END SUBSTA							
2000KVA TRANSFORMER TRANS	2	EA	50.0	100.0	250.00	50,000	MARK
138KV LB SWITCH W/FOSES	2	EA	12.0	24.0	11,000	22,000	HATFIELD
3000A SECONDARY MAINS	2	EA	15.0	30.0	13,600	27,200	WEST.
3000A TIE BREAKER	1	EA	16.0	16.0	13,600	13,600	
800A FEEDER BREAKER	3	EA	8.0	24.0	3825	11,475	
600A FEEDER BREAKER	8	EA	8.0	64.0	3825	30,600	
TRANSITION SECTION	2	EA	8.0	16.0	3800	7,600	
CURRENT TRANSFORMER	8	EA	5.0	40.0	425	3,400	
POWER TRANSFORMER	4	EA	5.0	20.0	595	2,380	
AMMETER-VOLTMETER	4	EA	2.0	8.0	850	3,400	
AMMETER-VOLTMETER WITH	4	EA	2.0	8.0	450	1,800	
WEATHER PROOFING	1	EA	100.0	100.0	1445	1,445	
SUB TOTAL TO SHT 39				837.3		186,306	

Figure D-9. Construction Cost Estimate, Electrical Exterior Summary (Sheet 3 of 3)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C 95	DATE COMPLETED MAY 1, 1985	SHEET 42 OF 42 SHEET EE4 OF 					
PROJECT/NO TITLE ORDNANCE BUILDING LC 39		DRAWING NO.1 79K67892	SHEET NO M-31 M32				
STATION SET JOHN F. KENNEDY SPACE CENTER, FLA.	LOCATION JOHN F. KENNEDY SPACE CENTER, FLA.	PCN 77406	PD/CB/D				
ARCHITECT OR ENGINEER J.B. SMITH INC		OFFICIAL USE ONLY		WORK ORDER OR CONTRACT NO 6005			
ESTIMATOR KOLB J.B. SMITH INC.	CHECKER PURVIS J.B. SMITH INC.	APPROVED J.A. BROWN DD-FED					
SPECIAL CONSTRUCTION SUMMARY	QUANTITY		LABOR (HR MM)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> PAD	PER UNIT	TOTAL	
13 F GASEOUS NITROGEN GNL							
1/2" SOLENOID VALVE 3/4"	1	EA	1.28	1.3	417.07	417	CIRCLE SEAL
1/2" GLOBE VALVE 3/4"	2	EA	1.28	2.6	154.29	309	CIRCLE SEAL
1/2" PRESS GAGE 3/4"	2	EA	1.28	2.6	60.96	122	
1/2" FILTER 10 MICRON	1	EA	1.28	1.3	25.45	25	GULF CONTROLS
1/2" PRESS REGULATOR	1	EA	1.28	1.3	26.00	26.6	GRUVE VALVE
1/2" TUBING 072 WALL 304%	50	LF	1.80	90.0	4.18	209	WALL TUBE
KC103 SEAL RING	20	EA	.10	2.0	.40	8	NIABCO
KC107C8 TEE	4	EA	.48	1.9	26.58	106	
KC112C8 ADAPTER	6	EA	.32	1.9	5.85	35	
KC126C8 UNION	4	EA	.32	1.3	7.41	30	
KC142C8 NUT	20	EA	.16	3.2	1.51	30	
KC143C8 SLEEVE	20	EA	.16	3.2	1.54	31	
75M04185-2.8 BAND MARKER	10	EA	.10	1.0	.41	4	
CLEANING COMPONENTS	8	EA	3.0	24.0	3.85	31	SEE SHT 6
CLEAN TUBE 4444	10	EA	1.0	10.0	3.85	39	FOR DETAIL
GFE GNL 10000 SIG PANEL	4	EA	2.5	10.0	82.50	330	GFE VALVE
TEST & CHECK OUT	4	EA	7.5	30.0	-	-	\$150,000
LABOR HOURS x RATE	1876	HR	21.08	3955		1992	
PT & I AND SALES TAX		%	25	989	5	100	
SUBTOTAL				4944		2992	7036
OVERHEAD	15	%					1055
SUBTOTAL							8091
PROFIT	10	%					809
SUBTOTAL							8900
PRIME MARK UP & BOND	10	%	+ 1%				988
TOTAL GNL TO SHT 2	50	LF	197.76				9888

KSC FORM 21-248 (REV 4/80)

Figure D-10. Construction Cost Estimate, Special Construction Summary

APPENDIX E
BID COST ESTIMATE
(CODE C-100)

COST ESTIMATE COVER SHEET

GOVERNMENT ESTIMATES ARE ADMINISTRATIVELY CONFIDENTIAL
ACCESSIBLE TO AUTHORIZED NASA/KSC PERSONNEL OR REPRESENTATIVES ONLY

PROJECT ORDNANCE BUILDING 4100 SF
 LOCATION KSC-LC 39-VAB AREA
 IFB NO MADE UP 10-00-123-5
 BID DATE AUG 15, 1985
 AMENDMENT AMEND #1 DATED 6-2-85 AMEND #2 DATED 6-10-85
 ESTIMATE CODE C100
 PCN 77406
 CONTRACT W.O. 6005

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DRAWING NO 79K67302 SHT 80

PREPARED BY J.B. SMITH & E FRC KSC
1400 AFBLO BLVD
 FIRM/ADDRESS ROCKET CITY,

LOCATION UTAH 42134

MODEL NO N/A

SUBMITTAL DATE JULY 22, 1985.

LEAD DESIGNER ALICE JONES J.B. SMITH

ESTIMATED BY VARDELL FRC 2421

KSC COST ENGINEER JOE A. BROWN NASA

PHONE NO. 867-2725

PROJECT ENGINEER DRAINWOOD J.B. SMITH

REVIEWED BY L. SEYMORE

APPROVED BY R.V. SURE

PHONE NO. 867-3994

Cost Estimating for procurement requires special handling in accordance with DE ID-1142.23, KSC SPEC-G-0002 and KSC SPEC-G-0003 for GSE.

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KSC FORM 21-888 (3/83)

Figure E-1. Cost Estimate Cover Sheet

FOR OFFICIAL USE ONLY

SOLICITATION, OFFER, AND AWARD <i>(Construction, Alteration, or Repair)</i>		1 SOLICITATION NO 10-00-123-5	2 TYPE OF SOLICITATION <input type="checkbox"/> SEALED BID (IFB) <input type="checkbox"/> NEGOTIATED (RFP)	3 DATE ISSUED 7-15-85	PAGE OF PAGES
IMPORTANT - The "offer" section on the reverse must be fully completed by offeror					
4 CONTRACT NO		5 REGISTRY/IDR/PURCHASE REQUEST NO 10-00-123-5	6 PROJECT NO 77406		
7 ISSUED BY CODE SI-PRO-31		8 ADDRESS OFFER TO			
JOHN F. KENNEDY SPACE CENTER, NASA PROCUREMENT OFFICE KENNEDY SPACE CENTER, FLORIDA 32899		JOHN F. KENNEDY SPACE CENTER, NASA PROCUREMENT OFFICE, CODE SI-PRO-A HEADQUARTERS BLDG., ROOM 2414 KENNEDY SPACE CENTER, FLORIDA 32899			
9 TOP INFORMATION CA--		10 NAME COPIES: ATS/PRO Questions: G. D. Fain		11 TELEPHONE NO (include area code) <i>NO COLLECT CALLS</i> Copies: 305/867-2851 Quest: 305/867-7230	
SOLICITATION					
NOTE: In sealed bid solicitations offer and offeror mean bid and bidder. 12 THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS WITHIN MONTHLY NO DATE					

ORDNANCE BUILDING KSC, FLA.

TASK I SITE WORK OUTSIDE 5' LINE

TASK II BUILDING STRUCTURE TO 5' LINE, INCLUDING STRUCTURAL - MECHANICAL - ELECTRICAL

TASK III UTILITIES OUTSIDE 5' LINE

TASK IV (OPTION) SPECIALIZED CONSTRUCTION GN₂ LINE

MAGNITUDE 1,000,000 TO 5,000,000

PRIORITY RATING (DMS REG #1)

OFFICIAL USE ONLY

11 The Contractor shall begin performance within 5 calendar days and complete it within 210 calendar days after receiving award notice to proceed. This performance period is mandatory negotiable (See _____)

12A THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS:
IF YES (Indicate within how many calendar days after award in Item 12B)
 YES NO

12B CALENDAR DAYS
Within 5 days after request

13 ADDITIONAL SOLICITATION REQUIREMENTS

A Sealed offers in original and 2 copies to perform the work required are due at the place specified in Item 8 by 3:00 pm (hour, local time) 8-15-85 (date). If this is a sealed bid solicitation offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B An offer guarantee is is not required.

C All offers are subject to the (1) work requirements and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

D Offers providing less than 60 calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.

NSN 7540-01-168-37 2

1442 201

STANDARD FORM 1442 (REV. 4-85)
Prescribed by GSA - KSC OP 12-86
FAR (48 CFR) 53.236-7(a)

Figure E-2. Bid Form, Construction Contract (Sheet 1 of 2)

14 NAME AND ADDRESS OF OFFEROR (Include ZIP Code) OFFICIAL GOVERNMENT ESTIMATE		15 TELEPHONE NO (Include area code) 16 REMITTANCE ADDRESS (Include only if different than form 14) N/A	
CODE _____ FACILITY CODE _____			
17 The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation. If this offer is accepted by the Government in writing within _____ calendar days after the date offers are due (this time number equals contract time that the offer is accepted stated in item 13D) Failure to meet this number means it is not a reply to the minimum in item 13D)			
AMOUNTS	BID PRICE TASK I II III IV OPTION	134,269 564,329 556,559 1,251,157 10,667	
18 The offeror agrees to furnish any required performance and payment bonds			
19 ACKNOWLEDGMENT OF AMENDMENTS <small>(The offeror acknowledges receipt of amendments to the solicitation - Give number and date of each)</small>			
AMENDMENT NO		I II	
DATE		7-23-82 & 2-82	
20A NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)		20B SIGNATURE	20C OFFER DATE
AWARD (To be completed by Government)			
21 ITEMS ACCEPTED APPROVED BY <u>Justin Cook</u> DE <u>Alice Jones</u> CE <u>J. A. Brown</u> <small>DD-FED-82 DD-FED DD-FED</small> A&E J. B. Smith Joe A. Brown, C.C.E.			
22 AMOUNT RECEIVED <u>DE-CAT-1</u>		23 ACCOUNTING AND APPROPRIATION DATA	
24 SUBMIT INVOICES TO ADDRESS SHOWN IN ITEM 14 (Include unless otherwise specified)		25 OTHER THAN FULL AND OPEN COMPETITION SUBJECT TO <input type="checkbox"/> 10 USC 2304(c) <input type="checkbox"/> 41 USC 252(c)()	
26 ADMINISTERED BY CODE <u>S1-PRO-32</u>		27 PAYMENT WILL BE MADE BY	
JOHN F. KENNEDY SPACE CENTER, NASA CONTRACT ADMINISTRATION SECTION KENNEDY SPACE CENTER, FLORIDA 32899		JOHN F. KENNEDY SPACE CENTER, NASA COMMERCIAL ACCOUNTS & FUND CONTROL SECTION CODE: AC-FMO-23A KENNEDY SPACE CENTER, FLORIDA 32899	
CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE			
<input type="checkbox"/> 28 NEGOTIATE AGREEMENT (Contractor is required to sign this agreement and return _____ copies to issuing office. Contractor agrees to furnish and deliver a copy of contract award requirements identified on this form and any continuation sheets to the contractor in strict accordance with the contract. The rights and obligations of the contractor under this contract shall be governed by (a) this contract award ID, the solicitation and (b) the clauses, recommendations, specifications and specifications incorporated by reference in or attached to this contract.		<input type="checkbox"/> 29 AWARD (Contractor is not required to sign this document. If you offer of this solicitation is formally accepted as to the items listed. This award document summarizes the contract which consists of (a) the Government solicitation and (b) (1) this contract award. No further contract document is necessary.	
20A NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)		20B NAME OF CONTRACTING OFFICER (Type or print)	
20B SIGNATURE	20C DATE	20D UNITED STATES OF AMERICA	20E AWARD DATE

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STANDARD FORM 1467 BACK (REV. 6-85) 40C108 (4-86)

Figure E-2. Bid Form, Construction Contract (Sheet 2 of 2)

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION			
CODE C100		DATE COMPLETED JULY 22, 1985		SHEET <u>4</u> OF <u>6</u> SHEET <u>4</u> OF <u>48</u>			
PROJECT/NO TITLE ORDNANCE BUILDING				DRAWING NO: 79K67392 SHEET NO 1-86			
STATION SET K4C LC39		PCN 39143		PD/CCBD			
ARCHITECT OR ENGINEER J.B. SMITH INC				WORK ORDER OR CONTRACT NO 0576			
ESTIMATOR MIKE L BROWN JBS		CHECKER JOHN KOLE		APPROVED J.B. SMITH PRCY			
BID FORM SUMMARY	QUANTITY		LABOR (\$ OR MM)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD <input type="checkbox"/> TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL	
TASK							
I SITE WORK FROM SHTE							
						124,462	
				.0788%		9,807	
						0,000	
	4100	SF	327485				134,269
II BUILDING-STRUCT TO 5' LINE							
						512,652	
				.0788%		40,397	
						11,280	
	4100	SF	137642				564,329
III UTILITIES OUTSIDE 5' LINE							
						507,981	
				.0788%		40,028	
						4,550	
	4100	SF	134705				552,559
	4100	SF	305162				1,251,157
IV SPECIALIZED CONSTRUCTION							
	50	LF	197.76			9,888	
				.0788%		719	
						0,000	
	50	LF	215.34			10,667	10,667
GFE VALUE \$150,000 NIC							
TO BID FORM E-6							
OFFICIAL USE ONLY							

KSC FORM 21-243 (REV 4/80)

Figure E-3. Bid Form Summary

<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		COST ESTIMATE		<input checked="" type="checkbox"/> CONSTRUCTION				
CODE C-100		DATE COMPLETED JULY 22, 1985		SHEET <u>5</u> OF <u>48</u> SHEET <u>2</u> OF <u>42</u>				
PROJECT/TITLE ORDNANCE BUILDING LC 39				DRAWING NO. 79K67392				
STATION SET LOCATION JOHN F KENNEDY SPACE CENTER, FLA				SHEET NO C-1 THRU C-9				
ARCHITECT OR ENGINEER J. B. SMITH INC				PCN 77406				
ESTIMATOR VARNDELL REC 2501				WORK ORDER OR CONTRACT NO 6005				
CHECKER WRIGHT REC 2421				APPROVED				
PROJECT SUMMARY	QUANTITY		LABOR (MM)		MATERIAL		TOTAL COST	
	NO. UNITS	UNIT MEAS.	PER UNIT	<input type="checkbox"/> FIELD TOTAL <input type="checkbox"/> FAB	PER UNIT	TOTAL FROM		
I SITE WORK								
2A DEMOLITION PAVING	610	SY	@	3.08	OFFICIAL USE ONLY	4	1,880	
2E EARTH WORK	6500	LY	@	7.73		4	50,273	
2P BIT PAVING	3,100	SY	@	15.31		4	47,469	
2T GRASSING	5,600	SY	@	1.96		4	10,984	
2V STORM DRAINAGE	132	LF	@	104.97		4	13,856	
SUBTOTAL								124,462
II BUILDING STRUCT. TO 5'-0" LINE								
2-14 ARCH. STRUCT	4,100	SF	@	74.34	OFFICIAL USE ONLY	15	304,780	
15 MECHANICAL (INT.)	4,100	SF	@	25.84		23	105,449	
16 ELECTRICAL (INT.)	4,100	SF	@	24.86		29	101,923	
SUBTOTAL								512,652
III UTILITIES OUTSIDE 5'-0" LINE								
15F STEAM DISTRIBUTION	1,000	LF	@	34.72	OFFICIAL USE ONLY	35	34,715	
15G SANITARY SEWERS	160	LF	@	36.54		35	5,846	
15Y WATER SUPPLY	1,014	LF	@	37.31		35	37,831	
16A EXTERIOR ELEC	2,000	KVA		214.78		39	429,569	
SUBTOTAL								507,961
IV SPECIALIZED CONSTRUCTION								
13F SPECIALIZED SYS. GNS	SEE OPTION I			SHT.	42			
GFE VALUE 3-PANEL @ 50,000	150,100				49		=	
EST. CONVT. BID COST	4,000	SF		281.70			1,145,075	
SPECIAL CONDITIONS (NO D.T ESCAL)							91,031	
AMEND I FROM SHT 4					4		11,280	
AMEND II FROM SHT 4					4		4,550	
OPTION I SHT 42	50	LF	@	197.76	42		9,888	
SUBTOTAL								=
BID COST ESTIMATE								1,261,824

KSC FORM 21-245 (REV 4/80)

Figure E-4. Project Summary

APPENDIX F
SUPPORTING DATA

<u>REFERENCE</u>	<u>SHEETS</u>	<u>COSTS</u>
BLOG ESTIMATOR'S REFERENCE BOOK, WALKER PP 93 THRU 96, 106	3 THRU 17	A/S - LABOR/MATERIAL
ENGINEERING NEWS RECORD, MAY 1985 PP 24 THRU 25	9/10	A/S - TURNWORK AND FINISHES LABOR
CONTRACTOR'S EQUIPMENT OWNERSHIP EXPENSE	7	SITE WORK - GRADER, D-9 OPERATION
KSC CONSTR. COST INDEX	5,7,9,10,12, 14,15,17,20,25	A/S, MECHANICAL, ELECTRICAL MARKUPS
COST MANUAL FOR PIPING AND MECHANICAL CONSTRUCTION	18 THRU 22	MECHANICAL LABOR/MATERIAL
NATIONAL PRICE SERVICE MONITOR	23 THRU 26	ELECTRICAL LABOR/MATERIAL
QUOTES, BROWNSVILLE, FLA, FIRMS		
R.L. BURGESS, ARM MANUFACTURING, 9/23/75	8	STEEL BAR JOISTS, MILL COSTS
AMERICAN STEEL FABRICATORS, T.O'NEAL, 9/27/75	8,9	STRUCTURAL STEEL SHOP COSTS
K. BROWN, TINKER CONCRETE, INC. 7/16/75	4	CONCRETE 8X12 BLOCK COSTS
<u>COMPUTATIONS</u>		
ATTACHMENT A, PAGE 2	2	SITE WORK, FILL DIRT
ATTACHMENT A, PAGE 3	19	SPECIALIZED CONSTRUCTION, LABOR FACTORS SUMMATION

Figure F-1. Quotes and Backup Data

CODE		BUDGET QUOTE FOR ESTIMATING			PAGE ____ OF ____	
C-95		KENNEDY SPACE CENTER (Vendor told for estimating VENDOR "QUOTE" FROM: purposes only). Yes			DATE	WORK ORDER #
COMPANY: ABC STEEL CO.		ADDRESS: 4500 Pine Street Canaveral Groves, FL 32922			4/30/85	0576 G-1.000
PERSONS NAME: Robert Steel		POSITION/TITLE: Chief Estimator			UP DATED	6/30/85
PHONE: 305-633-1234		ORIGINATOR			Varndell	PHONE #
		COSTS OBTAINED BY			Wright	867-2725
		DELIVERY SCHEDULE			4 WKS After Shop Dwg.	PHONE #
		JOB POINT			Job Site, LC-39 Area	77406
		TOTAL WEIGHT			10 Tons	FREIGHT CHARGES
						850
ITEM	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	TOTAL	
1	Structural Steel, Warehouse Steel Beam Co.	5*	Tons	900	4,500	
2	Shop Fabrication (includes shop dwg)	5	Tons	625	3,125	
3	Sand Blast (SP10)	5	Tons	140	700	
4	Inorganic Zinc (0001)	5	Tons	220	1,100	
5	Erection labor	5	Tons	800	4,000	
	Bar hoist - 40 L20-(30 ea) & Bridging					
6	Fabricated Delivered Job Site	4	Tons	1,785	7,140	
7	Field erection labor & equipment	4	Tons	915	3,660	
FOR OFFICIAL USE ONLY						
		9	Tons	3,112	17,550	
REMARKS: (SPECS QUOTED, ETC.) (SPECS QUOTED ,ETC.) Spec Section 5 & 9L Read to ABC.						
DRAWINGS 100 %, DATE 7/21/85 Reference Sheets S1-5						
<ol style="list-style-type: none"> These are and labor material prices, Taxes, ins., OH & profit must be added to these prices. Field touch-up painting included in erection prices if by painting sub, delete \$40/ton. Approximate quantities for obtaining vendor quote. 						

KSC FORM 21-871 12/80

Figure F-2. Budget Quote for Estimating

TYPICAL BREAK DOWN STRUCT STEEL										
FORM NO.	DATE	ESTIMATED BY	SHEET 40 OF 42							
6005 FCN 77408 79K67592	MAY 1, 1985	J. KOLB & J.B. SMITH INC								
ORDNANCE BUILDING - KSC - OFFICIAL USE ONLY										
DESCRIPTION	QUANTITY	UNIT	UNIT MAT'L	UNIT LABOR	E & Q KENT	OWNER-MATERIAL	CONTRACTOR MATERIAL	LABOR	EQUIP. RENTAL	TOTAL
BEAMS						FAB. MAT'L				
MAT'L FROM WAREHOUSE AFTM 1574	1	TON	900				900	COM. INDEK DEL TO FABRICATION		
GR 50 FABRICATION										
ENGINEERING SHOP DRAWINGS	1	TON	125			125				
FIELD MEASUREMENTS	1	TON	225			225				
SHOP FABRICATION PER TON	25	HR		25		625		OFF 10-16 HRS/TON		
SAND BLAST NEAR WHITE S.F. ID	300	SF	.20	234		70	60			
PAINT INORGANIC ZINC STD F 0001	300	SF	.25	.50		150	75			
CONNECTIONS & WASTE 10%	200	LB	.40	45		80	90			
FREIGHT TO JOB	1	TON	45	35		45	40			
FIELD ERECTION					FAB	1,320	265	400 (6.7 PER TON)		1,785
UNLOAD, PLACING & TACK OR FLIBIT	1	TON		400				400		
FIELD WELDING 300/TON/1.5 HR	20	HR		20				400		
WELDING RODS 30#	30	LB	.40				12			
WELDING MACHINE	20	HR			150				30	
CRANE 40 TON - 150' BOOM	1	HR			85				85	
TOTAL LABOR-MATL-EQUIP RENT	1	TON				1,320	(1,177)	800*	(115)	3,412
NOTE-1. TYPICAL BREAKDOWN TO BE MADE ON ALL						1,177		To LABOR COLUMN		
STEEL SUCH AS BEAMS, TRUSSES, COLUMNS, ETC.						115				
2. COMBINE EQUIP. RENTAL & CONTRACTOR INTO						2,612		(To MATERIAL COLUMN)		
FAB. MATERIAL COLUMN IN ORDER TO FIGURE										
YOUR SALES TAX.										
3. ALL QUOTES IN REGARD TO ERECTION, FOR MTL-WAREHOUSE OR								ABC STEEL CO		
PAINTING ETC SHOULD INCLUDE VENDORS NAME PRICE								FAB	320. TON	
TOTAL									4-90	85

Figure F-3. Cost Estimate Work Sheet, Typical Breakdown, Structural Steel

METHOD 1 GFE ESTIMATING									
		A			B		C		
DESCRIPTION	QUANTITY	UNIT	UNIT MAT'L	LABOR	FACTOR	OWNER MATERIAL	CONTRACTOR MATERIAL	LABOR	RENTAL
GN ₂ Panel, SS, 4' X 2', 6000-10,000 psi W.P., 5 valves, 4 meters, 5 outlets, and Electrical Connections (FIND NOS. A79553, A79554, A79555)	3	EA	\$ 5,000	MH 3.0	(2A) 2.0	GFE 15,000	\$ 300	MH 9.0	
	1	EA	1,000	1.0	3.0	1,000	30	1.0	
	10	EA	13,400	-	(2B) -	134,000	NIC 330	NIC 10.0	
	TOTAL	GFE VALUE	(3)			150,000	(4)	10.0	Totals to Shts D-4, E-6, E-7 & D-44
<p>GFE FACTORS</p> <p>1. Handling - 0.5% 2. Insurance - 1.0% (2A) 3. Storage - 0.5%</p> <p>Total 2.0% per item</p> <p>GN₂ Panel, SS, 6' X 6' X 8', 6000-10,000 psi W.P., 9 valves, 10 meters, 9 outlets (FIND NO. A76521)</p> <p>GFE FACTORS</p> <p>1. Handling 1.0% (2B) 2. Insurance 1.5% 3. Storage 0.5% 3.0%</p>									

- When listing GFE, describe by noun, physical characteristics (size, shape), functional design characteristics, and KSC drawing find number(s).
- GFE factors may vary from equipment item to equipment item. Therefore, list GFE factors used in the estimate of each equipment item.
- Multiply owner material cost of GFE by the associated GFE factor percentage in column A to obtain the contractor material cost in column B (\$5,000 X 3.0 X 2% = \$300).
- Carry forward prices in column B and C to the Mechanical Division Trades' Summary sheets for markups. Identify column B and C costs as GFE costs in the trades' summaries.
- Summarize GSE and value and carry forward to project summary.
- Total value of GFE \$150,000. Carry forward to project summary D-4, E-6, & E-7.

Figure F-4. Method 1, GFE Estimating

APPENDIX G
SPECIAL SUMMARIES

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SYSTEM SUMMARY OF GOVERNMENT ESTIMATE FOR BUILDINGS

DRAWING NO. 79K67392
WORK ORDER CONTRACT
6005 MAS10-10190-5
PROJECT ENGINEER
J. B. SMITH (ABE)
SHEETS 1-80
PLANNING RESEARCH CORP (KSC)
VENDOR #11, PRC 7421
KSC, L.C. 39, VAB ARFA
ESTIMATION
77406
DATE
2/7/85
CODE C-100
SUBMITTED MAY 1, 1985 8/1/85

DIV TITLE	QTY	UNIT	S UNITS	S UNITS	S UNITS	TOTAL	DIV TOTAL	DIV TITLE	QTY	UNIT	S UNITS	S UNITS	S UNITS	TOTAL	DIV TOTAL	DIV TITLE	QTY	UNIT	S UNITS	S UNITS	S UNITS	TOTAL	DIV TOTAL	COMMENTS
1 GHL COND (15%)	4100	LF	40.00	22.50		1205.22		9 FINISHES	21143	SE	78	4.08		1626.7		10 SPECIALTIES								EXCELLENT GOVT ESTIMATE
2 SITE WORK	7265	CV	28.59	50.65		7636	207685	11 EQUIPMENT	21143	SE	78	4.08		1626.7		12 FURNISHINGS								ESTIMATE \$7000 SPECIAL
CLP GRIB	3	ALR	2565.11	1.86		1880		13 SPECIAL CONSTR								14 CONCRETE SYS	15	TUN	5947.33	21.76		89176		CONC BLOCK & STEEL
DEMOLITION	610	SV	3.08	.46		42768		15 MECHANICAL	15	TUN	5945.07	21.75		89176		16 WOODWORK							1.60 X 4.00 X 8.00	
ERTH/FILL	7285	SV	6.58	11.58		6649		17 PLUMBING								18 TRIM							3.00 X 4.00 X 8.00	
PLING						2308		19 ELECTRICAL								20 FLOORING							3.00 X 4.00 X 8.00	
UTILITIES (H&P)						3100		21 CARPENTRY								22 ROOFING							3.00 X 4.00 X 8.00	
PAVING BIT						5600		22 ROOFING								23 PAINT & COVER							3.00 X 4.00 X 8.00	
OTHER						6342		23 PAINT & COVER								24 OTHER							3.00 X 4.00 X 8.00	
3 CONCRETE	207	CV	311.56	15.71		23682		24 OTHER								25 FURNISHINGS							3.00 X 4.00 X 8.00	
FRSB	8850	1B	92	1.73		7098		26 TRIM								27 FURNISHINGS							3.00 X 4.00 X 8.00	
REBAR	207	CV	124.78	5.30		25829		28 TRIM								29 FURNISHINGS							3.00 X 4.00 X 8.00	
CEMENT DECKS PRECAST	3240	SF	1.81	1.41		5851		29 FURNISHINGS								30 FURNISHINGS							3.00 X 4.00 X 8.00	
OTHER CRANF	95	1Y	21.40	.50		2014		31 FURNISHINGS								32 FURNISHINGS							3.00 X 4.00 X 8.00	
4 MASONRY	9600	5F	3.63	8.04		79678		32 FURNISHINGS								33 FURNISHINGS							3.00 X 4.00 X 8.00	
BLOCK	8000	1A	4.12	7.24		3777		33 FURNISHINGS								34 FURNISHINGS							3.00 X 4.00 X 8.00	
OTHER MORTON	31	CV	105.71	.80		43355		34 FURNISHINGS								35 FURNISHINGS							3.00 X 4.00 X 8.00	
5 METALS	9.7	TUN	4669.69	10.37				35 FURNISHINGS								36 FURNISHINGS							3.00 X 4.00 X 8.00	
STRUC STL	9.7	TUN	4669.69	10.37		43355		36 FURNISHINGS								37 FURNISHINGS							3.00 X 4.00 X 8.00	
JOISTS & DECK								37 FURNISHINGS								38 FURNISHINGS							3.00 X 4.00 X 8.00	
MISC								38 FURNISHINGS								39 FURNISHINGS							3.00 X 4.00 X 8.00	
ALUM								39 FURNISHINGS								40 FURNISHINGS							3.00 X 4.00 X 8.00	
PLTMS								40 FURNISHINGS								41 FURNISHINGS							3.00 X 4.00 X 8.00	
6 WOOD PLASTICS	260	BK	1.74	.08		348		41 FURNISHINGS							42 FURNISHINGS							3.00 X 4.00 X 8.00		
CARPENTRY	260	BK	1.74	.08		348		42 FURNISHINGS							43 FURNISHINGS							3.00 X 4.00 X 8.00		
7 MOISTURE PROTECT	61	SO	853.29	8.53		33074		43 FURNISHINGS							44 FURNISHINGS							3.00 X 4.00 X 8.00		
WATERPROFNG	7880	SE	.92	1.28		2216		44 FURNISHINGS							45 FURNISHINGS							3.00 X 4.00 X 8.00		
INSULATION	7900	SE	1.00	1.92		7852		45 FURNISHINGS							46 FURNISHINGS							3.00 X 4.00 X 8.00		
ROOFING	50	SO	423.17	4.23		17354		46 FURNISHINGS							47 FURNISHINGS							3.00 X 4.00 X 8.00		
SIDING								47 FURNISHINGS							48 FURNISHINGS								3.00 X 4.00 X 8.00	
DECK								48 FURNISHINGS							49 FURNISHINGS								3.00 X 4.00 X 8.00	
8 W/ F/L AL	568	1E	4.67	.65		2632		49 FURNISHINGS							50 FURNISHINGS								3.00 X 4.00 X 8.00	
9 DOORS & GLASS	388	SE	53.51	4.07		3488		50 FURNISHINGS							51 FURNISHINGS								3.00 X 4.00 X 8.00	
DOORS	84	SE	56.26	.95		12820		51 FURNISHINGS							52 FURNISHINGS								3.00 X 4.00 X 8.00	
SPECIAL DOORS	300	SE	42.33	3.13				52 FURNISHINGS							53 FURNISHINGS								3.00 X 4.00 X 8.00	
GLASS & LAMIN								53 FURNISHINGS							54 FURNISHINGS								3.00 X 4.00 X 8.00	
FINISH HARDWARE								54 FURNISHINGS							55 FURNISHINGS								3.00 X 4.00 X 8.00	
OTHER								55 FURNISHINGS							56 FURNISHINGS								3.00 X 4.00 X 8.00	

CONSTRUCTION BID DATA: 10-00-123-5
TOTAL BLDG SF: 4100
ARCH-STRUC: 24.34 / 819 \$ 304,780
INTERIOR MECH: 25.84 / 819 \$ 105,952
INTERIOR ELEC: 24.86 / 819 \$ 101,923
TOTAL INTERIOR: 123.09 / 819 \$ 504,623
TOTAL EXTERIOR: 154.23 / 819 \$ 632,422
TOTAL CONSTR: 277.32 / 819 \$ 1,137,045
ADDITIONAL: 8 \$ 2.43 / 819 \$ 9888
TOTAL PROJECT EST: 307.26 / 819 \$ 1,261,824
BID DATE: 8/1/85
AWARDED TO: DAD CONST
CONSTRUCTION TIME SPAN: 180
NO OF BIDDERS: 7
PERCENT DIFFERENCE AWARDED BID AND GOVT EST: 12

PROJECT TOTALS: 1,154,865

REVISIONS: 9/85

Figure G-1. System Summary of Government Estimate for Buildings

LABOR AND MATERIAL COST SUMMARY FOR BUILDINGS									
DRAWING NO		SHEET		PROJECT		LOCATION		DATE	
79K6/397		80 SHEETS		7/406		KSC, 11-19 VAB AREA		ESTIMATION	
WORK ORDER CONTRACT		ARCHITECT ENGINEER		CLIENT		CONTRACT		PROJECT TOTALS	
PRC 6005 NAS10-10196-5		J B SMITH INC (ASF)		PLANNING RESEARCH (KSC)		VARHILL, PRC 2421		MATERIAL, PRC 2421	
SUMMITRY BY J.A. 1985		C-95 & 100		C-95 & 100		C-95 & 100		C-95 & 100	
LINE ITEM	LABOR	MATERIAL	ARCHITECTURAL	STRUCTURAL	MFCHEMICAL	ELECTRICAL	SPECIALIZED CONSTRUCTION	OTHER	PROJECT TOTALS
SITE WORK	29161	44651							73812
ARCHITECTURAL/STRUCTURAL			98173	110078					208251
INTERIOR MECHANICAL					15146				15146
A/C					1689				1689
PLUMBING					1697				1697
COMM. AIR					1661				1661
OTHER VENT									
INTERIOR ELECTRICAL						16794			16794
POWER & LIGHT						5097			5097
GROUNDING									
EXTERIOR UTILITIES									
MECHANICAL									
ELECTRICAL									
POWER & LIGHT									
WTR & COMM									
SPECIALIZED CONSTRUCTION									
STRUCTURAL									
MECHANICAL									
ELECTRICAL									
OTHER									
SUBTOTAL LABOR	29161		98173	110078	22193	19891	3955	83619	256872
SUBTOTAL MATERIAL		49651		110078	65378	45388	1992	249910	497398
SALES TAX	5	2483		5500	2769	2693	100	12266	24871
P.T.B.I.	7285		26593		548	4973	989	20854	66247
SUBTOTAL	36426	52134	122966		27741	24864	47637	104274	257156
TOTAL	88560		218548		75388	22421	2036	363430	843681
CONTR. OVERHEAD	13286		35782		11708	10878	1055	54215	126522
SUBTOTAL	101844		274330		86696	81399	8091	415645	970005
CONTR. PROFIT	10184		27433		8670	8150	809	41565	97001
SUBTOTAL	112028		301763		95366	91749	8090	457210	1067006
PRIME MARKUP	11207		30176		9537	9174	800	45721	1067006
SUBTOTAL	123230		331939		104903	100911	9729	502931	1173708
RIPRO	12323		33194		10490	10100	98	50293	1173708
TOTAL	124667		302780		105957	101711	9688	507460	1173708

PN FORM 21-369 (9/76) SUPPLEMENT 9/85

Figure 6-2. Labor and Material Cost Summary

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COMPARISON OF BUDGETED AND ESTIMATED COSTS

ORDNANCE BUILDING

79K67329

BUDGETED COSTS	MAR 84		NOV 84		FEB 85		MAY 85		AUG 85		REMARKS	
	COF	PR	COF	PR	COF	PR	COF	PR	COF	PR		
885,000	+18	106,000	+13	117,500	+1	119,650	+1	124,500	0	1,124,662	-1	BREAKDOWN AT PRE-AWARD MARK CONF 8/15/85
237,000	+10	(B) 260,000	+4	270,500	+4	287,800	+6	304,780	0	304,780	-7	
56,000	+41	79,000	+20	95,000	+7	107,000	+6	105,950	0	105,952	+4	
94,500	+1	95,000	+8	101,000	0	101,500	0	101,923	0	101,923	-2	
500,000	+1	501,000	+0	506,000	0	505,200	0	507,961	1	507,961	-2	
9,000	0	9,000	+6	9,500	+7	9,700	+7	9,884	0	9,888	+1	
35,000	+16	60,000	+100	1,097,500	+1	1,125,300	+1	1,154,963	0	1,154,963	-1	
1,018,200	+7	1,080,000	+1	1,097,500	+1	1,125,300	+1	1,154,963	0	1,154,963	-1	
355,300	-19	(26) 283,400	-23	(20) 219,500	-1	(17) 191,000	-5	(16) 181,400	11	91,031	+7	
1,393,500	0	1,373,400	-4	1,317,000	0	1,316,600	0	1,316,600	0	1,261,824	-1	REF. OPTION 1 AT 2-100
139,400	0	140,360	-4	131,700	0	131,660	0	131,666	-2	*(128,969	-3	
153,300	0	153,900	-6	144,870	0	144,826	0	144,833	-2	*(141,866)	-3	
1,686,200	-1	1,667,660	-5	1,593,570	0	1,593,086	0	1,593,158	-4	*(1,532,659	-1	AC-100 FOR COMPARISON PURCHASED SEPARATELY
150,000	0	150,000	0	150,000	0	150,000	0	150,000	0	150,000	0	SUPPLY CONT 5/7/85 65,000
1,836,200	-1	1,817,660	0	1,811,570	0	1,812,086	0	1,816,158	-3	1,736,659	-2	
PROJECT TOTAL											1,729,339	
PER DIFFERENCE BUDGETED ESTIMATED TOTALS											-4	

Figure 4-3, Comparison of Budgeted and Estimated Costs

APPENDIX H
GLOSSARY OF TERMS

APPENDIX H

A glossary is provided below to define terms commonly used in construction and construction cost management.

GLOSSARY OF GENERAL TERMS

ALLOWANCE - an item of cost or monetary significance, which has the following characteristics:

- a. Reasonableness
- b. May be of the "unit price" or "lump sum" variety
- c. Should be inclusive of all overhead, profit, and general conditions

CHECKER - responsible for checking math extensions totals. Check that all subtotals are brought to summary with page number noted on both sheets. See that summaries are complete and insure accuracy of transferred totals.

COST - any or all expenditures, including such items as hidden costs, profit, taxes, and interest associated with a construction project

COST ACCOUNTING - the historical reporting of disbursements and costs and expenditures on a project. When used in conjunction with CCE estimates, cost accounting can assist in giving the precise status of the project, to date.

COST ANALYSIS - a method using historical and planned project data to ascertain the most likely costs of future and on-going projects. Cost analysis may also be applied to escalation, as well as cost differentials between various localities, types of buildings, types of estimates, types of projects, and time of year.

COST ENGINEERING - the application of scientific principles and techniques to problems of cost estimation, cost control, and profitability dealing with the control, management, and manipulation of costs pertaining to a single project or a series of projects. The cost engineering discipline is involved in life cycle costing, conceptual cost estimating, cost escalation, cost index, bid strategy, analysis of cost data, cost analysis, cost prediction, cost control, and management of costs applicable to a project.

COST ESTIMATOR - responsible for take off of drawing specs and IFB. Apply established unit prices and labor rates to apply to basic construction/fabrication and installation costs. Apply appropriate overhead, profit, and burden rates. Apply special condition. Obtain quotes on major items. Review for completeness of drawing. Evaluate and comment on cost-saving construction; review bid documents for cost effectiveness.

CONTINGENCY - the allocation of a certain percentage or sum of money to compensate for unknown costs which may arise in the future. Contingencies are allocated on the basis of probability and past experience to assure that the total budgeted or bid sum is not exceeded by actual costs. Contingencies appear most frequently as:

- a. Design Contingency - an allocation for unknown design features and details. It is higher at the initial schematic design phases of a project and decreases as more finite planning details become known and working drawings are developed.
- b. Estimating Contingency - an allocation utilized by the cost engineer or estimator to compensate for uncertain, unknown, or fluctuating cost situations in order that actual costs will not exceed estimated costs.
- c. Construction or Field Contingency - an allocation established to compensate for unbid subcontractable items and unknown and unforeseeable field conditions.
- d. Change Order Contingency - an allocation for design refinements and the correction of design errors for which the contractors are entitled to additional and reasonable compensation.

CURRENT COST ESTIMATE (CCE) - The CCE is that cost that reflects the latest and best total project estimated cost available based on design or construction progress and constitutes the most realistic estimate of ultimate final project costs. It includes: the engineering cost to build the project in today's dollars plus contingencies; escalation to the mid-point of construction; and supervision, inspection, and engineering services. The CCE is also known as CWE current working EST by other government agencies.

ECBC C-95 - estimated construction bid cost based on completed design package. It is the final estimate before bid package has been released to potential bidders. The C-90 review changes have been incorporated at this level. Barring addenda/amendments, these drawings and specifications will be the same as those sent to prospective bidders.

This package should include all quotes from vendors, element summary, labor and material summary, system summary, general condition sheet, cover sheet, and list of government furnished equipment, including approximate cost of the material and cost of handling the equipment. All sheets must be stamped: For Official Use Only.

BID COST EST-C-100 - Estimated bid cost for complete bid package. It is the official government estimate and is based on the same package that was supplied to all prospective bidders. The C-100 may have special conditions added to total during bidding period. These special conditions calculations shall be included in C-100. They may be used by A&E and/or government.

The estimate should be treated as a bid for the government. It must include all the information supplied in the C-95 estimate and update, if necessary, and add special conditions determined by the IFB. Estimate should also include any amendment and a signed bid form found in the IFB. All sheets of the estimate must be stamped: For Official Use Only.

ENGINEERING COST - is the total estimated cost of labor, materials, equipment, and contractor's markup in today's dollars. This cost is used to develop the CCE. The engineering cost does not contain government contingencies, S&A, escalation, or design costs.

ESCALATION - an increase in costs of interest, labor, materials, or other factors which add to the total direct cost of a project, measured over time.

FIVE-FOOT LINE - an imaginary line outside of and conforming to the exterior wall of building. The 5-foot line is the traditional separation between interior (building) and exterior work.

FRINGE BENEFITS - the added costs normally associated with labor. Fringe benefits include profit sharing, health, welfare, pension, apprentice training, educational programs, union dues, vacation, holiday insurance premiums, and other similar items which are fringe to direct payroll costs.

GENERAL OVERHEAD - the fixed cost of operating a business. It includes office, plant, equipment, staffing, and expenses thereof maintained by a contractor for his general business operation.

JOB OVERHEAD - the expense of items such as trailer, toilets, telephone, superintendent, transportation, temporary heat, testing, power, water, clean-up. It may include the costs for bond and insurance associated with the particular project.

LIFE CYCLE COSTS (OR TOTAL COSTS) - includes all costs from inception through obsolescence of a part, subsystem, system, or an entire building project. This cost includes all construction and operational costs.

MARKUP - includes such percentage applications as general overhead, profit, and other indirect costs. When markup is applied to the bottom of a bid sheet for a particular item, system, or other construction price, any or all of the above items (or more) may be included, dependent on local practice.

MILESTONE - a particular event in a schedule sequence which has increased significance above and beyond the more common schedule activity or event. For example, building close-in or top-out would be a milestone event.

NASA/KSC LEAD COST ENGINEER - provides the management overview of KSC cost estimates with responsibility for standards and guidelines to be used by A/E firms, A/E support contractor, and in-house personnel for preparation of government cost estimates. Coordinates and reviews A/E, support contractor, and in-house cost estimates to assure accuracy of cost and conformity to established guidelines and standards.

NASA/KSC LEAD DESIGN ENGINEER - provides the project technical lead with responsibility for the work (preliminary engineering, design concepts, design, change to design, design analysis, cost estimating, and resolution of design problems) on his project within a framework of established project scope, milestone schedules, and cost controls. He is the single point of contact for systems engineers, cost engineers, cost estimators, and other personnel supporting his project.

NEGOTIATIONS - discussions between owner and/or contractor or vendor held to ascertain that all items of work are included and that a proper and reasonable price has been agreed upon by both parties.

OPERATIONAL COST - all fuel, lubricants, and normally scheduled parts changes necessary to keep a subsystem, system, particular item, or entire project functioning. Operational costs also include general building maintenance, energy, cleaning services, taxes, and similar items.

OWNER - the individual or company who pays the bills and for whose benefit the project is being constructed.

PRODUCTIVITY - the rate at which a given crew or mechanic accomplishes final in-place installation of an item or system within a project. Productivity must be assessed on an item-by-item basis to properly schedule project work.

PROFIT - the bottom line or anticipated reward for accomplishing work. Profit has three parts:

- a. Anticipated Profit - the profit projected from the beginning to the end of the project at time of bid
- b. Gross Profit - the total before-tax (and possibly before general overhead expense) profit associated with a particular project or company
- c. Net Profit - the after-tax, after disbursement bottom line figure of a particular company or individual or project

PROJECT SUMMARY - is a line item summary of construction bid costs by site-work; building/structures; architectural, mechanical, and electrical work; exterior utilities; and specialized construction. It also shows the current cost estimate with markups for escalation, contingencies, and S&A.

REVIEWER - responsible for complete estimates in regards to format and accuracy per KSC Specifications Management Overview for Cost Effective Design and Construction.

QUALITY SURVEY - the technique of listing all items and salient features of the work and the quantities thereof necessary to build a particular project. Quantity survey may be done with productivity in mind, but does not include pricing.

SCHEDULING - the method whereby sequence of events of administration, design, procurement, and erection of a facility or structure are organized in a logical manner to assure that all elements of the project are accomplished within the specified completion date. Scheduling may be by bar chart, or critical path method (CPM).

SITE DEVELOPMENT - all work associated with utilities, construction, excavation, clearing, grading, parking, and landscaping outside of the 5-foot line.

VALUE ENGINEERING - the systematic application of recognized techniques which identify the function(s) of a product or service, establish the worth of that function, and reliably provide the necessary function at the lowest overall cost (value engineering, value analysis, and other similar terms are considered to be synonymous).

WAGE RATE - the hourly, daily, or weekly cost, including statutory overburden (taxes) of a person who works for wages, such as mechanics, laborers, and steamfitters.