UFC 3-740-05
8 November 2010
Change 1, June 2011

UNIFIED FACILITIES CRITERIA (UFC)

HANDBOOK:
CONSTRUCTION COST ESTIMATING

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

UNIFIED FACILITIES CRITERIA (UFC)

HANDBOOK: CONSTRUCTION COST ESTIMATING

U.S. ARMY CORPS OF ENGINEERS (Preparing Activity)
NAVAL \1\FACILITIES ENGINEERING/1/ COMMAND
U.S. AIR FORCE CIVIL ENGINEER CENTER

Record of Changes (changes are indicated by \1\ ... /1/)

Change No.	Date	Location
1	June 2011	Above, 1, 11, 85

This UFC supersedes UFC 3-700-02A, dated 01 March 2005.

FOREWORD

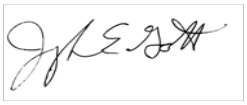
The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD(AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the more stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Center for Engineering and the Environment (AFCEE) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale should be sent to the respective service proponent office by the following electronic form: Criteria Change Request (CCR). The form is also accessible from the Internet sites listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

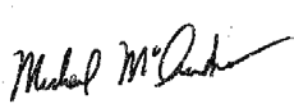
- Whole Building Design Guide web site http://dod.wbdg.org/.

Hard copies of UFC printed from electronic media should be checked against the current electronic version prior to use to ensure that they are current.



JAMES C. DALTON, P.E.
Chief, Engineering and Construction
U.S. Army Corps of Engineers

JOSEPH E. GOTT, P.E.
Chief Engineer
Naval Facilities Engineering Command



TERRY G. EDWARDS, P.E.
Director, Air Force Center for Engineering and the Environment
Department of the Air Force

MICHAEL McANDREW
Director, Facility Investment and Management
Office of the Deputy Under Secretary of Defense (Installations and Environment)

UNIFIED FACILITIES CRITERIA (UFC)
REVISION SUMMARY SHEET

Document: UFC 3-740-05
Superseding: UFC 3-700-02A, dated 1 Mar 05

Description of Changes:

This document is a complete update to UFC 3-700-02A, establishing uniform guidance to describe methods, procedures, and formats for the preparation of construction cost estimates and construction contract modification estimates. It addresses all phases of construction cost estimating from planning phases through modification estimates during construction. The term construction includes remedial action environmental projects, dredging and other construction type work often implemented as service contracts.

Reasons for Changes:

This UFC will provide guidance on the correct way for DOD personnel to prepare a project cost estimate.

Impact:

There are negligible cost impacts.

Non-Unification Issues: Due to differences in Services management structure and operational processes, not all criteria within this UFC are unified.

Independent Review of Construction Cost Estimate - The independent review processes vary among the Services due to differing organizational structures and operational processes, which are delineated in separate Service-specific directives.

The independent reviews of Army DD Form 1391 programming documents are performed by a specialized team of cost engineers residing in Huntsville District. The review is performed under the direction of HQUSACE and in coordination with the HQACSIM. For the Navy, independent reviews are performed by the Region/FEC and the Consistency Review Board at NAVFACHQ.

Format, Presentation of Government Estimate, and Productivity Adjustment Factors - The preliminary and intermediate steps in the preparation of the estimates vary among the Services, however, the final estimate product is essentially the same.

1) The design execution processes by which the Services produce cost estimates are also different. The Army manages this process by means of using design

codes, which are issued by HQDA (DAIM-FD). There are twelve distinct design codes. The USACE in turn issues these codes to their divisions and districts through the directive network (DIRNET) system within the Programming Administration and Execution System (PAX) processor (AR-420-1). The Navy manages this process by means of the MILCON Team Planning Programming Process. There are no design code directives as with the Army. The Navy process is an ongoing reiterative process from the initial planning by Installation/PWD to the Program Final DD Form 1391 to NAVFACHQ.

2) The Military Services utilizes the DoD Facilities Pricing Guide (UFC 3-701-01 for the current year) for preparation of the DD Form 1391 MILCON project estimates. However, the Army also produces a supplemental document (PAX Newsletter 3.2.2, Unit Costs for The Army Facilities – Military Construction Program) to provide additional unit cost guidance for non-standard facilities, which are not covered by UFC 3-701-01 for the current year. The Navy does not produce a supplemental unit cost guidance document for non-standard facilities, but can refer to the Army PAX Newsletter 3.2.2.

Other Project Costs such as Supervision, Inspection, and Overhead (SIOH) - The Services set different SIOH percentage rates. SIOH is a cost allotment for the agencies field construction management of the construction projects.

CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1-1 PURPOSE

This document establishes uniform guidance to describe methods, procedures, and formats for the preparation of construction cost estimates and construction contract modification estimates. This guidance represents where services have common requirements, however, for instances where there are differences, use the cognizant design agencies policies and procedures.

1-2 APPLICABILITY

This UFC applies to all military construction projects.

1-3 REFERENCES

References cited in this manual are listed in appendix B.

1-4 SCOPE

This document addresses all phases of construction cost estimating from the initial start of design through modification estimates during construction. \1\UFC 3-730-01/1/ PROGRAMMING COST ESTIMATES FOR MILITARY CONSTRUCTION provides guidance for cost estimating during the initial planning, programming, and budget review phases. The term construction includes remedial action environmental projects, dredging and other construction type work often implemented as service contracts. For the purposes of this document, the term cost engineer applies to all individuals, whether employed by the Government or under contract to the Government, who are engaged in the preparation or review of government cost estimates.

1-4.1 Arrangement

The information in this document is arranged by chapters. Contents in each chapter contain information and instructions common to all programs. Appendix C contains examples of estimate pages. Appendix D contains the work breakdown structure for military programs. Appendix E contains a checklist for cost estimate preparation. Appendix F contains an overview of automation systems used for developing cost estimates.

1-4.2 Agency Specific Requirements

Agency program specific cost engineering policy, guidance, and procedures for the preparation of cost estimates for military projects are provided in the cognizant design agency policies and procedures.

1-4.3 Military Programs

For Army projects, the appropriate guidance is provided in ER 1110-3-1300. Further guidance is provided in Army Regulation (AR) 420-1. For Air Force projects, the appropriate guidance is per the cognizant design agency procedures. For Navy projects, the appropriate guidance is provided in http://www.uscost.net/costengineering/about.htm.

CHAPTER 2

BACKGROUND AND OBJECTIVES

2-1 ESTIMATING PHILOSOPHY

Government cost estimates should be prepared as though the Government were a prudent and well-equipped contractor estimating the project. Therefore, all costs, which a prudent, experienced contractor would expect to incur, should be included in the cost estimate. This philosophy prevails throughout the entire project cycle -- from programming through completion of construction. Each estimate should be developed as accurately as possible, in as much detail as can be assumed, and be based upon the best information available. This objective is to be maintained so that, at all stages of the project programming, design, and during construction, the cost estimate will in all aspects represent the "fair and reasonable" cost to the Government. Refer to cognizant design agency directive requirements for cost engineers to the use of automation tools. The complete Tri-Service Automated Cost Engineering System (TRACES) automation tools are discussed in appendix F.

2-2 RESPONSIBILITY FOR PREPARATION AND REVIEW

2-2.1 Preparation

Preparation and review of construction cost estimates through contract project completion is the responsibility of the Cost Engineering Office or as designated by the cognizant design agency. In concert with this responsibility, the cost engineer must be accountable for the completeness, quality, accuracy and the reasonableness of the cost estimate.

When it is necessary to contract services for the preparation of quantities and/or cost estimates, such services will be provided by competent firms experienced in cost engineering. In all cases, the procedures and requirements of this manual will apply. Other specific needs, submittals, and requirements should also be provided to insure a complete understanding of the cost engineering requirements. These supplementary requirements should be included as part of a comprehensive contract scope of work. Architect-Engineer (A-E) contracts should provide that each final estimate submitted to the Government be accompanied by a letter of transmittal that includes the following statement: “To the best of my knowledge the confidential nature of this estimate has been maintained.” This statement should be signed, dated, and maintained until the official markings have been removed.

2-2.2 Review

All construction cost estimates, whether prepared in-house or by contract, will be given an independent review by government cost engineers as prescribed by the cognizant

agency review procedures. The estimate should be reviewed for the purpose of confirming the validity of the assumptions and the logic used in estimating the cost of construction tasks. The review should always include a check of the quantities, unit prices, and arithmetic. It is important that the reviewer develops and uses a uniform checklist procedure in the review process to better assure that important considerations have not been overlooked (see sample checklist in appendix E).

2-3 ESTIMATE FORMAT STRUCTURE

It is important that the format of all estimates be as consistent as possible. Two formats have been established for this purpose, Work Breakdown Structure (WBS) and Uniformat II (ASTM Standard E1557-97). They are a hierarchical presentation of the scope of work. They provide a common, ordered hierarchy framework for summarizing information and for quantitative reporting to customers and management. The purpose of the formats are to: (1) provide an organized manner of collecting project cost data in a standard format for cost reporting and cost tracking; (2) provide a checklist for categorizing costs; and (3) provide a basis to maintain historical cost data in a standard format. The appropriate format is to be used in accordance with the cognizant design agency requirement.

A unique WBS has been developed for military programs and the WBS is provided in hard copy or electronically within Microcomputer Aided Cost Engineering System (MCACES/MII) for Army projects, SUCCESS© for Navy projects, and PACES for Air Force projects.

Uniformat II was established for military construction design-build projects using the Whole Building Design Guide, located at http://www.wbdg.org/references/pa_dod.php. Uniformat II is provided electronically within SUCCESS© for Navy projects.

2-4 COST ESTIMATING METHODOLOGY

The Association for the Advancement of Cost Engineering (AACE) International publishes cost engineering community recommended practices. AACE publishes matrixes of acceptable levels of cost accuracy for various stages of project definition. The matrixes show both positive and negative values. For a given project scope and project definition, this range represents the amount of uncertainty that the prepared estimate can be either higher or lower than determined in the market place at the time of contract award. This does not mean that any given estimate is too high and can be reduced. Rather it represents an acceptable variability in cost estimating given various levels of design information, assumptions on the contractor's means and methods to execute the project, and other assumptions about bid competition and market conditions.

There are four general methods used to estimate construction costs, described below in order from least- to most-accurate. Increased accuracy provides a greater level of confidence in the estimate but requires more information about specific project requirements and local conditions. Use the most accurate method for the amount of information known when preparing the estimate.

2-4.1 Project Comparison Estimating

Project Comparison Estimating is used in early planning stages when little information is known about the project other than overall project parameters. Project comparison estimating uses historical information on total costs from past projects of similar building types. For example, the number of beds in a hospital, or number of spaces in a parking garage, or number personnel in an administration building can form the basis of a project comparison estimate by comparing them to recent projects of similar scope in the same geographic region. Supporting facilities are estimated as a percentage of total facilities cost. This method is considered "preliminary" and is accurate only from -25% to +40% notwithstanding abnormal market conditions (i.e. natural disasters, market volatility, etc).

2-4.2 Square Foot/Square Meter Estimating

Square Foot/Square Meter Estimating is another method of developing both preliminary and intermediate budgets based on historical data. This method is effective in preparing fairly accurate estimates if the design is developed enough to allow measurement and calculation of floor areas and volumes of the proposed spaces. There are several historical databases such as UFC 3-701-01 for the current year, RSMeans, Tri-Service Parametric adjusted models (PACES) available to support this method of estimating providing unit costs ($/SF). More accurate estimates made with this method make adjustments and additions for regional cost indices, escalation rates, and size adjustment cost tables. Further adjustments may be made to account for other unique aspects of the design such as special site conditions or design features being planned. In addition, the estimate can develop overall "core and shell" costs along with build-out costs of different space types, allowing for relative ease of determining the impact of changes to the program. Estimates made with this method can be expected to be accurate between -15% to +25% notwithstanding abnormal market conditions (i.e. natural disasters, market volatility, etc).

The Unit Cost table (Table 2A, UFC 3-701-01 for the current year) supports a Square Foot /Square Meter Estimating method, and is generally applicable during the planning phase of a project. The unit costs in the table are national average historical costs with a known standard deviation for each facility type. When additional information allows a more detailed estimate using the Parametric or Quantity-Take-Off methods, the unit costs in Table 2A should not govern the estimate

2-4.3 Parametric Cost Estimating

Parametric Cost Estimating is an intermediate-level estimate performed when design drawings are typically between 10% and 35% complete. Parametric costs are based on assemblies or systems grouping the work of several trades, disciplines and/or work items into a single unit for estimating purposes. For example, a foundation usually requires excavation, formwork, reinforcing, concrete, including placement, finish and backfill. A parametric cost estimate prices all of these elements together by applying engineered values developed in assemblies cost data databases. These databases are based on historical data, typically organized in Uniformat II™. Estimates made with this method can be expected to be accurate between -10% to +15% notwithstanding

abnormal market conditions (i.e. natural disasters, market volatility, etc).

2-4.4 Quantity Take Off (QTO) Estimating

In Quantity Take Off (QTO) Estimating, the work is divided into the smallest possible work increments, and a "unit price" is established for each piece. These work increments are typically organized by MasterFormat™. The unit price is then multiplied by the required quantity to find the cost for the increment of work. All costs are summed to obtain the total estimated cost. For example, the cost to erect a masonry wall can be accurately determined by finding the number of bricks required and estimating all costs related to delivering, storing, staging, cutting, installing, and cleaning the brick along with related units of accessories such as reinforcing ties, weep-holes, flashings, and the like. Accuracy is more likely to be affected by supply and demand forces in the current market. A QTO can be based on a site adapt design cost estimate or using a 35% or more design. This method provides the most accurate estimate, which is typically between -7.5% to +10% of construction costs notwithstanding abnormal market conditions (i.e. natural disasters, market volatility, etc).

2-5 DEGREE OF DETAIL

2-5.1 Construction Tasks

All cost estimates within the scope of this manual will be prepared on the basis of calculated quantities and unit prices that are commensurate with the degree of detail of the design known or assumed. This is accomplished by separating construction into its incremental parts. These parts are commonly referred to as construction tasks and are the line-by-line listings of every estimate. Each task is then defined and priced as accurately as possible. Tasks are seldom spelled out in the contract documents, but are necessary for evaluating the requirements and developing their cost.

2-5.2 Analyzing Construction Tasks

When analyzing construction tasks in an estimate, the cost engineer should identify the tasks that account for the major costs in the estimate. These tasks can be identified by applying the 80/20 rule, which states that approximately 80% of the project cost is contained in 20% of the tasks. Because these significant tasks account for most of the project cost, they should receive prime emphasis and effort in both preparation and review.

2-5.3 At the Most Detailed Level

At the most detailed level; each task is usually related to and performed by a crew. The cost engineer develops or selects the task description by defining the type of effort or item to be constructed. Task descriptions should be as complete and accurate as possible to lend credibility to the estimate and aid in later review and analysis. An example of a manually prepared construction cost estimate is provided in Chapter 16, Figure 16-1 thru Figure 16-13. Whenever a significant amount of design assumptions are necessary such as in design-build process, the cost engineer should use historical cost data from previous similarly designed projects and/or use parametric estimating models.

2-6 ACCURACY AND COMPLETENESS

Accuracy and completeness are critical factors in all cost estimates. An accurate and complete estimate establishes accountability with the cost engineer and enables management to place greater confidence in the cost estimate.

2-7 ROUNDING FIGURES

2-7.1 Total Distributed Cost (Markup)

For cost estimates prepared manually, rounding of costs is desirable to avoid the use of decimals when allocating the total distributed cost (markup) to the direct subtotal costs for each work item.

2-7.2 Preliminary or Alternative Cost Estimates

Cost estimates prepared manually to determine preliminary or alternative cost estimates when design details are limited may be rounded based on the experience of the cost engineer, whereby the end cost is not significantly affected.

2-7.3 Total Cost of the Project

Rounding the total cost of military construction projects to the nearest thousand dollars for design estimates and Independent Government Estimates (IGE) is acceptable for reporting purposes.

2-8 SAFEGUARDING COST ESTIMATES

Although not required by regulations, estimates based on less than completed design should be handled in a discretionary manner. Access to each estimate and its contents will be limited to those persons whose duties require knowledge of the estimate. Estimates prepared by A-E's will also be similarly handled. Any request by the public for information and pricing in the estimate will not be provided until coordination, verification of data, and approvals have been given by the commander or designated authority.

2-9 SECURITY AND DISCLOSURE OF GOVERNMENT ESTIMATE

2-9.1 Contents of the Government Estimate

The Government estimate normally consists of a title page, signature page, and price schedule. Supporting documents that are publicly available as parts of the solicitation (such as plans, specifications, and project descriptions) are not part of the Government estimate. Government estimates for contract awards and contract modifications are treated the same.

2-9.2 Access to the Government Estimate

Access to the estimate and its contents will be limited to personnel whose duties require they have knowledge of the subject. When an A-E is responsible for preparing any such estimate, the A-E submittal should include a list of individual's names that have had access to the total amount of the estimate. Government personnel also should sign the

same or a similar list. A list similar to Figure C-1, in appendix C should be filed with the Government estimate.

2-9.3 Marking the Government Estimate

The Government estimate will be marked in accordance with AR 25-55 or cognizant design agency requirement. The Government estimate will ensure that the protective marking "For Official Use Only" (FOUO) is properly applied to all pertinent documents, computer files, compact discs (CDs), printouts, and other documents prepared manually or electronically for incorporation into the Government estimate.

2-9.4 Disclosure Outside of the Government

After contract award, ordinarily, only the title page, signature page, and price schedule are disclosed outside the Government. The Government estimate back-up data should not be released since it contains sensitive cost data (e.g., contractor quotes, crews and productivity) that are proprietary or might compromise cost estimates for future similar procurement.

2-9.5 Bid Protests and Litigation

During bid protests and litigation, if appropriate and to the extent possible, Counsel should have the Government estimate and/or the Government estimate back-up data placed under a “protective order.” There are valid reasons for not releasing the Government back-up data supporting the Government estimate to the contractors. In the case of a bid protest, there is a possibility that the contract could be re-advertised or converted to a negotiated procurement. Release of the Government back-up data would provide bidders with the detailed cost data that supports the Government estimate. If, however, the apparent low bidder protests the details of the Government estimate, the Command may provide the Government estimate and Government back-up data, to the protestor only, upon receipt of complete details of the protestor’s estimate. If the protest is not sustained and the proposal is re-advertised, all bidders are entitled to have the same information as the protestor.

2-10 RELEASE OF GOVERNMENT ESTIMATES UNDER THE FREEDOM OF INFORMATION ACT (FOIA)

The Government estimate and Government estimate back-up data, prepared for construction contracts and modifications, are sensitive procurement information and should in many cases be withheld under the FOIA.

2-10.1 Definitions

- The Government estimate consists of a title page, signature page, and price schedule.

- The Government estimate back-up data is the detailed cost data, which includes production and crew development methodology, labor, equipment and crew back-up files, subcontractor quotes and all other data identified on agency approved estimating software as detail sheets.

- Fair market price determinations, under the Small Business Program, Federal Acquisition Regulations (FAR) 19.202.6, will be treated as Government estimates for purposes of this guidance.

- Supporting documents that are publicly available as part of the solicitation, such as plans, specifications and project description, or that contains no cost information, such as sketches, soil borings and material classifications, are not part of the Government estimate or back-up.

2-10.2 Requests for Government Estimates and Back-Up Data

Government estimates and Government estimate back-up data are intra-agency memoranda, which may be withheld under FOIA Exemption 5, “confidential commercial information” and “deliberative process” privileges. Proper use of Exemption 5, however, requires a showing that release of information will harm the Government’s interests. Therefore, requests for Government estimates and back-up data will be reviewed on a case-by-case basis, based on the following guidance, to determine whether release will harm the interests of the Government. In reviewing requests, the FOIA Officer will seek the assistance of the cost engineer. If the FOIA Officer determines that release will harm the interests of the Government, the information will be withheld.

2-10.2.1 Sealed Bid Procurement

When sealed bidding is used, neither the Government estimate nor the Government estimate back-up data should be released prior to bid opening. See FAR 36-203(c), 36.204. It is well established that release of Government estimates and back-up data before contract award would harm the interests of the Government. FAR 36.203, Federal Open Market Committee v. Merrill, 443 U.S. 340 (1979), Morrison-Knudson v. Department of the Army, 595 F. Supp. 352 (D.D.C. 1984), aff’d 762 F.2d 138 (D.C. Cir 1985).

2-10.2.2 Post Bid

The Government estimate will normally be released when bids are opened. In some instances, however, the Government estimate will not be released at that time, such as when all bids received are non-responsive and a re-procurement is envisioned.

2-10.2.3 Negotiated Procurement

In negotiated procurement for construction under FAR Parts 15 and 36, the Government estimate should not be released prior to contract award, except that Government negotiators may disclose portions of the Government estimate in negotiating a fair and reasonable price, see FAR 36-203(c).

2-10.2.4 Back-Up Data

The Government estimate back-up data should not be released. Release of Government estimate back-up data after contract award and before completion of a construction contract may also result in harm to the Government. The Government estimate back-up data is used to develop cost estimates for modifications and claims. Release of the backup data prior to contract completion provides the contractor with the

details of the Government's position and would allow the contractor to develop a biased price proposal. This could harm the Government's ability to negotiate a fair and reasonable price for the modification or claim, putting the Government at a serious commercial disadvantage. Moreover, knowledge of the construction methods contemplated by the Government might reduce the contractor's incentive to discover less expensive methods. This could also reduce the contractor's incentive to locate and charge out materials at a lower cost, or to achieve project goals using less labor and equipment. See Quarles v. Department of the Navy, 983 F.2d 390, (D.C. Cir 1990). Taylor Woodrow International, Ltd. V. Department of the Navy, No. 88-429R, (W.D. Wash. Apr 6, 1989).

2-11 TEAM INVOLVEMENT

Cost engineers are an important member of the project delivery team. The cost engineer is expected to have a clear understanding of those responsibilities and areas where contributions can be made. It is imperative that the team concept be enhanced and supported by each member. As such, the cost engineer is encouraged to lead in cost issues and provide ideas for cost control and sharing measures.

2-12 LIFE CYCLE COST (LCC) STUDY SUPPORT

Quality management policy requires LCC studies to be performed to evaluate system alternatives. These analyses are the responsibility of the design team. The cost engineer may be called upon to support the analysis by providing cost input. As preparation to such responsibility, the cost engineer should be familiar with the LCC procedures.

2-13 WORK BREAKDOWN STRUCTURE

2-13.1 Military Programs.

The Military Work Breakdown Structure (MWBS) provides a common framework for preparing cost estimates, developing models, and collecting cost data for Department of Defense (DOD) military construction projects. It is to be used for categorizing facility costs and associated supporting facility costs for all conventional military construction projects. This MWBS is comprised of 15 primary facility systems and four supporting facility systems. Each system is divided into one or more subsystems, which are further divided into assemblies made up of construction line items. An example of MWBS levels numbering is as follows:

Level 1	Scope
Level 2	Facility (Building)
Level 3 (System)	02 – Superstructure
Level 4 (Subsystem)	01 – Floor Construction
Level 5 (Assembly Category)	03 – Floor Decks and Slabs

Level 6 (Assembly)	03 – Precast Concrete Slab
Level 7 (Detail Line Item)	03412 1105 Erection 03412 1901 100 mm Precast Slab

2-13.1.1 Measure

A unit of measure is associated with each level of the MWBS and should be followed in all estimates to facilitate the estimating review process. This will allow estimates to be compared to other similar project estimates.

2-13.1.2 Numbering Structure

The standard numbering structure and description manual is available and referred to as "Data Dictionary." The dictionary includes description of building functional components and associated supporting facilities. A sample MWBS to level 2 is provided in appendix D. The complete MWBS is provided at http://www.usace.army.mil/CaEI/Pages/Guidance.aspx and is also supplied with each copy of SUCCESS© for Navy projects.

2-14 MILITARY PROGRAM SPECIFIC REQUIREMENTS

In the Military Construction (MILCON) program, construction cost estimates are prepared throughout the planning, design, and construction phases of a construction project. These construction cost estimates may be categorized as follows: programming estimate, concept estimate, final estimate, and Government estimate.

2-14.1 Programming Estimate

In the planning phase, the cost estimate is called programming estimate and is prepared on a Department of Defense form, DD Form 1391. Develop this programming estimate based on preliminary project scope or mission requirements. Refer to \1\UFC 3-730-01/1/ for criteria and standards for development and preparation of programming cost estimates for constructing military facilities.

2-14.2 Design Estimate

Design estimates for Design-Bid-Build (DBB) projects may be categorized as 15%, 35%, or 65% stages of design. The estimates are refined more during these phases since the design criteria and project requirements have been further defined. The 15% design estimate may be prepared by a variety of methods, such as conducting a Design Charrette utilizing parametric estimating procedures, detailed quantities take-off, or a combination of detailed quantities take-off with parametric estimating procedures. There may be instances when a 35% and a 65% design estimate would be prepared, which would be a further refinement of the project cost at this phase to be as a guide in comparison to the programmed amount. Design estimates for Design-Build (DB) projects are based upon draft RFP performance and prescriptive specifications.

2-14.3 Pre-Final Estimate

The next stage of development is the pre-final estimate. DBB and DB projects are each developed differently due to these two project delivery methods.

2-14.3.1 Design Build

Pre-final estimates for DB projects are based upon the 100% RFP performance and prescriptive specifications stage.

2-14.3.2 Design Bid Build

Pre-final estimates for DBB projects are based on the 90% design phase. This estimate is the detailed bottoms-up cost estimate based on the final plans and specifications.

2-14.4 Independent Government Estimate

The last stage of development is the IGE. For DBB projects the IGE is based on the 100% design phase of the plans and specifications. For DB projects the estimate is based upon the final RFP performance and prescriptive specifications. The estimate that is provided to the Contracting Officer serves as the IGE.

CHAPTER 3

BASICS FOR PREPARATION OF ESTIMATES

3-1 GENERAL

This chapter establishes uniform guidance to be used prior to estimate preparation. In the normal sequence of events toward the preparation of any estimate, it is of utmost importance to understand basic fundamental principles and responsibilities. Construction cost estimates consist of:

- Descriptions of work elements to be accomplished (tasks).
- A quantity of work required for each task.
- A cost for each task quantity.

A unit cost for each task is developed to increase the accuracy of the estimating procedure and should provide a reference comparison to historic experience. Lump sum estimating when used at the task level must be fully documented to show the intent and extent of the item.

3-2 PLANNING THE WORK

The cost engineer must thoroughly understand the project scope of work, the biddability, constructibility, operability, environmental (BCOE) and aspects of the project being estimated. The cost engineer must also review drawings, specifications, and construction sequences and durations to determine total construction costs. A site visit is strongly recommended to enable the cost engineer to relate the physical characteristics of the project to the available design parameters and details. This is particularly important on projects with difficult site conditions, major maintenance and repair projects, and alteration/addition projects. The construction sequence must be developed as soon as possible and should be used to provide a checklist of construction requirements throughout the cost estimating process. The overall format of major cost elements in an estimate must be compatible with current standards, management needs, the anticipated bidding schedule, and the appropriate WBS.

3-3 QUANTITIES

The quantity “take-off” is an important part of the cost estimate. It must be as accurate as possible, and should be based on all available engineering and design data, and use of appropriate automation tools as available.

- After the scope has been analyzed and broken down into the construction tasks, each task must be quantified prior to pricing. Equal emphasis should be placed on both accurate quantity calculation and accurate pricing. Quantities should be shown in standard units of measure and

should be consistent with design units. Assistance for preparing “take-off's” may be provided by others within the organization in support of cost engineering or by A-E contracts; however, the responsibility for the accuracy of the quantities remains with the cost engineer.

- The detail to which the quantities are prepared for each task is dependent on the level of design detail. Quantity calculations beyond design details are often necessary to determine a reasonable price to complete the overall scope of work for the cost estimate. Project notes will be added at the appropriate level in the estimate to explain the basis for the quantity calculations, to clearly show contingencies, and to note quantities determined by cost engineering judgment that will be reconciled upon design refinement.

3-4 TYPES OF COSTS

Various types of cost elements must be evaluated in detail.

- Direct costs are those costs, which can be attributed to a single task of construction work. These costs are usually associated with a construction labor crew performing a task using specific equipment and materials for the task. Labor foreman cost should normally be considered as a direct cost. Subcontracted costs should be considered as direct costs to the prime contractor in estimates.

- Indirect costs are those costs, which cannot be attributed to a single task of construction work. These costs include overhead, profit, and bond. Indirect costs are also referred to as distributed costs.

- Estimates based on detailed design will be developed from separate direct cost pricing of labor, material, construction equipment, and supplies. Applicable indirect costs will be added to reflect the total construction cost. Other costs, including escalation, design contingencies, design-build design costs, building commissioning, sustainment, construction contingencies, construction supervision, inspections and overhead (SIOH), and Operation and Maintenance (O&M) Manuals, may be added to the construction costs to determine the total project cost as required by program specific requirements.

3-5 PRICE SOURCES

Various pricing sources should be obtained and be available to the cost engineer. In pricing from any source, experience and ability to relate data in hand to a specific circumstance is important. The following discussion is provided on commonly used sources and source development.

3-5.1 Cost Book

The Cost Book is the common name for the Tri-Services construction direct costs

database. It contains repetitive construction tasks with direct cost pricing (labor, equipment, material) based on a typical crew and production rate for new construction. Some Cost Book line items may include quotes for work that is fully provided and installed by subcontractor. All quotes for work fully priced by subcontractor shall be shown in the appropriate column. Each office is encouraged to use this pricing source and to refine the database by obtaining quotes to more accurately reflect local costs at the project site.

3-5.2 Historical Data

Historical costs from past similar work are excellent pricing sources when adequate details have been saved and adjustment to project specifics can be defined. Portions of other estimates having similar work can be retrieved and repriced to the current project rates. Automated historical databases are discussed in appendix F.

3-5.3 Parametric Database

A parametric database of predefined-assemblies for buildings and sitework has been developed and is discussed in appendix F.

3-5.4 Development of Specific Tasks

When standard tasks do not meet project needs, specific new tasks may need to be developed. Such development requires experience. Descriptions developed must adequately define the scope and material requirement for each task. Unit cost for each task is developed as a direct cost with separate costing for the labor, equipment, and material components. Notes, which explain key factors in the pricing and methodology, should accompany the task development. Comparison with existing pricing guides is recommended.

- Labor unit cost - This cost is based on a defined crew from the Cost Book or on a newly developed crew, which performs the tasks at an assigned production rate. Hourly rates for each craft are applied to the crew labor to arrive at the hourly crew labor cost. The total crew labor cost/hour is divided by the expected production rate (units/hour) to derive the labor cost/unit.

- Equipment unit cost - This cost is derived similar to labor unit cost. Hourly equipment rates are obtained from the appropriate regional manual, entitled, Construction Equipment Ownership and Operating Expense Schedule (herein referenced as, Equipment Ownership Schedule), Engineer Pamphlet (EP) 1110-1-8 or developed according to the methodology as described in this pamphlet.

- Material unit cost - This cost is developed using vendor quotes, historical costs, commercial pricing sources, or component calculations. The price should include delivery to the project site.

- Commercial unit cost books - These common sources are typically

available through subscription or purchase. Basis of costs shown are typically explained along with adjustment methodology. Such publications are valuable for verification and appropriate for commercial type work item pricing.

3-6 COSTS AND PRICING

The cost for each task should be developed by summing the direct cost elements for labor, equipment and materials. The indirect costs and other markups associated with each task or work item should be identified and are considered separately for the specific project.

3-6.1 Minor Direct Costs

The direct cost on construction tasks of minor overall cost significance and of a repetitive nature can normally be priced from any of those sources discussed above.

3-6.2 Historical Pricing

When using historical pricing, adjustments must be made for project location, work methodology, quantity of work, and other dissimilarities, which affect prices.

3-6.3 Lump Sum Items

Use of lump sum items is discouraged. If lump sum items are used in the estimate, they must have backup cost data relating to their tasks and source of the data.

3-6.4 Detailed Backup of Cost

As a general rule-of-thumb, it is highly recommended that when a task extended direct cost is $10,000 or more, or 5 percent or more of the total direct cost, whichever is less, a detailed backup for the cost should be prepared or vendor quotations obtained as pricing support to the cost estimate.

3-6.5 Predetermined Bid Items

Applying a similar rule-of-thumb, in some instances, unit price bid items for Government estimates may be based on suitable experienced bid prices or historical cost data, i.e., predetermined bid item does not exceed $100,000, or 5 percent or more of the estimated total cost, whichever is less. For cost estimates prepared during preliminary or planning phases, where design is limited or not available, predetermined unit prices adjusted to current pricing level may be used by the cost engineer. Use of experienced prices should consider any necessary adjustments in prime contractor's profit or distributed costs appropriate to the contract requirements. The cost engineer must use extreme care and sound judgment when using predetermined unit costs. The basis for the unit costs should be well documented and included in the supporting data of the estimate. Where a bid item consists mostly of equipment and labor costs, with very little materials and supplies, it is advisable to develop the cost as indicated above, even though the item may fall under this rule-of-thumb.

3-7 COST ESTIMATE FORMAT AND SUPPORTING DOCUMENTATION

All construction cost estimates are generally composed of contract costs and other allowable project costs authorized by directives or regulations. The overall format of the cost estimate should be in accordance with the appropriate WBS as described in Chapter 2. The cost engineer should always remain mindful of the documentation necessary to support the cost estimate submission requirements specified for each phase of project development. Support documentation such as project narrative, pricing schedule, plan of construction, backup data, and drawings and sketches are further discussed in Chapter 4.

3-8 MILITARY CONSTRUCTION PROGRAM SPECIFIC REQUIREMENTS

In addition to costs described in this chapter, the CWE for Military Construction projects should include all other costs authorized by directive to be charged to construction as funded cost. These costs include installation costs or installed equipment in place to be furnished by the using service or other agency, and the cost of Government-Furnished Materials (GFM) or Government-Furnished Equipment (GFE) purchased with construction funds and furnished to the contractor without reimbursement.

CHAPTER 4

COMPOSITION OF GOVERNMENT ESTIMATES

4-1 GENERAL

The Government estimate is the formal, approved construction cost estimate prepared and submitted to the Contracting Officer to support contract award. Each Agency may have its own requirements and procedures. The presentation format for this type of estimate generally is: Government Estimate of Contract Cost, Narrative of Contract Cost, Government Estimate Back-up Data, and Miscellaneous Support Data. Each part is shown in Figure 4-1. Sample Government estimate sheets are illustrated in appendix C. Security and control of the Government estimate is described in chapter 2.

4-2 GOVERNMENT ESTIMATE OF CONTRACT COST

The Government estimate is the portion of the cost estimate to be submitted as required by procurement regulations. It includes the title page, signature page, and pricing schedule.

4-2.1 Title Page

The title page should include the name and location of the project, the office responsible for the project design, the cost engineer responsible for preparation of the cost estimate, and the date and price level of the cost estimate.

4-2.2 Signature Page

The signature page should contain the names and signatures of those individuals responsible for the preparation, review, submittal, and approval of the cost estimate. It is necessary that the sheet contain the total amount of the estimated costs. The number of amendments included in the estimate should appear on the same page so that there will be no question as to the approved amount.

4-2.3 Pricing Schedule

The pricing schedule required by the solicitation documents must be completed as part of the Government estimate. As part of the design team, the cost engineer should be involved in the development of the pricing schedule. The format of the pricing schedule must be anticipated in planning and design estimates. When the pricing schedule is finalized for procurement, it must show unit prices, quantities, extension of unit prices, lump sum items, and total costs. Rounding off is not permitted on the pricing schedule between the unit price and extension. Any rounding adjustments must be performed in the detail estimate. Instructions in the bidding request documents also pertain to the Government estimate.

4-3 NARRATIVE OF CONTRACT COSTS

This part of the estimate of construction cost consists primarily of those sheets, with notes, which describe the scope tasks and costing. It also contains discussions, considerations, and the developed construction plan. The types of items normally included are as follows:

4-3.1 Table of Contents

This page denotes the backup content.

4-3.2 Project Narrative

The project narrative provides general details of the project. The narrative defines the assumptions made during the preparation of the cost estimate. It describes the project requirements that must be performed in sufficient detail to give a clear understanding of the scope of work. It also describes project details including length, width, height and shape of primary features, special problems that will be encountered in performing the work, site conditions affecting the work, reasons for selection of major plant and equipment, method and time for mobilization and demobilization of all equipment, and the reasons for unusually high or low unit prices. Each estimate will include a statement, which relates both the development of design, as appropriate, and date of effective pricing. Other factors to be considered in the project narrative include:

- Construction schedule, use of overtime, construction windows, phasing, acquisition plan and subcontracting.

- Project related details including site access, borrow areas, construction methodology, unusual conditions (soil, water or weather), unique techniques of construction, equipment/labor availability and distance traveled, environmental concerns, contingencies by feature or sub feature, if appropriate, and effective dates and sources for labor, equipment and material pricing.

4-3.3 Construction Schedule

The cost engineer may prepare a construction schedule to support the cost estimate that is consistent with the schedule for completion of the project. It may be in the form of a bar chart or network analysis system. It must identify the sequence and duration of the tasks upon which the cost estimate is developed. The schedule must be prepared in sufficient detail to adequately develop the required labor, equipment, crew sizes, and production rates required for each of the identified construction tasks.

4-3.4 Equipment and Materials Utilization

On those projects involving considerable heavy construction equipment, it is necessary to sufficiently plan the equipment usage against the work schedule to identify the actual number of cranes, dozers, and allow for proper mobilization to assure that demand for the equipment is not over or understated. For equipment selected from EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, indicate the region and date of the equipment schedule used for pricing the equipment. Materials,

which require long lead-time and can become critical to the construction schedule should be noted, planned, and adequately considered.

4-3.5 Labor Discussion and Utilization

The estimate should clearly state the sources for the various labor classifications and rates and include tabulation by crafts of the various composite wage rates used. When extensive overtime beyond the normal workday is used in the estimate, an explanation should be included.

4-4 GOVERNMENT ESTIMATE BACKUP DATA

This part of the estimate consists of all the support and backup documentation. The various categories of support documentation contained in this part are:

- Cost analysis summary sheets. The automated or manually prepared summary sheets for direct, indirect and owner costs are used to summarize cost components for each bid item and by the appropriate Work Breakdown Structure. Distribution of overhead and profit is shown on this sheet.

- Mobilization, preparatory work, and demobilization. These costs should be itemized and costed separately. These costs may be combined at summary level with overhead if these costs are not paid as a separate bid item. This item may be shown as a lump sum on the bid schedule.

- Profit computation sheet. When profit is included, the weighted guidelines will be used to compute the profit and will be part of the cost estimate backup.

- Overhead costs. The itemization and calculations of overhead costs, both job site and home office, should be accomplished in accordance with chapter 10.

- Bond costs. Bond costs should be calculated in accordance with chapter 12. Distribution is made to bid items similar to or as part of overhead costs distribution.

- Automated detail sheets. The completed direct costs should be organized in the proper sequence by the appropriate Work Breakdown Structure for each bid item.

- Production rates. The automated or manually prepared details are used to express production rate analysis of crews. See chapter 6 for further discussion.

- Crew, labor, equipment rates. These automated or manually prepared details are used to express the crew composition, and associated rates for

labor and equipment costs. The information contained on these sheets provides the backup support for the task unit labor and equipment costs shown.

- Quantity computations. The quantity takeoff computations for the tasks estimated, should be organized by task for the bid items and kept as backup. The takeoff should reference the drawing and clearly explain the computation.

- Quotations. Quotations should be collected and compiled by task or bid item into an organized reference. When quotations were not obtained for significant material and supply items, the basis for the cost used should be fully described. Quotations should be considered proprietary information and should be kept confidential to protect the information entrusted to the cost engineer.

Projects outside continental United States (OCONUS) should include International Balance of Payment (IBOP) analysis under normal or revised procedures. Estimates will not include the IBOP statement but the documentation will be retained at the cognizant design agency office. The projects will be evaluated for IBOP impact in accordance with DODI 7060.2, Federal Acquisition Regulation (FAR) 25-300 and Defense Federal Acquisition Regulation Supplement (DFARS) 225.75. Countries exempt from IBOP analysis are listed in DFARS 225.872-1 http://www.acq.osd.mil/dpap/dars/dfars/html/current/225_8.htm - 225.872

4-5 MISCELLANEOUS SUPPORT DATA

Include all other information pertinent to the estimate such as drawings and sketches, which were used as the basis of the cost estimate. Drawings may include a project map showing the location of the work with respect to principal cities, roads, railways, and waterways; a site map showing the location of the work, borrow, quarry, and spoil areas, and existing work access roads; any existing facilities usable by the contractor; a general plan and elevation, or profile of the work with typical sections; and a construction layout.

Supporting documents that are publicly available as parts of the solicitation, such as plans, specifications and project description, or that contain no cost information, such as sketches, soil boring and material classifications, are not part of the Government estimate or back-up.

4-6 REQUIREMENTS FOR REVISION TO GOVERNMENT ESTIMATE FOR BIDDING

Prior to award, the Government estimate may be changed or revised as a result of errors, differing conditions or additional information. Approval authority for revision to the estimate remains the responsibility of the Contracting Officer or authorized original estimate-approving official. Each office should assure that appropriate justification is attached to the revised cost estimate. Estimates may be revised by supplementary

sheets or by actually changing the contents of the original estimate pages. The method used will be determined by the nature of the revision and the format of the estimate. Whichever the method, all revisions to the estimate must be clearly indicated, dated, justified, and approved. A new signature sheet relating both the previously approved total and revised total will be re-approved. A copy of each estimate that has been approved should be included in a file along with the details and circumstances reflecting the revisions.

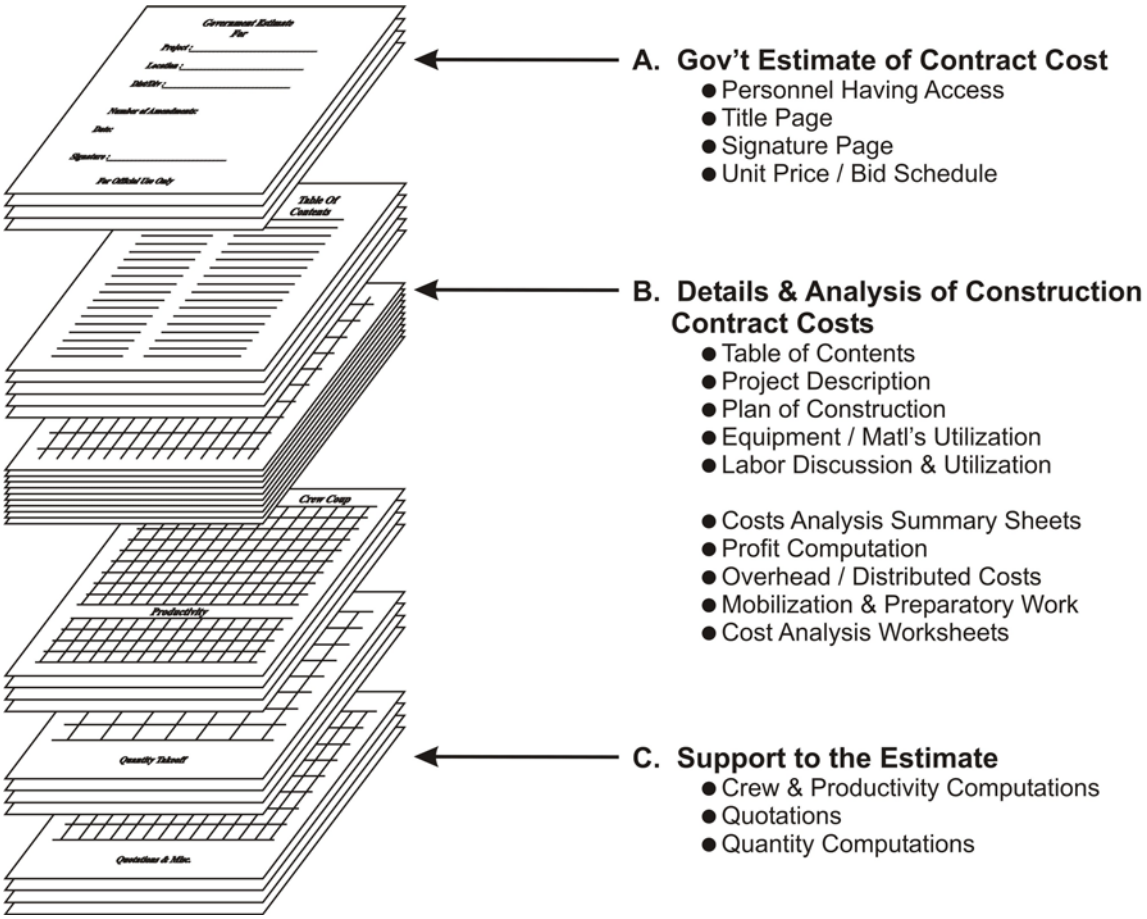


Figure 4-1 Example Composition of an estimate

CHAPTER 5

LABOR

5-1 GENERAL

5-1.1 Direct Labor Costs

Direct labor costs are defined as base wages plus labor cost additives including payroll taxes, fringe benefits, travel, and overtime allowances paid by the contractor for personnel who perform a specific construction task. In addition to the actual workers, there are generally working crew foremen who receive an hourly wage and are considered part of the direct labor costs.

5-1.2 Indirect Labor Costs

Indirect labor costs are wages and labor cost additives paid to contractor personnel whose effort cannot be attributed to a specific construction task. Personnel such as superintendents, engineers, clerks, and site cleanup laborers are usually included as indirect labor costs (overhead).

5-2 CREWS

Direct labor cost requirements are broken into tasks of work. Since each task is usually performed by a labor crew including equipment, the crew must be defined, costed, and a production rate established for the task. Crews may vary in size and mix of skills. The number and size of each crew should be based on such considerations as having sufficient workers to perform a task within the construction schedule and the limitation of workspace. Once the crews have been developed, the task labor costs can be determined based on the production rate of the crew and the labor wage rates.

5-3 WAGE RATES

A wage rate must be developed for each labor craft, which will represent the total hourly cost rate to the construction contractor. This total rate will include the base wage rate plus labor overtime, payroll taxes and insurance, fringe benefits, and travel or subsistence costs as further described in this chapter. The composite wage rate for each craft will be used for development of the estimate. The computation will be prepared on Figure 16-9 or similar local forms, or cognizant design agency approved cost estimating software.

Wage rates are generally well defined. The Davis-Bacon Act, PL 74-403, requires a contractor performing construction in the United States for the Government to pay not less than the prevailing rates set by the Department of Labor. Information on prevailing rates can be found at http://www.wdol.gov/. A schedule of minimum rates is included in the project specifications and is normally kept on file for each location by each local

Office of Counsel. The cost engineer should consult with the Contracting Officer on any questions regarding determination coverage, specific definitions, or concerns. Where labor is in short supply for certain crafts in the area, or the work is in a remote area, or it is well known that rates higher than the set rate scale will be paid, these higher wage rates should be used instead of the minimum wage since this would be required of the contractor in order to attract labor to the job. The wage rate should be adjusted to include travel time or night differential where these are a customary requirement.

5-3.1 Long Duration Projects

For a long duration project, where future wage rates are known and used, care must be taken to avoid duplication by also applying an escalation rate to such costs.

5-4 OVERTIME AND SHIFT DIFFERENTIAL

The cost engineer should carefully consider the available working time in the construction schedule for each task accomplishment in a normal time period. The efficiency of both the second and third shifts should be adjusted to recognize that production will not be as high as the day shift for most types of construction operations. A three-shift operation should normally be avoided due to lower labor efficiency and the requirement to include equipment maintenance.

5-4.1 Overtime

Overtime should be included in the labor cost computation when work in excess of regular time is required by the construction schedule or is the custom of labor in the local vicinity. Overtime labor cost is normally calculated as a percentage of the base wage rate. It is usually based on time and one-half, but may be double time depending on the existing labor agreements. Tax and insurance costs are applied to overtime, but fringe benefits and travel and/or subsistence costs are not. Example 5-1 shows overtime calculation for 40 hours regular time, plus 8 hours overtime at time and one half:

Example 5-1

48 hours at straight time	= 48.00 hours
8 hours at ½ time	= 4.00 hours paid
equivalent straight time	= 52.00 hours
(52 hrs paid/48 hrs worked = 1.0833) -1 x 100%	= 8.33%

Note: See example estimate sheets in Chapter 16 for method of application

5-4.2 Shift Operations

Many construction projects utilize multiple shift operations. When estimating direct labor costs for multiple shift operations, the cost engineer should estimate the number of hours to be worked (include shift differential work loss) and the number of hours to be paid for each shift based upon the developed construction schedule. Differential shift premiums may need to be added to the hourly rate.

5-4.3 Tabulation of Overtime Percentages

A tabulation of overtime percentages for most conditions is shown in Table 5-1. The percentage also includes an allowance for the direct work loss of multiple shift or shift differential, where applicable.

Table 5-1 Overtime and shift differential

	Actual Hours Worked		Hours Paid		Percentages for OT and Shift Differential		
..	Day	Week	Reg	OT	1.5x Wk/Sat 2x Sun	1.5x Week 2x Sat/Sun	Week 2x All OT
One-shift operation							
5-Day Week	8	40	40	0	0	0	0
	9	45	40	5	5.55	5.55	11.11
	10	50	40	10	10.00	10.00	20.00
	11	55	40	15	13.64	13.64	27.27
	12	60	40	20	13.37	13.37	33.33
6-Day Week	8	48	40	8	8.33	16.67	16.67
	9	54	70	14	12.96	21.33	25.93
	10	60	40	20	16.67	25.00	33.33
	11	66	40	26	19.70	28.03	39.39
	12	72	40	32	22.22	30.56	44.44
7-Day Week	8	56	40	16	21.43	28.57	28.57
	9	63	40	23	25.40	32.54	36.51
	10	70	40	30	28.57	35.71	42.86
	11	77	40	37	31.17	38.31	48.05
	12	84	40	44	33.33	40.68	52.38
Two-Shift Operation (one 8 hours and one 7.5 hours)							
5-Day Week	15.5	77.5	80	0	3.23	3.23	3.23
	18	90	80	12.5	9.72	9.72	16.67
	20	100	80	22.5	13.75	13.75	25.00
	22	110	80	32.5	17.05	17.05	31.82
	24	120	80	42.5	19.79	19.79	37.50
6-Day Week	15.5	93	80	16	11.83	20.43	20.43
	18	108	80	31	17.13	25.69	31.48
	20	120	80	43	20.42	28.96	38.33
	22	132	80	55	23.11	31.63	43.94
	24	144	80	67	25.35	33.85	48.61
7-Day Week	15.5	108.5	80	32.0	25.35	32.72	32.72
	18	126	80	49.5	29.76	37.10	42.06
	20	140	80	63.5	32.50	39.82	47.86
	22	154	80	77.5	34.74	42.05	52.60
	24	168	80	91.5	36.61	43.90	56.55

..	Actual Hours Worked Day	Week	Hours Paid Reg	OT	Percentages for OT and Shift Differential 1.5x Wk/Sat 2x Sun	1.5x Week 2x Sat/Sun	Week 2x All OT
Two-Shift Operation (each 7.5 hours)							
5-Day Week	15	75	80	0	6.67	6.67	6.67
	18	90	80	15	13.89	13.89	22.22
	20	100	80	25	17.50	17.50	30.00
	22	110	80	35	20.45	20.45	36.36
	24	120	80	45	22.92	22.92	41.67
6-Day Week	15	90	80	16	15.56	24.44	24.44
	18	108	80	34	21.30	30.09	37.04
	20	120	80	46	24.17	32.92	43.33
	22	132	80	58	26.52	35.23	48.48
	24	144	80	70	28.47	37.15	52.28
7-Day Week	15	105	80	32	29.52	37.14	37.14
	18	126	80	53	34.13	41.67	47.62
	20	140	80	67	36.73	43.93	52.86
	22	154	80	81	38.31	45.78	57.14
	24	168	80	95	39.88	42.37	60.71
Three-Shift Operation							
5-Day Week	22.5	112.5	120	0	6.67	6.67	6.67
6-Day Week	22.5	135.0	120	24	15.56	24.44	24.44
7-Day Week	22.5	157.5	120	48	29.52	37.14	37.14

5-5 TAXES AND INSURANCE

5-5.1 Rates

Rates for all taxes and insurance should be verified prior to computation.

5-5.2 Workman's Compensation

Workman's compensation and employer's liability insurance costs applicable for the state in which the work is performed should be included in the composite wage rate. Insurance rates may be obtained from the state if the state law provides a monopoly or from insurance companies providing this type insurance. The project compensation rate is based on the classification of the major construction work and applies to all crafts employed by the contractor.

5-5.3 Unemployment Compensation Taxes

Unemployment compensation taxes are composed of both state and Federal taxes. Unemployment compensation tax will vary with each state while the Federal unemployment tax will be constant for all projects. Insurance rates can be obtained from the state unemployment office, commercial publications, or the Bureau of Labor Statistics.

5-5.4 Social Security Tax Rates

The social security tax rates and the income ceilings on which social security taxes must be paid vary from year to year. Therefore, the cost engineer must verify the rate to be used in the cost estimate. Current and future rates can be obtained from the Social Security Administration.

5-5.5 Total Percentage of Taxes and Insurance

The total percentage of the above taxes and insurance is summed and then applied to the basic hourly wage rate plus overtime for the various crafts. Example 5-2 illustrates the method for deriving the total tax and insurance percentage. Since rates are subject to change and in some cases vary by region, the calculations shown are presented as an example only. Actual values must be determined by the cost engineer for the specific project.

Example 5-2

Workman's compensation and employer's liability (varies with state and contractor).	7.60%
State unemployment compensation (varies with each state)	3.20%
Federal unemployment compensation	0.80%
Social Security & Medicaid	7.65%
Total taxes and insurance	19.25%

Note: Foreman and overhead labor rates must also include these applicable costs. See example estimate sheets in Chapter 16 for method of application.

5-6 FRINGE BENEFITS AND TRAVEL/SUBSISTENCE

5-6.1 Fringe Benefits

Fringe benefits may include health and welfare, pension, apprentice training, depending on the craft and the location of the work. These summed costs are usually expressed as an hourly cost with the possible exception of vacation, which may be easily converted to an hourly cost. The type of fringe and the amount for the various crafts can usually be found with the Davis-Bacon Act wage determination in the specifications. Non-union contractors pay comparable fringe benefits directly to their employees.

Example 5-3 illustrates the calculations for fringe benefits. Since the values change and vary by region and union agreement, the calculations shown are presented as an example only. Actual values must be determined by the cost engineer.

Example 5-3

Health and welfare $0.70/hr
Pension 0.75/hr
Apprentice training 0.00/hr
(N/A in this case)

Total fringe benefits $1.45/hr

5-6.2 Travel and Subsistence

Travel and subsistence costs are normally expressed as a daily or weekly cost. When included in the cost estimate, they should be converted to an hourly cost and excluded from an overtime premium unless travel and subsistence are part of an increased hourly wage. See example estimates in Chapter 16 for methodology.

Some fringe benefits and travel/subsistence are subject to payroll taxes. For example, vacation benefits are taxable and should be added to the basic wage rate.

CHAPTER 6

LABOR PRODUCTIVITY

6-1 GENERAL

Estimating labor productivity is subject to many diverse and unpredictable factors. There is no substitution for the knowledge and experience of the cost engineer when estimating labor productivity. For some types of work, the task productivity of crewmembers such as equipment operators, helpers, or oilers is determined by the productivity of the equipment. For some labor based crews, the task productivity of craftsman such as carpenters, steel workers, and masons may be based on average experience in the Cost Book, tempered with the experience of the cost engineer, historical records, or other appropriate reference manuals.

6-2 PRODUCTIVITY ADJUSTMENT CONSIDERATIONS

6-2.1 Labor Effort

The labor effort needed to perform a particular task varies with many factors, such as the relative experience, capability and morale of the workers, the size and complexity of the job, the climatic and topographic conditions, the degree of mechanization, the quality of job supervision, amount of similar task repetition, and the existing labor-management agreements and/or trade practices. The effort from these labor efficiency factors and work practices that exist in the project locality must be considered in each productivity assignment.

6-2.2 Complexity of the Variable

The complexity of the variables affecting productivity makes it difficult to estimate a production rate. Therefore, production rates should be based on averaging past production rates for the same or similar work. The cost engineer must incorporate particular job factors and conditions to adjust historical data to the project being estimated. Other sources for production rates include reference manuals, field office reports, construction logbooks, and observation of ongoing construction.

CHAPTER 7

CONSTRUCTION EQUIPMENT AND PLANT

7-1 GENERAL

Construction plant and equipment refers to the tools, instruments, machinery, and other mechanical implements required in the performance of construction work. Construction plant is defined as concrete batch plants, aggregate processing plants, conveying systems, and any other processing plants which are erected in place at the job site and are essentially stationary or fixed in place. Equipment is defined as items, which are portable or mobile, ranging from small hand tools through tractors, cranes, and trucks. For estimating purposes, plant and equipment are grouped together as equipment costs.

7-2 SELECTION OF EQUIPMENT

An important consideration in the preparation of an estimate is the selection of the proper equipment to perform the required tasks. The cost engineer should carefully consider number, size, and function of equipment to arrive at optimum equipment usage. Some factors to consider during the selection process are: conformance to specification requirements; job progress schedule (production rate); magnitude of the job; type of materials; availability of space; mobility and availability of equipment; suitability of equipment for other uses; equipment capabilities; number of shifts; distances material must be moved; steepness and direction of grades; weather conditions; hauling restrictions; standby time; and mobilization and demobilization costs.

The cost engineer preparing the estimate must be familiar with construction equipment and job-site conditions. The equipment selected should conform to contract requirements and be suitable for the materials to be handled and conditions that will exist on the project.

7-3 ESTIMATING METHODOLOGY

The "crew concept" discussed in Chapter 5 for construction cost estimates requiring detailed estimating of labor, materials, and equipment is to also be considered in costing equipment. For each significant work task, workers and equipment are expressed in the hourly cost and expected production rate. Where a major piece of equipment serves more than one crew, the total equipment time should be prorated between both crews.

7-4 PRODUCTION RATE

After determining the type of equipment to be employed, the cost engineer should select the specific equipment size which has a production rate suited to the efficient and economical performance of the work. The size and number of units required will be influenced by equipment production rate, job size, availability of space for equipment

operations, the project construction schedule for the various work tasks, number of shifts to be worked, and the availability of equipment operators. Emphasis must be placed on the importance of establishing a reasonable production rate. Production may be based on actual performance data, commercial manufacturer tables or rates from MCACES/MII/SUCCESS© historical equipment models and assemblies, adjusted for project conditions.

7-5 MOBILIZATION AND DEMOBILIZATION

Mobilization costs for equipment include the cost of loading at the contractor's yard, transportation cost from the yard to the construction site, including permits, unloading at the site, necessary assembly and testing, and standby costs during mobilization and demobilization. Trucks for the project capable of highway movement are usually driven to the site and are often used to transport minor items. All labor, equipment, and supply costs required to mobilize the equipment should also be included in the mobilization cost. When the equipment location is unknown, the mobilization and demobilization distance should be based on a circular area around the project site, which will include a reasonable number of qualified bidders. Demobilization costs should be based on that portion of the equipment that would be expected to be returned to the contractor's storage yard and may be expressed as a percentage of mobilization costs. All labor, equipment, and supply costs required for cleaning/prepping the equipment so that it is in the same condition as it was when it arrived at the site should also be included in the demobilization cost. Transporting rates should be obtained periodically from qualified firms normally engaged in that type work.

Mobilization and demobilization costs for plant should be based on the delivered cost of the item, plus erection, taxes, and dismantling costs minus salvage value at the end of the project. Maintenance and repair are operating costs and should be distributed throughout work accomplishment.

7-6 EQUIPMENT OWNERSHIP AND OPERATING EXPENSE COST RATES

The EP 1110-1-8 Construction Equipment Ownership and Operating Expense determines the hourly rates for equipment ownership and operating expense. These rates are also included in the Cost Book and will be used in the preparation of all cost estimates for owned equipment. These pamphlets have been developed for different geographic regions in the United States, and the appropriate pamphlet or Cost Book should be used based upon project location. Rented and leased equipment is also discussed in the EP and is appropriate for inclusion in the estimate at competitive rates if judgment determines this to be a reasonable approach by a prudent contractor. The cost engineer may also use current commercially available publications for assistance in determination of rates.

When the cost engineer develops costs for the actual equipment being used at a job site exceeding 40 hours per week, the rates shall be adjusted as described by EP 1110-1-8.

7-7 PLANT COST

In cases of highly specialized plant, 100 percent write-off of the total value of the plant

may be justified for a particular project. For less highly specialized plant, some salvage may be anticipated, depending on storage cost, resale value, and probability of sale or reuse in the immediate future. The total project charge including operation, maintenance, and repair should be distributed in proportion to the time and item the plant is used on the various contract items. Cost of plant required for the production of concrete, aggregates, ice or heat for cooling or heating of concrete, etc., should normally be included in the estimate as part of the cost of these materials or supplies manufactured or produced at the site.

7-8 SMALL TOOLS

The cost of small power and hand tools and miscellaneous non-capitalized equipment and supplies should be estimated as a percentage of the labor cost. The allowance must be determined by the cost engineer in each case, based upon experience for the type of work involved. Unit prices based on historical data already include a small tools allowance. The small tool cost will be considered as part of equipment cost. Such allowance can range typically up to 12 percent of direct labor cost. The cost engineer must ensure that this cost is not duplicated in the overhead rate percentages. The crew's database in the Cost Book does not contain a small tools allowance.

CHAPTER 8

MATERIALS AND SUPPLIES

8-1 GENERAL

Materials and supplies are defined below and, for the purpose of estimating, both can be considered materials unless they need to be separated because of different tax rates.

8-1.1 Materials

Those items which are physically incorporated into and become part of the permanent structure.

8-1.2 Supplies

Those items which are used in construction but do not become physically incorporated into the project such as concrete forms.

8-2 SOURCES OF PRICING DATA

8-2.1 General

Prices for materials and supplies may be obtained from pricing services, the Cost Book, catalogs, quotations, and historical data records. Each office should review the source of the pricing contained in these publications and assess the reasonableness prior to use. Standard unit prices from these sources are considered satisfactory only after an applicability determination has been made. Care should be taken when using this type of cost data to make proper allowances for quantity discounts, inflation, and other factors affecting contractor cost.

8-2.2 Quotes from Manufacturers and Suppliers

Quotes should be obtained for all significant materials and installed equipment and for specialized or not readily available items. Quotations may be received either in writing or telephonically. It is preferable to obtain quotes for each project to ensure that the cost is current and that the item meets specifications. If possible, more than one quote should be obtained to be reasonably sure the prices are competitive. The cost engineer should attempt to determine and ensure that contractor discounts are considered in the estimate. Quotes should be kept proprietary to preserve the confidentiality entrusted. A sample telephone quotation data sheet similar to that shown in appendix C, Figure C-5 should be utilized for recording quoted information. The cost engineer should also take into consideration FAR Subpart 25.2 Buy American Act-Construction Materials and FAR Subpart 6.1 Full and Open Competition for the materials specified.

8-3 WASTE ALLOWANCE

Waste and loss considerations may be included in material unit price computations. This methodology when computing material costs results in a quantity takeoff of work placement, which is not altered to reflect material losses. However, the alternative methodology of increasing the measured quantity by waste and loss quantity is acceptable if the excess quantity will not be used for any other purpose. The methodology used by the cost engineer should not charge labor on the excess quantity. In either case, a note statement is required in the estimate explaining the methodology used.

8-4 FORWARD PRICING

Sometimes quotes are requested in advance of the expected purchase date. However, suppliers are reluctant to guarantee future prices and often will only quote current prices. It may therefore be necessary to adjust current prices to reflect the cost expected at the actual purchase date. This cost adjustment, if required, should not be included as a contingency, but should be clearly and separately defined in each estimate. Adjust current pricing to future pricing using program specific escalation factors. Computations of adjustment should be clear and should be maintained as cost estimate backup support.

8-5 FREIGHT

The cost engineer should check the basis for the price quotes to determine if they include delivery. If they do not include delivery, freight costs to the project site must be determined and included. The supplier can usually furnish an approximate delivery cost. For delivery charge, Free on Board (FOB) refers to the point to which the seller will deliver goods without additional charge to the buyer.

8-5.1 FOB Factory or Warehouse

If the materials or supplies are FOB factory or warehouse, freight costs to the construction site should be added to the cost of the materials or supplies.

8-5.2 Unloading and Transporting the Materials or Supplies

If the cost of materials or supplies includes partial delivery, FOB to the nearest rail station, the cost of unloading and transporting the materials or supplies should be included in the estimate.

8-5.3 Large Quantity in Bulk

If the materials or supplies are a large quantity in bulk from which would require extensive equipment for unloading and hauling, it may be desirable to prepare a labor and equipment estimate for the material handling and delivery.

8-6 HANDLING AND STORAGE

The contractor is usually required to off-load, handle and stockpile, or warehouse materials on site. These costs should be included in the estimate. An item of electronic equipment requiring special low-humidity storage might have this special cost added to

the direct cost of the equipment. For common items, such as construction materials or equipment needing secure storage, the cost for the security fencing, temporary building and material handling should be considered as an indirect cost and be included in the job-site overhead cost.

8-7 TAXES

When applicable, state and local sales tax should be added to the materials or supplies cost. In some states, material incorporated into Federal construction is exempt, but supplies are not. Care should be taken, therefore, that the sales tax rate is applied as required. The cost engineer should verify the tax rates and the applicability of these rates for the project location. Sales tax is considered a direct cost of the materials and supplies, and also should be applied to Government-Furnished Equipment (GFE) and included in the estimate.

8-8 MATERIALS OR SUPPLIES MANUFACTURED OR PRODUCED AT THE SITE

If it is likely the contractor will manufacture or produce materials or supplies at the project site, a separate estimate component should be developed for this work. This estimate should be detailed equipment, labor, materials, and supplies estimate, and should conclude with a unit cost of material or supply delivered to the stockpile, storage yard, or other end point.

8-9 GOVERNMENT-FURNISHED MATERIALS (GFM) OR EQUIPMENT (GFE)

On some projects, the Government may provide some of the project materials. Government-furnished materials and equipment should be estimated in the same manner as other materials, except that the purchase price is not included. The estimate should include an allowance for transporting handling, storage from point of delivery and assembly, sales tax and installation if applicable. There may be special costs associated with Government-furnished materials such as insurance to cover loss until final installation, special storage costs, or special security measures. Note that these materials and procurement costs are normally to be included as part of the total project cost.

CHAPTER 9

SUBCONTRACTED WORK

9-1 GENERAL

In construction, specialty items such as plumbing, heating, electrical, roofing, plastering, and tile work are usually more effectively performed by subcontract. With so many specialties being performed, subcontract work becomes a very significant portion of the total costs of construction. Since each estimate should be prepared as practically and as realistically as possible, subcontract costs become a necessary consideration.

9-1.1 Parts of Work to be Subcontracted

The cost engineer must first determine those parts of the work that will probably be subcontracted. When the work to be subcontracted has been determined, those items will be identified in the estimate. The appropriate subcontractor overhead and profit costs should be applied to subcontractor direct cost items in addition to the appropriate prime contractor overhead and profit.

9-1.2 Cost of Subcontracted Work

The cost of subcontracted work is the total cost to the prime contractor for the work performed. Subcontractor's costs include direct labor, materials and supplies, equipment, second tier subcontracts, mobilization and demobilization, transportation, set-up, and charges for overhead and profit. Particular attention should be given to large items such as turbines, generators, and incinerators. The total subcontract cost is considered a direct cost to the prime contractor.

9-1.3 Construction Contractual Methods

The cost engineer should be aware of the type of contractual method for which the solicitation is being issued. Limited competition contractual procurement methods may result in multiple compounded levels of subcontracted work, e.g. compounded subcontractors' markups passed on to the prime contractor. Some examples of limited contractual procurement methods are 8-A Sole Source RFP, MATOC sole source task order, POCA sole source task order, etc. The prime contractor is required per the contract to perform a minimum amount of work, but all the remaining work may be performed by subcontractors. Particular attention should be given to the workload capacity and workforce capability of the prime contractor. If the prime contractor already is at full capacity in performing other work, or their own workforce resources are at maximum usage, then the prime contractor will likely subcontract to the maximum extent allowable. Also, the same scenario would occur for the subcontractors if they are at their maximum capacities.

9-2 USE OF QUOTATIONS

The cost engineer may utilize quotes for the expected subcontracted work when reviewed and verified as reasonable. In lieu of a quotation, each task of the subcontract should be priced as a direct cost with an appropriate rate of subcontractor's overhead and profit added.

CHAPTER 10

OVERHEAD COSTS

10-1 GENERAL

Overhead costs are those costs, which cannot be attributed to a single task of construction work. Costs, which can be applied to a particular item of work should be considered a direct cost to that item and are not to be included in overhead costs. The overhead costs are customarily divided into two categories:

- Job office overhead (JOOH) also referred to as General Conditions or Field Office Overhead.
- General home office overhead commonly referred to as General and Administrative (G&A) costs.

10-1.1 Duplication of Overhead Costs

The cost engineer must be sure that overhead costs are not duplicated between the two categories. Because of the nature of overhead costs, it is not practical to discuss all overhead items. Specific considerations must be carefully evaluated for each project. The cost engineer must use considerable care and judgment in estimating overhead costs. Many indirect cost items are frequently described in the General Requirements Section (Construction Specification Institute (CSI) Division 01) of the contract specifications. If not related to a specific work task, these costs must be identified and appropriately assigned as overhead costs.

10-1.2 Previously Determined Overhead Rates

The application of a previously determined overhead rate may be used for early design stages, but it is not an accurate or reliable method of forecasting costs. Overhead will vary from project to project and may even vary from month to month within any given project. Job overhead items for the prime contractor should be estimated in detail for all projects at final design requiring a Government estimate. Detailing of overhead costs for subcontract work is recommended when the impact of these costs is significant.

10-2 JOB OFFICE OVERHEAD

Job overhead costs are those costs at the project site, which occur specifically as a result of that particular project. Some examples of job overhead costs are:

- Job supervision and office personnel.
- Engineering and shop drawings/surveys.
- Site security.
- Temporary facilities, project office.

- Temporary material storage.
- Temporary utilities.
- Preparatory work and laboratory testing.
- Transportation vehicles.
- Supplies and maintenance facilities.
- Temporary protection and Occupational Safety and Health Administration (OSHA) requirements.
- Telephone and communications.
- Permits and licenses.
- Insurance (project coverage).
- Schedules & reports.
- Quality control.
- Cleanup.
- Taxes.
- Equipment costs not chargeable to a specific task.
- Operation and maintenance of temporary job-site facilities.

10-2.1 Mobilization and Preparatory Work

The costs of mobilization and preparatory work, including the setup and removal of construction facilities and equipment are part of overhead costs unless there is a specific bid item. For large projects, the cost for each part of this initial work should be estimated on a labor, materials, and equipment basis. For smaller projects, these costs may be estimated based on experience.

10-3 GENERAL HOME OFFICE OVERHEAD (G&A)

Home office overhead expenses are those incurred by the contractor in the overall management of business, associated with all costs at the home office. Since they are not incurred for any one specific project, they must be apportioned to all the projects. Many expenses such as interest and entertainment are not allowable. Construction equipment depreciation is included in the EP 1110-1-8, Construction Equipment and Operating Expense Ownership Schedule cost rates and should not be included in the G&A rate. An accurate percentage of G&A can only be determined by an audit. On major changes requiring an audit, it is important to request that the G&A rate be determined.

Of all the categories of costs, the contractor's G&A costs are the least definable. Each contractor organizes his company differently from any other. Each incurs costs differently from varying sources and manages operations of that home office by their own methodology. It is important to understand that home office costs are not standard and fixed. Even though the cost for a specific contractor varies from period to period, a rate is normally averaged as a computation of total home office costs over a sufficient period divided by the total volume of business during that specific period. This rate computation methodology allows distribution and projection to future project estimates. When more specific data is not available, the cost engineer may include empirical rates. Empirical G&A rates typically range from three percent for large contractors to ten percent for small contractors. Home office costs are typically included in the estimate of

overhead as the product of an average experienced percentage rate times the expected contract amount. Typical categories of home office overhead are:

- Main office building, furniture, equipment.
- Management and office staff, salary and expense.
- Utilities.
- General communications and travel.
- Supplies.
- Corporate vehicles.
- General business insurance.
- Taxes.

10-4 DURATION OF OVERHEAD ITEMS

After the overhead items have been listed, a cost must be determined for each. Each item should be evaluated separately. Some items such as erection of the project office may occur only once in the project. The cost engineer should utilize the developed job schedule in estimating duration requirements. Costs reflective of each particular item during the scheduled period should then be applied. The product of duration and unit cost is the overhead cost for the item.

10-5 SOURCES FOR PRICING

The cost engineer must rely on judgment, historical data, and current labor market conditions to establish overhead costs. Sources for information can be obtained from current or past contractors bid data and audits. Some contractors will informally discuss and furnish information for overhead items and audit reports of previous similar projects. Other sources include previously negotiated modifications and review of organizational charts of construction firms for staffing and overhead costs evaluation. Overhead salaries should include an allowance for payroll taxes and fringes such as Federal Insurance Contributions Act (FICA), health benefits, and vacation.

10-6 DISTRIBUTION OF OVERHEAD

The prime contractor's overhead costs, which have been costed in an organized format, should be summed and distributed to the various bid items. A proportionate distribution is commonly made by percentage ratio of total direct costs to those direct costs in each item. When additive or split-bid items are included, only those overhead costs, which relate directly to the additive work, should be distributed to those additive items. Those overhead costs, which the contractor will incur regardless of additive or deductive items, should be distributed to base bid schedule items only. Selective distribution ensures recoupment of costs if only the basic contract scope is awarded. Regardless of the method of distribution, the estimates should clearly demonstrate the procedures and cost principles applied. For modification estimates, overhead requirements should be itemized and costed to reflect the actual net change in cost of overhead, that is, costs before and after the modification work. As a refinement to distribution, the cost engineer may reasonably and justifiably reduce the prime overhead distribution on subcontract work items. The balance of the total prime overhead should then be distributed as discussed above to the remaining prime items of work.

CHAPTER 11

PROFIT

11-1 GENERAL

Profit is defined as a return on investment. It is what provides the contractor with an incentive to perform the work as efficiently as possible. A uniform profit rate should be avoided.

11-2 WEIGHTED GUIDELINES METHOD

There are various types of weighted guideline methods determining profit according to the FAR and its supplements. The proper weighted guideline method to use will depend on the type of contractual acquisition action and the supplemental regulations that apply to the contracting activity. Reference here is made to the FAR Sub-part 15.404-4 concerning the use of weighted guideline when price is based on a negotiated firm fixed price construction contracts. The use of the weighted guideline method when price is negotiated will be per the cognizant design agency guidance. The determination of profit, as appropriate for each procurement action, may be determined and submitted on the sample worksheet identified as Figure 11-1. Explanation of the factors to be used in calculating profit, are described below, and shown in Table 11-1.

11-2.1 Weighted Guidelines Method

The weighted guidelines method yields a reasonable profit value and should be used to determine profit for all contracts that include profit. This methodology should also to be used wherever a detailed direct costing method is used for preparing current working estimates. A rate of profit may be used based on historical experience for early stage estimates prepared for programming, reconnaissance, or concept design.

11-2.2 Weighted Guideline Factors

Based on the circumstances of each procurement action, each of the factors listed in Table 11-1 will be weighted from 0.03 to 0.12 as discussed in the following text and provided in Table 11-1. Statements in sufficient detail to explain the reasons for assigning the specific weights shall be included on the profit computation sheet. The value will then be obtained by multiplying the rate column by the weight column. The value column when totaled indicates the fair and reasonable profit percentage.

- **Degree of Risk.** Where the work involves no risk or the degree of risk is very small, the weighting should be 0.03; as the degree of risk increases, the weighting should be increased up to a maximum of 0.12. Lump sum items will have, generally, a higher weighted value than unit price items for which quantities are provided. Other things to consider include ; the nature of work; where the work is to be performed; the reasonableness of negotiated costs; the amount of labor included in the costs; and whether the negotiation occurs before or after the period of performance of work.

- **Relative Difficulty of Work.** If the work is difficult and complex, the weighting should be 0.12 and should be proportionately reduced to 0.03 on the simplest of jobs. This factor is tied in to some extent with the degree of risk. Some things to consider include technical nature of the work; by whom work is to be done; location of work; and time schedule.

- **Size of the Job.** Work not in excess of $100,000 will be weighted at 0.12. Work estimated between $100,000 and $5,000,000 will be proportionately weighted from 0.12 to 0.05. Work from $5,000,000 to $10,000,000 shall be weighted at 0.04 and work in excess of $10,000,000 at 0.03.

- **Period of Performance.** Jobs in excess of 24 months are to be weighted at 0.12. Jobs of lesser duration are to be proportionately weighted to a minimum of 0.03 for jobs not to exceed 30 days. No weight is given for modification estimates when additional performance time is not required.

- **Contractor's Investment.** Jobs are to be weighted from 0.03 to 0.12 on the basis of below average, average to above average of contractor investment. Things to consider include amount of subcontracting; mobilization payment item; Government-furnished property; method of making progress payments; and front-end requirements of the job.

- **Assistance by Government.** Jobs are to be weighted from 0.12 to 0.03 on the basis of below average to above average. Things to consider include use of Government-owned property, equipment and facilities, and expediting assistance.

- **Subcontracting.** Jobs are to be weighted inversely proportional to the amount of subcontracting. Where 80 percent or more of the work is to be subcontracted, the weighting is to be 0.03 and such weighting proportionately increased to 0.12 where all work is performed by the contractor's own forces.

11-2.3 Separate Profit Calculation

A separate profit calculation should be performed for the prime contractor and for each subcontractor. When the subcontractor assumes the risk and responsibility for portions of the work, the prime contractor's profit rate on that work should be decreased. As a general rule, profit is applied as a percentage rate to the total of all costs required by the contract or modification scope. For early design stage estimates, a rate of profit may be assumed based on past historical experience.

Weighted Guidelines Profit Sheet

Project: Estimated By:

Contract No: Checked By:

Change Order No.: Date 9/14/05

Profit Objective For: (Prime Contractor, Subcontractor)

Factor	Rate (%)		Weight (0.03 - 0.12)		Value
1. Degree of Risk		x		=	
2. Difficulty of work		x		=	
3. Size of Job		x		=	
4. Period of Performance		x		=	
5. Contractor's Investment		x		=	
6. Assistance by Government		x		=	
7. Subcontracting		x		=	
	%		Profit Factor		%

COMMENTS (Reasons for Weights Assigned):

1.

2.

3.

4.

5.

6.

7.

Figure 11-1 Weighted Guidelines Profit Sheet

Table 11-1 Guidelines for Weighted Factors Profit Determination

Degree of Risk (Judgmental):

Degree	Weight
Small	0.03
High	0.12

Relative Difficulty of Work (Judgmental):

Degree	Weight
Difficult	0.12
Simple	0.03

Size of Job:

Value (x 1000)			Weight	Value (x 1000)			Weight
$ 0	to	100	0.120	$ 2,701	to	2,800	0.081
101	to	200	0.119	2,801	to	2,900	0.080
201	to	300	0.117	2,901	to	3,000	0.079
301	to	400	0.116	3,001	to	3,100	0.077
401	to	500	0.114	3,101	to	3,200	0.076
501	to	600	0.113	3,201	to	3,300	0.074
601	to	700	0.111	3,301	to	3,400	0.073
701	to	800	0.110	3,401	to	3,500	0.071
801	to	900	0.109	3,501	to	3,600	0.070
901	to	1,000	0.107	3,601	to	3,700	0.069
1,001	to	1,100	0.106	3,701	to	3,800	0.067
1,101	to	1,200	0.104	3,801	to	3,900	0.066
1,201	to	1,300	0.103	3,901	to	4,000	0.064
1,301	to	1,400	0.101	4,001	to	4,100	0.063
1,401	to	1,500	0.100	4,101	to	4,200	0.061
1,501	to	1,600	0.099	4,201	to	4,300	0.060
1,601	to	1,700	0.097	4,301	to	4,400	0.059
1,701	to	1,800	0.096	4,401	to	4,500	0.057
1,801	to	1,900	0.094	4,501	to	4,600	0.056
1,901	to	2,000	0.093	4,601	to	4,700	0.054
2,001	to	2,100	0.091	4,701	to	4,800	0.053
2,101	to	2,200	0.090	4,801	to	4,900	0.051
2,201	to	2,300	0.089	4,901	to	5,000	0.050
2,301	to	2,400	0.087	5,001	to	10,000	0.040
2,401	to	2,500	0.086				
2,501	to	2,600	0.085	Over		10,000	0.030
2,601	to	2,700	0.084				

Table 11-1 (Continued)

Period of Performance:	Weight
Over 24 Months	0.120
23 to 24 Months	0.116
22 to 23 Months	0.112
21 to 22 Months	0.109
20 to 21 Months	0.105
19 to 20 Months	0.101
18 to 19 Months	0.098
17 to 18 Months	0.094
16 to 17 Months	0.090
15 to 16 Months	0.086
14 to 15 Months	0.082
13 to 14 Months	0.079
12 to 13 Months	0.075
11 to 12 Months	0.071
10 to 11 Months	0.068
9 to 10 Months	0.064
8 to 9 Months	0.060
7 to 8 Months	0.056
6 to 7 Months	0.052
5 to 6 Months	0.049
4 to 5 Months	0.045
3 to 4 Months	0.041
2 to 3 Months	0.038
1 to 2 Months	0.034
Under 30 Days	0.030

Contractor's Investment (Judgmental):

Degree	Weight
Below average	0.03
Average	0.07
Above average	0.12

Assistance by Government (Judgmental):

Degree	Weight
Below average	0.12
Average	0.07
Above average	0.03

Table 11-1 (Continued)

Subcontracting	Weight
80% or more	0.030
70% to 80%	0.042
60% to 70%	0.055
50% to 60%	0.068
40% to 50%	0.080
30% to 40%	0.092
20% to 30%	0.105
10% to 20%	0.118
0	0.120

CHAPTER 12

SURETY BONDS

12-1 GENERAL

Surety bonds are three-way agreements between a bidder or contractor (the principal), and a second party (the surety), to assure fulfillment of the principal's obligations to a third party (the obligee). If the principal obligations are not met, the bond assures payment to the extent stipulated of any loss sustained by the obligee.

In most Government construction contracts, these three parties are as follows:

Three Party	Under a General Contract	Under a Subcontract:
The Principal	Contractor	Subcontractor
The Obligee	Government	Contractor
The Surety	Surety	Surety

12-2 PURPOSE OF BONDS

The purpose of surety bonds varies with the type of bond.

12-2.1 Bid Bonds or Bid Guarantee

Bid bonds or bid guarantee provides an assurance that the bidder will not withdraw his bid within the specified period for acceptance and will execute a written contract and furnish the required bonds if the bid is accepted.

12-2.2 Payment Bonds

Payment bonds protect subcontractors, suppliers, and laborers against nonpayment by the prime contractor.

12-2.3 Performance Bonds

Performance bonds ensure the contractor will complete the project as specified and for the agreed price. It does not shift responsibility for administering the contract to the surety. A performance bond provides a financial guaranty for the work and provides the contractor with a method of freeing his working capital and other assets, which might otherwise be tied up by other forms of surety such as certified checks, retainage, or deposits.

12-3 AMOUNT OF REQUIRED SURETY BONDS

The amount included in the estimate should be based on the contract requirements, the

bond rules, premium rates, and, if known, the actual contractor bond cost. Performance and payment bonds are required for all construction contracts of $100,000 or more and some form of payment guarantee for lesser value contracts (FAR 28.102). The cost of all performance bonds, payment bonds, and other types of bonds determined to be appropriate by the cost engineer are allowable costs.

12-4 RULES GOVERNING THE APPLICATION OF BOND RATES

Bonds are classified as Class A, Class B, or Class A-1, depending on the type of construction to be performed. If the contract is susceptible to two classifications, normally the higher rate is applicable (Table 12-1).

12-4.1 Separate Contracts

Separate contracts take the same classification as a general contract. Neither the classification nor the rate is changed by subdividing the work or by the Government's providing certain materials.

12-4.2 Subcontracts

Subcontracts take the same classifications and rates as general contracts.

12-4.3 Non-Deviating States Exceeding 12 Months Stipulated Time

For states in conformance (non-deviating) with the Surety Association of America (SAA) rates (Table 12-1) where the construction time exceeds the bond stipulated time of 12 months, add 1 percent of the bond premium for each month in excess of 12 months.

12-4.4 Non-Deviating States Exceeding 24 Months Stipulated Time

For states in conformance (non-deviating) with the SAA rates (Table 12-1) where the construction time exceeds the bond stipulated time of 24 months, add 1 percent of the basic premium for each month in excess of 24 months.

12-4.5 Deviating States Exceeding Stipulated Time

For states not conforming (deviating) with the SAA rates where the construction time exceeds the bond stipulated time of 12 months, add ½ percent of the basic premium for each month in excess of 12 months up to 24 months and 1 percent of the basic premium for each month in excess of 24 months.

12-4.6 Consent of the Surety Not Required

If the consent of the surety is not required and given for changes or extras, first and renewal premiums for the additional cost thus caused are computed at manual rates from the date of the bond.

12-4.7 Consent of the Surety Required

If the consent of the surety is required and given for changes or extras, premium for the additional cost thus caused is computed at manual rates from the date of such surety's cost.

12-5 COST OF PERFORMANCE AND PAYMENT BONDS

Performance and payment bonds are normally obtained as a single package. The premium is the same as for the performance bond alone. Rates vary with the type of the contract work, the dollar value, and the length of the contract.

12-5.1 Coverage Limit of Performance Bonds

The coverage limit of performance bonds is specified in each contract and is usually for the full amount of the contract price (bid amount). The premium is adjusted at the completion of the work for any modification changes in the contract price other than changes due to time bonuses or penalties. If the original contract price is increased through change order, the contractor must pay an additional premium. Conversely, if any part of the original work is deleted and the original price thereby reduced, the contractor will receive a refund from the surety.

12-5.2 SAA Issues Advisory Rates

It should be noted the surety industry has become a state regulated industry. The SAA issues advisory rates, but these rates may or may not be accepted by the state involved. Therefore, actual rates charged by surety corporations may vary from state to state.

12-5.3 Types and Classes of Bonds

Table 12-2 shows the various types and classes of bonds.

12-5.4 Calculation of Bond Premium Cost

Example 12-1 illustrates the calculation of bond premium cost. Since the rates are subject to change and may vary by state, the calculations are to be used as a sample only. The cost engineer is responsible for ensuring the rates used are accurate and current. This example assumes a canal excavation project in Tennessee to be accomplished at an estimated cost of $2.5 million, including profit, with a duration of 20 months. From Table 12-2 excavation is found in Class B. Referring to the Class B rate schedule in Table 12-1, the premium for a performance-payment bond written in the full amount of the contract price (including bond) and by a non-deviating Surety Association Company would be calculated as follows:

Example 12-1 - Bond Premium Calculation

Estimated Bond	Amount	x	Rate =	Premium
First	$ 100,000	@	$25.00/M	$ 2,500
Next	400,000	@	15.00/M	6,000
Next	2,000,000	@	10.00/M	20,000

Anticipated Estimated Amount (inc. bond)	
$2,500,000	$28,500

(20 mos - 12 mos = 8 mos surcharge)

Eight additional months @ 1%/MONTH

(8 mo × 1% × $28,500)	2,280
TOTAL PREMIUM	$30,780

Table 12-1 Bond Rates

1. Performance and performance-payment bond rates and lump sum and unit fixed price contracts where the stipulated time for completion is not over 12 months (Bond rates may change and should be verified on an annual basis).

a. Non-deviating SAA advisory rates per $1,000 of contract value for all jurisdictions except South Carolina, Louisiana, Delaware, Hawaii, and Arkansas are as follows:

Amount of Contract Price		Class B	Class A	Class A-1
First $	100,000	$25.00/M	$15.00/M	$9.40/M
Next	400,000	15.00	10.00	7.20
Next	2,000,000	10.00	7.00	6.00
Next	2,500,000	7.50	5.50	5.00
Next	2,500,000	7.50	5.00	4.50
Over	7,500,000	6.50	4.50	4.00

b. Deviating rates from companies that may or may not belong to the SAA and are dependent on competition and contractor net worth. The following rates per $1000 of contract value are typical of a large contractor having a preferred rate structure:

Amount of Contract Price		Class B	Class A	Class A-1
First $	100,000	$10.00/M	$7.50/M	$4.90/M
Next	400,000	8.00	5.50	4.50
Next	2,000,000	7.00	5.00	4.10
Next	2,500,000	6.00	4.40	3.80
Next	2,500,000	5.00	3.80	3.50
Over	7,500,000	4.50	3.25	2.95

2. Performance and performance-payment bond rates for lump sum and unit fixed price contracts where the stipulated time for completion is not over 24 months (Bond rate may change and should be verified on an annual basis). Non-deviating SAA advisory rates per $1,000 of contract value for South Carolina, Louisiana, Delaware, Hawaii, and Arkansas are as follows:

Table 12-2 Contract Bonds Rate Classifications

Amount of Contract Price		Class B	Class A	Class A-1
First $	500,000	$14.40/M	$10.80/M	$7.20/M
Next	2,000,000	8.70	6.72	6.00
Next	2,500,000	6.90	5.28	4.92
Next	2,500,000	6.30	4.92	4.44
Over	7,500,000	5.76	4.44	3.96

Class A
Unless otherwise stated, the rates on the preceding page apply to contracts for furnishing and installing, or installing only, certain services or equipment such as the following:

Airport Runways
Aluminum siding
Athletic Fields
Beacon or floodlights
Burial Contracts
Ceilings (metal or acoustical tile)
Certain Walls (nonstructural)
Coal Storage
Ducts (underground power, light, phone)
Elevators/escalators
Greenhouses
High-pressure power piping
Janitorial service
Machinery made to special order
Map Making
Millwork
Murals
Parking Areas
Planting and Cultivation of Land
Playgrounds and Parks
Ski lifts
Sprinkler systems
Stone (furnishing, delivering only
Storage tanks metal
Tennis courts
Water carnage of freight
Water proofing (except with gunite
Wind tunnels

Class B
Unless otherwise stated, the rates on the preceding page apply to contracts such as the following:

Airport buildings
Aqueducts
Atomic Energy Plants
Breakwaters
Canals and Canal Lining
Carpentry
Coal Stripping
Commercial Buildings
Concrete work
Dams
Dikes
Ditches
Docks and drydocks
Drilling contracts
Educational Buildings
Electrical
Embankments
Excavations
Filling Stations
Gas piping
Golf Courses
Grain Elevators
Gunite Contracts
Heating Systems
Hospital Buildings
Incinerators
Industrial buildings and plants
Jetties
Landscaping
Locks
Masonry
Missile installations
Nuclear Reactors
Office Buildings
Offshore Platforms
Painting
Piers
Pilings
Sand blasting
Sculptures
Sea Walls
Sewage Disposal plants
Sewers/septic tanks
Shipyards
Spillways
Stone
Subways
Swimming pools
Terminals-buses
Test Boring
Tile and terrazzo
Transmission or distribution lines
Tunnels
Underwater cables
Ventilation systems
Water Works
Wells

Filtering Plans
Fountains
Garbage disposal plants
Gasoline cracking plants
Gas compressor stations
Gas mains and laterals
Pipelines for water
Plastering
Plumbing
Power Plants
Public improvements
Railroad roadbeds
Wharves

Class A-1

Unless otherwise stated, the rates on the preceding page apply to contracts for furnishing and installing, or installing only, certain services or equipment such as the following:

Arms
Ash conveyors
Automatic Strokers
Automatic telephone exchange and equipment
Automotive service contracts
Band concerts
Bird control
Boiler re-tubing and repair
Bookbinding
Cataloging
Coal handling machinery
Computers and data processing equipment
Conveyors
Data processing and computer works
Doors/Dynamos
Exterminating Contracts
Fire Alarm Systems
Fire escapes
Flagpoles
Floats
Floors
Furnishing food services
Gas Tanks
Generators
Grain doors, salvage and disposal
Guardrails
Heating
Incinerator operations
Insulation contracts
Kitchen equipment
Laboratory equipments
Leasing of motor vehicles
Lightning rods
Lock gates
Mail handling machinery
Metal windows and shutters
Mosquito control contracts
Movies
Office personnel
Organ repairs
Ornamental ironworks
Parking meters
Photogrammetric work
Pipelines for oil or gas
Police alarm systems
Projectiles
Public address and music systems
Radio Towers
Radiological equipment
Recapping automobile tires
Repair of automobiles and trucks
Re-smelting old metal
Riprap Stone (furnishing only)
Rolling stock
Scaffolding cost engineer should
Sidewalks
Signaling systems on railroads
Signs (all)
Stack rooms
Standpipes
Street and subway lighting systems
Temporary personnel services
Thermostat equipment
Tollgates
Track laying
Traffic control systems on highways
Training manuals
Tree trimming and removal
Watchmen and signal services
Water Towers
Weather Stripping
Weed mowing
Window cleaning
Work and Labor
X-Ray inspections

CHAPTER 13

OTHER COSTS

13-1 GENERAL

This Chapter provides guidance regarding other costs not specifically identified in previous Chapters, but costs that must be included in the preparation of detailed project cost estimates.

13-2 CONTRACTOR COMPETITION AND MARKET ANALYSIS

Each Government estimate for procurement will reflect the fair and reasonable cost to a prudent contractor for performing the scope specified. Although contractor bids will reflect the anticipated competitiveness, the Government estimate must remain the "yardstick" against which cost reasonableness is judged. Therefore, Government estimates can contain adjustments due to quotations on direct and indirect costs, but no separate adjustment due to contractual acquisition methods.

During development of the design-stage CWE, market competitiveness may be considered for funding and design alternatives. When competition is included in the CWE, it should be clearly defined and made known to the program manager.

13-3 OTHER PROJECT COSTS

13-3.1 Military Projects

For the Navy, the CWE includes all project costs (including SIOH and a design-build fee if applicable) except for contingency. CWE plus contingency is the Funding Requirement (FR). For all other services and DoD agencies, the CWE includes all project costs including contingencies. The CWE (or FR for the Navy) is equivalent to the Total Request line on the DD1391.

13-3.1.1 SIOH

An allowance or cost calculation for construction management is normally included in each CWE. Planning estimates may include SIOH, a factor expressed as a percentage applied to the subtotal of the construction contract. The rate of SIOH and its application is further discussed in the specific program regulation. The current cognizant design agency's authorized SIOH percentage for the continental United Stated (CONUS) and OCONUS should be used.

13-3.1.2 Other Project Costs

In order for a total project estimate to be prepared, other project costs identified in project requirements and per cognizant design agency guidance need to be estimated.

These costs, such as as-built drawing preparation, O & M manual preparation, need to be identified and included as determined by the project manager and specific program requirements.

13-4 COST ESCALATION

Cost estimates, when finalized, must reflect cost escalation due to inflation. This cost escalation must be identified as a separate element within the cost estimate. This allows the cost engineer the ability to easily adjust the estimate to reflect schedule changes. The usual method of applying cost escalation is to use the midpoint of construction as the end date of the escalation.

13-4.1 Military Programs

The Military Construction Program (MCP) Index will be used to project escalation due to inflationary factors. The indexes are based on forecasts of anticipated escalation for the future fiscal years issued by the Comptroller of the Department of Defense. The MCP index is updated annually and available through UFC 3-701-01 FOR THE CURRENT YEAR.

13-5 CONTINGENCIES

Contingencies are used to cover unknowns, unforeseen uncertainties, and/or unanticipated conditions that are not possible to adequately evaluate from the data on hand at the time the cost estimate is prepared, but must be represented by a sufficient cost to cover the identified risks. Contingencies relate to a known and defined project scope and are not a prediction of future project scope or schedule changes.

13-5.1 Elements of Contingencies

Contingencies are normally separated into two elements - design contingencies and construction contingencies.

13-5.1.1 Design Contingencies

Design contingencies are assigned to cover construction cost increases due to design incompleteness, detail changes, alternative design changes, and associated costing inaccuracy. Design contingencies will normally decrease, as design information becomes known.

13-5.1.2 Construction Contingencies

Construction contingencies are a reserve for construction cost increases due to adverse or unexpected conditions such as unforeseeable relocations; foundation conditions; utility lines in unknown locations; quantity overruns; or other unforeseen problems beyond interpretation at the time of or after contract award.

13-5.2 Cost Risk Analysis

When considerable uncertainties are identified, cost risk analysis can establish the areas of high cost uncertainty and the probability that the estimated project cost will or will not exceed the actual cost. Cost risk analysis is a process to consider costs and

risks as follows:

- Identify risks within a project that could result in cost change.
- Measure this change impact on the estimated cost.
- Manage these risk elements to avoid their negative consequences. This type of analysis is an in-depth approach that replaces a simple percentage rate contingency assignment. Computer programs are commercially available to perform cost risk analysis and are discussed in appendix F.

13-6 APPLICATION OF CONTINGENCIES

Contingency allocations are specifically related to the project uncertainties and should not be reduced without appropriate supporting justification. The decision to reduce these uncertainties and improve the cost estimate through additional investigations or studies, or to proceed with the higher cost estimate, is a management decision.

13-6.1 Military Programs

The design contingency covers component items that cannot be analyzed or evaluated at the time the estimate is prepared; however, such items are susceptible to cost evaluation as engineering and design progresses. The magnitude of design contingency is determined by the level of technical complexity of the project for which the estimate is being prepared.

13-6.1.1 Construction Contingencies

Contingency percentages for military projects may be applied in accordance with cognizant agency requirements.

CHAPTER 14

CONTRACT MODIFICATIONS AND OTHER NEGOTIATED PROCUREMENT

14-1 GENERAL

FAR Part 36 requires an independently prepared Government estimate for modifications in excess of $100,000. Normally, estimates are not required for changes less than $100,000, but are required by the Contracting Officer for unilateral modifications. For contract modifications, the amount refers to the sum of the absolute value of increases and decreases. For example, a modification containing an increase of $60,000 and decrease of $45,000 has an absolute value of $105,000, and a Government estimate would be required.

14-2 DIRECTIVES

Those responsible for the preparation of cost estimates for contract modifications should be thoroughly familiar with the requirements set forth in FAR, DFARS, their supplements, the appropriate ER, and per guidance of the cognizant design agency. The acronyms for the Federal Acquisition Regulations are listed in the Glossary.

14-3 NEGOTIATED PROCUREMENT AND CONTRACT MODIFICATIONS

The cost engineer has several important tasks to perform prior to actually preparing the estimate. The cost engineer will prepare a technical analysis of the proposed procurement action or contract modification. Some of the major activities to be considered in preparing the technical and cost analysis in addition to labor, material, equipment and construction techniques include:

14-3.1 Review of Available Documents

Reviewing available documents and becoming thoroughly familiar with the scope and requirements of the changed work. This will perhaps entail a comparison, analysis, and discussions with the designer or field office to ensure common understanding of the scope of work. The cost engineer must assure that the proposed modification or procurement action is clearly defined with regard to specified work requirements, proposed measurement, and payment.

14-3.2 Determine Status of Construction

Determining the status of construction and the effect the changed work will impact the construction schedule. This will require obtaining progress reports, schedules, and discussion with the field office responsible for the construction. For major or complex changes, a visit to the construction site is required.

14-3.3 Contractor's Existing Methods, Capabilities and Rates

The cost engineer shall be fully aware of the contractor's existing methods, capabilities, and rates of accomplishment. The estimate should not arbitrarily include methods and capabilities different from the method in which the contractor is performing the ongoing work. The cost engineer should base the change on existing contractor operations for similar work. When work is anticipated to be subcontracted, the estimate should be prepared to include subcontractor costs.

14-3.4 Current Labor and Equipment Rates

The cost engineer shall obtain current labor and equipment rates for the work force and work actually ongoing. These rates are usually available from labor reports or from the contractor upon request. Suppliers for materials should be contacted for quotes. The price, which the contractor is expected to pay, should be the basis for estimating material costs. A list of equipment on the job should be obtained and equipment rates determined in accordance with EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule.

14-3.5 Teaming with Negotiator

As a team member working with the negotiator, coordinate with the contractor to agree on scope of work and format prior to preparation of the Government estimate and submittal of the contractors proposal. This discussion will assist both the Government and contractor in reaching a mutually accepted scope of work to eliminate unnecessary effort for both parties during negotiations.

14-4 PREPARATION OF COST ESTIMATES AND NEGOTIATION

The estimate can be prepared after all the information has been collected and analyzed, and the cost engineer decides upon the format to present the change. It is important to have a prior agreement and discussion as previously indicated with the contractor. Generally, successful negotiations depend on agreement in scope of work and accurate quantity take-off and a detailed estimate supported by accurate cost data for all elements. General guidance for the calculation of direct costs is noted as follows:

14-4.1 Additional Work

For additional work, items and format should be priced similar to a new contract as performed by the known contractor. New work should be priced at the rates anticipated to be in effect at the time the work will be performed.

14-4.2 Changed Work

For changed work, a separate quantity takeoff for each item directly affected will be required for both before and after the change. Each item should be priced at the rates, which would be in effect at the scheduled time of accomplishment. Typically, each item of changed original work is priced, and each comparable item of revised work is priced at the applicable rates. The net cost (or credit) would be obtained by subtracting the total of the original work from the total of the revised work. It is important that the cost engineer maintain a comparable scope of work for both estimates. When an item of

work will be performed as originally specified, except for a revision in quantity, the net quantity may be estimated directly for that item.

14-4.3 Deleted Work

For deleted work, the item and format should be priced similar to a new procurement as performed by the current contractor. Rates in effect at the time the work would have occurred should be used. In addition to the direct cost of the work, overhead, profit, and bond costs should be included for credit on the deleted work.

14-4.4 Impact Related Costs

Impact related costs, if applicable, should be clearly described and included as a part of each cost estimate.

14-4.5 Detail of Estimate

The cost estimate for a modification should be prepared in as much detail as required to clearly cost the change for negotiations. In many instances, even more detail is required to negotiate the lowest reasonable price. The estimate should, however, be modified to reflect a negotiated procurement in lieu of an advertised procurement. It should include a general summary sheet relating the major categories of cost of the modification, both for increases and for decreases. Revised construction drawings and specifications are included in the modification supporting documents. When the cost engineer prepares the estimate, the effort should be the same as the contractor acting prudently under the given conditions. The results will generally provide an accurate estimate, which can be used as a firm basis for negotiation. The Government estimate should not rely on past generalized rates and settlements unless actually appropriate to the specific modification under consideration.

14-5 COST CONSIDERATIONS

The estimate should be based on the data actually collected and experienced from the project. Time motion studies are important, and periodic field visits and log records can provide this data. Previous modifications can also provide valuable data. Valuable cost data is often available from past audit reports on other modifications. With the assistance of the auditor, many costs can be readily obtained and may be directly applicable to the present modification. The cost engineer must exercise judgment in the use of audit information from a specific report, which may not be released.

14-6 TIMELINESS OF PREPARATION

Timeliness of the estimate for modification is as important as its accuracy. Procurement requirements stress the importance of settlement prior to commencing the work. Therefore, the cost engineer should immediately proceed to obtain the necessary data for the modification and notify the appropriate authorities of the earliest date that the estimate can be completed. It is generally understood that the larger and more complex the change, the longer the time requirement for the initial preparation of an accurate cost estimate.

14-7 IMPACT COSTS

When a modification is initiated, the settlement of that modification includes not only the cost and time change of the work directly affected but also the cost and time impact on the unchanged work. The impact portion of a modification is very important to be estimated accurately. The scope of impact may be broad and susceptible to a large variety of situations. The following discussion will provide guidance and understanding of impact cost considerations.

14-7.1 Acceleration and/or Delay

Generally, the greatest portion of impact costs results from acceleration and/or delays due to changes. When delays due to a change can be minimized, impact costs are reduced. Impact costs are normally determined on a case-by-case basis for each particular situation. The determinations have been based on interpretation of the Contract Clauses and on Board of Contract Appeals and court decisions.

14-7.2 Comparative Review

Impact costs are generally presented by the contractor as part of the proposal. The existing construction schedule furnished by the contractor must be analyzed to determine the actual construction and the extent of the impact at the time of the change. The modification work must be superimposed upon the original schedule in such a position to determine and minimize the delay. The revised plan must then be thoroughly reviewed relative to the existing job plan. This comparative review should indicate those areas, which have been affected by the modification.

14-7.3 Factual or Judgmental Costs

Once the extent of impact has been determined, each cost claimed must be classified as either factual or judgmental. The factual costs are those which are fixed and established and can be determined directly from records. These include rental agreements, wage rate agreements, and purchase orders. Once the item has been determined valid as a factual impact, the item cost may be directly calculated. The amount of cost change is stated on the certified document or can be determined from the scheduled time change of the construction progress plan. Judgmental costs are those, which are dependent on variable factors such as performance, efficiency, or methodology and cannot be stated factually prior to actual accomplishment. These must be negotiated and based upon experienced judgments. In actual practice, most factual costs are based to varying degrees upon judgment.

14-7.4 Cost of Impact

The estimate of impact should be prepared for each activity affecting the change. In some cases, the impact items are typically so interrelated that it is often best to develop a detailed plan for accomplishing the remaining work. Each item in this plan would be estimated at the productivity and rate in effect at the time the work is to be accomplished. The same items of work under the original plan would also be estimated at the productivity and rate in effect at the originally scheduled time. The comparison of these two estimates yields the cost of impact. Impact costs determined to be valid must be estimated by the most accurate method available and included in the modification.

14-7.5 Impact Factors or Conditions

The following impact factors or conditions play a recurring role in determining impact costs. Each modification must be evaluated separately and impact costs considered especially for the implications of the particular change. Impact costs should only be included by detailed itemization and only after having been found to be valid.

14-7.5.1 Factual

Impact costs considered factual include escalation of material and labor wage rates, and change in equipment rates.

14-7.5.2 Judgmental

Impact costs considered judgmental include change of efficiency resulting from rescheduling; loss of labor efficiency resulting from longer work hours; loss of efficiency caused by disruption of the orderly existing processes and procedures; inefficiency from tearing out completed work and the associated lowering of morale; loss of efficiency during rescheduling of manpower; inefficiency incurred from re-submittal of shop drawings, and sample materials; additional costs resulting from inability to transfer manpower expertise to other work; and change in management for the revised work.

14-7.5.3 Factual Based on Judgmental

Impact costs considered factual but should be based on judgmental decisions including increase from extending the storage period for materials and equipment; increase from extending the contract for labor cost and subsistence; increase from a longer period of equipment rentals or use; increase from a longer period of utilizing overhead personnel, materials, and utilities; and increase from a longer period of providing overhead and project office services.

14-8 SUPPORT FOR THE NEGOTIATIONS

Before participating as part of a negotiating team, the cost engineer must become thoroughly familiar with negotiating requirements and techniques. The expertise and support of the cost engineer can be very beneficial in major and complex changes.

14-8.1 Review for Allowability

Many of the costs that are presented in the contractor's proposal breakdown must be reviewed for allowability. Of those costs found allowable, each item must further be reviewed for applicability for that portion relevant to the particular change. The auditor has primary responsibility for this determination and should advise the negotiation team accordingly. For those cases where the auditor is not directly involved, the negotiation team must base their decisions on regulatory guidance and the best expertise available. In accomplishing the review of the proposal, the cost engineer should remain constantly aware of the contractor's profit motivation. The Government must consider all reasonable costs anticipated to be incurred by the contractor.

14-8.2 Settlement of Disputed Work Items

In some cases, portions of the cost estimate may be revealed only to the extent

determined necessary by the negotiator to settle disputed items of work. The total of the Government estimate will not be released during negotiations. On occasion, important information has been revealed through negligence by allowing the estimate to lay open upon the negotiation table. The "For Official Use Only" designation will be removed after issuance of a signed modification.

14-8.3 Revision of the Government Estimate

Revision of the Government estimate may be necessary as a result of an error, changed conditions, or additional information. Approval authority for revisions to the estimate remains the responsibility of the Contracting Officer or authorized original estimate-approving official. When the Government estimate is changed during or subsequent to conferences or negotiations, the details of the basis for the revision or changes in price shall be fully explained and documented in the price negotiation memorandum. A copy of each estimate that has been approved should be included in the official modification file along with the details and circumstances causing the revisions.

CHAPTER 15

PROTESTS OR LITIGATION CONCERNING THE GOVERNMENT ESTIMATE

15-1 GENERAL

There are two major situations when the cost engineer may become involved in litigation concerning the Government estimate include:

- Either a bid protest when bids are opened;
- Or if a proposed change order/modification is not accepted by a contractor and the contractor pursues the dispute.

The procedure to process the issues are the same for all types of projects or contracts associated to military programs. When either of the above occurs, the cost engineer has a major role in reviewing the Government estimate and evaluating the Government's position.

15-1.1 Bid Protests

During the bidding process, and upon receipt of bids, if all bids are sufficiently higher than the Government estimate, any one of the proposer/offerors can protest the unreasonableness of the Government estimate by stating it contains errors or omissions as being too low and not fair and reasonable. A major concern occurs for a bid opening, as the contract cannot be awarded to the low bidder if the low bid exceeds the Government estimate by 25 percent for military programs. In such a case, a bid protest will delay all further contractual action to award until either the bid protester withdraws the protest, the Government estimate is revised, or a determination is made through the judicial process.

15-1.2 Contract Modifications/Change Orders

During the on-going construction, changes will occur; including over-runs of quantities, and disagreements may occur between the contractor and the Government. If a dispute does arise, it generally concerns a disagreement between what the government considers a fair and reasonable cost as compared to the proposal offered by the contractor. In the event, an agreement can’t be reached between the contractor and the Government, a dispute, or claim may result.

15-2 PREPARATION OF TECHNICAL AND COST ANALYSIS BY COST ENGINEER

The cost engineer should prepare a technical and cost analysis evaluation for documentation of the contract file. Major factors in the analysis include:

- The technical analysis will consist of an in-depth, point-by-point response

to all issues raised on the cost estimate by the protestor or contractor.

- The cost analysis will consist of a review of the Government estimate, including all backup and supporting data, and assumptions made which support the estimate.

Additional information concerning factors to be considered in the technical and cost analysis is presented in Chapter 14. Reference is made to FAR sub-part 15.608 for proposal evaluation.

15-3 REVIEW OF THE GOVERNMENT ESTIMATE

15-3.1 Bid Protests

If there is a bid protest concerning the reasonableness of the Government estimate, i.e. a bidder is claiming the estimate is too low, the cost engineer should conduct an independent review of the Government estimate.

15-3.1.1 Estimate Evaluation

The cost engineer should review the estimate to be sure that it does not contain mistakes. This evaluation must be completed as soon as possible to provide timely advice to the cognizant agency's staff to preclude delay in award. If the Government estimate is revised, and the revised estimate brings an offeror's price within the range of a fair and reasonable price, award will be made provided funds are available. The revised estimate requires the same approval authority as the original Government estimate.

15-3.1.2 Fair and Reasonable Determination

When the Government estimate is reviewed and has been determined to be fair and reasonable for the intended scope of work, unless the protester withdraws the bid protest, the usual procedure will require a Contracting Officers Decision (COD) in the form of a (letter) memorandum of denial of the protest unless the protestor withdraws the bid protest.

15-3.1.3 Meetings

Meetings may be held with the apparent low bidder or contractor prior to issuance of the COD memoranda to ensure that both the Government and the protestor have the opportunity to review the project and agree to the scope of work as specified by the plans and specifications. Meetings will also allow discussion whether there are unusual conditions or circumstances that may affect or complicate the work. If a meeting reveals an error or omission in the Government estimate, it may be revised as previously discussed.

15-3.1.4 Resolution Assistance

The protest/dispute may take several months to resolve. The Government's position may be reviewed and evaluated at the appropriate agency office, as well as by the

General Accounting Office, a court, or a board of contract appeals. During each of these reviews, questions will arise, and the cost engineer will be called on to support the estimate. The cost engineer(s) responsible for preparing the Government estimate are most familiar with the estimate, as such, should be prepared to assist counsel, contracting, and other staff to resolve the issue; and be prepared to testify in court and certify the validity of the estimate.

15-3.2 Contract Modifications/Change Orders

The cost engineer may also be required to prepare cost estimates for major or complex changes; or design change orders for on-going construction projects; major or extensive quantity overrun bid items; or even assisting in evaluating claims occurring during construction whereby a Government estimate is required.

15-3.2.1 Cost Estimate Agreement

Prior to the cost engineer finalizing the Government estimate, it is important to meet with the contractor to agree on the scope of work concerning change orders for on-going construction. The cost engineer will prepare the cost estimate as detailed in Chapter 14. On occasion, disputes arise between the Government and the contractor, primarily due to a very wide variance between the value of work estimated by the contractor and the Government estimate being on the low side. When a dispute arises, meetings are necessary in an attempt to resolve the difference in cost between the contractor and the Government. Even when the scope may be in general agreement, the cost may be in dispute. The Contracting Officer may issue a unilateral modification establishing the cost and the modification may result in litigation. The procedure upon encountering an impasse generally results in the Government issuing a COD, and the process is the same as previously discussed for a bid protest.

15-3.2.2 Estimate Revision

It is possible that not all of the facts of a claim, change, or major overrun of quantities have been provided or verified by the cost engineer. In those cases where the cost engineer was unable to meet with the contractor, and additional facts are discovered by other means, the cost engineer may revise the Government estimate as appropriate, provided an original Government estimate was prepared. The revised Government estimate requires the same approval authority as the original Government estimate. Upon revising the Government estimate and mutual agreement by the contractor and Government, a modification is processed.

15-3.2.3 Revision Documentation

When the Government estimate is changed during or subsequent to conferences or negotiation, the basis for the revision or changes in price shall be fully explained and documented in the price negotiation memorandum. Judgment in making this type of decision should be based on the circumstances of a particular issue, not all encompassing, and recommendations should be made to the Contracting Officer. For major differences in cost, disputes or claims not resolved, a revised Government estimate is recommended, supported by a technical and cost analysis of the dispute in litigation.

15-4 SECURITY AND DISCLOSURE OF GOVERNMENT ESTIMATES

Security and disclosure of the revised Government estimate should be handled in the same manner as the original Government estimate. Procedures for handling the Government estimate are described in Chapter 2.

15-5 MISTAKE IN BIDS

After the opening of bids, contracting officers shall examine all bids for mistakes. In cases of apparent mistakes and in cases where the contracting officer has reason to believe that a mistake may have been made, the contracting officer shall request from the bidder a verification of the bid, calling attention to the suspected mistake. Any clerical mistake, apparent on its face in the bid, i.e. obvious misplacement of a decimal point, may be corrected by the contracting officer before award, after first receiving verification of the bid intended.

15-5.1 Before Award in Sealed Bidding

For other mistakes disclosed before award in sealed bidding, the bidder must provide clear and convincing evidence to establish both the existence of the mistake and the bid actually intended. The contracting officer must make a determination as to the circumstances to verify the mistake; to allow the bidder to withdraw the bid; or make a determination that the bid be neither withdrawn nor corrected. The cost engineer may be part of the team of specialists to provide an analysis and a recommendation to the contracting officer. For the cost engineer, the evaluation could be the verification of a quantity as related to a unit price bid item; or determination of a fair and reasonable cost for a service or product. The cost engineer may refer to FAR part 14 for the appropriate definitions, discussions and overview of the acquisition requirements pertaining to sealed bidding.

15-5.2 Before Award in Negotiated Procurement

The process for determination of a mistake in bid when the solicitation of a project is contracted by negotiated procurement is similar to the procedure as for sealed bidding. Additional tools are available to the Government to amend a solicitation before award as compared to sealed bidding. Clarification may be used to communicate with an offeror for the sole purpose of eliminating minor irregularities, informalities, or apparent clerical mistakes in the proposal. In negotiated procurement, discussions mean any oral or written communications between the Government and an offeror that involves information essential to determine the acceptability of a proposal or provides the offeror an opportunity to revise or modify its proposal. When, either before or after receipt of proposals, the government changes, relaxes, increases, or otherwise modifies its requirements, the contracting officer shall issue a written amendment to the solicitation. In the event evaluation factors are selected to evaluate proposals, price or cost to the Government shall be included as an evaluation factor in every source selection. If a mistake in a proposal is suspected, the contracting officer shall advise the offeror or otherwise identifying the area of the proposal where the suspected mistake is and request verification. If the offeror verifies its proposal, award may be made. If an offeror alleges a mistake in its proposal, the contracting officer shall advise the offeror that it may withdraw the proposal or seek correction by submitting clear and convincing

evidence and a determination is made by agency. The cost engineer may also be involved in providing support to the contracting officer if any mistake concerns scope, quantity or prices in the Government estimate. The cost engineer may refer to FAR part 15 for the appropriate definitions, discussions and overview of the acquisition requirements pertaining to negotiated procurement. In the event negotiations are conducted with offeror's in the competitive field, the cost engineer should be a member of the negotiation team.

CHAPTER 16

STANDARD ESTIMATING FORMS

16-1 GENERAL

This Chapter contains a discussion of the standard estimating forms with a brief explanation of their use in presenting manually prepared construction cost estimates. A project narrative may be provided for each cost estimate prepared using these forms. Refer to Chapter 4-3 for factors to be considered when preparing the narrative.

16-1.1 Completed Examples

Completed examples of these forms are provided in this Chapter. Estimates developed using these forms may be prepared in an electronic format or pencil format. For uniformity in form completion, the following general guidance is given:

- Each original sheet should be in reproducible quality.
- Once the estimate has been completed, checked, and approved, the desired number of copies should be reproduced from the original.
- For Architect-Engineer prepared estimates, the original should be forwarded with the final submittal.
- Originals should normally be retained by the cost engineering office preparing the estimate.
- A cover sheet should be initialed by both the preparer and the reviewer.

16-2 FORMS

Although no forms are mandatory for use in preparing early design estimates, it is recommended that the cost engineer consider using form expressing unit price and extended price in columns. The following standard estimating forms may be used in preparing detailed construction cost estimates for military projects.

16-2.1.1 Estimate Detail Summary Sheet

Estimate Detail Summary Sheet, Figure 16-11, is used to summarize project costs, to relate the method of distribution of overhead and profit to the various bid items, and to determine the overall price for each bid item. For unit price bid items, calculations, results, and rounding may be shown on the line following the total bid item price calculation. Rounding of Lump Sum bid items may also be shown similarly. The total cost, or adjusted cost, should be transferred to the bidding schedule.

16-2.1.2 Cost Estimate Analysis

Cost Estimate Analysis, (Figure 16-12), is used to itemize and quantify work tasks and to calculate the direct cost for each task. The form follows, column by column, the format shown in the Cost Book. It is also intended as the direct cost summary sheet for each bid item. Items of significant cost should relate to other detailed backup sheets of analysis or quotations.

16-2.1.3 Construction Cost Estimate Worksheet

Construction Cost Estimate Worksheet, Figure 16-13, is used for miscellaneous cost items. Common uses include quantity takeoff, description and discussion pages, and price quotations.

16-2.1.4 Crew and Productivity Worksheet

Crew and Productivity Worksheet, Figure 16-14, is used to develop a crew analysis and task unit cost for labor and equipment. This is necessary for significant and unusual construction tasks. The "CREW REF NO" can be completed similar to the crew names described in the Cost Book.

16-2.1.5 Wage Rate Calculations

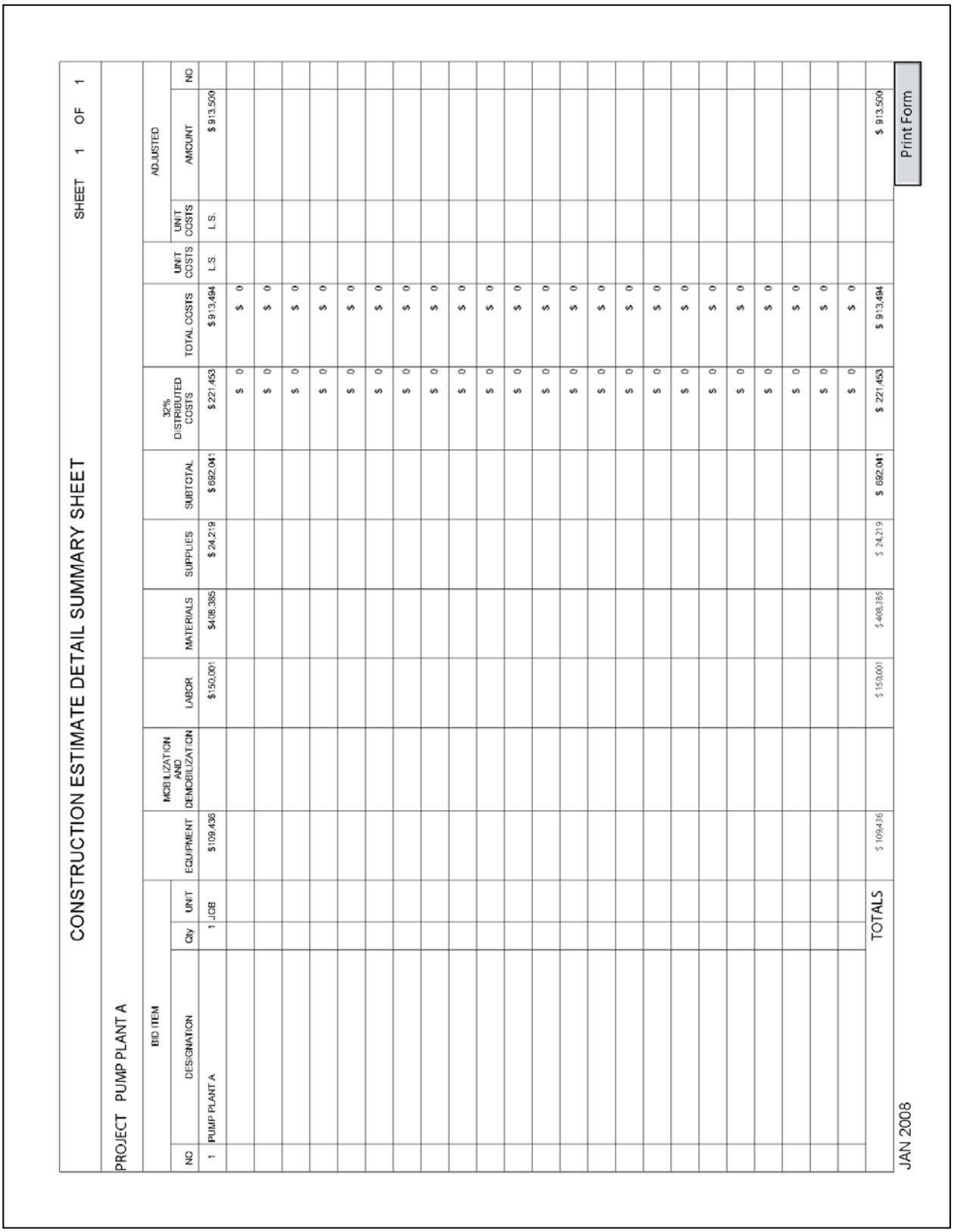
Wage Rate Calculations, Figure 16-10.

CONSTRUCTION ESTIMATE				SHEET 1 OF 1	
PROJECT CONSTRUCT PUMP PLANT A				INVITATION NO. DACW97-01-0001	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
1	PUMPING PLANT A	1	JOB	L.S.	$ 913,500.00
			Total		$ 913,500.00
	APPROVED:				
	CHIEF, COST ENGINEERING SECTION				
	Date				

CONSTRUCTION ESTIMATE, JAN 2008

Print Form

Figure 16-1 Example Construction Estimate



CONSTRUCTION ESTIMATE DETAIL SUMMARY SHEET

SHEET 1 OF 1

PROJECT PUMP PLANT A

BID ITEM NO	DESIGNATION	Qty	UNIT	EQUIPMENT	MOBILIZATION AND DEMOBILIZATION	LABOR	MATERIALS	SUPPLIES	SUBTOTAL	32% DISTRIBUTED COSTS	TOTAL COSTS	UNIT COSTS	ADJUSTED UNIT COSTS	ADJUSTED AMOUNT	ADJUSTED NO
1	PUMP PLANT A	1	JOB	$109,436		$150,001	$408,385	$24,219	$692,041	$221,453	$913,494	L.S.	L.S.	$913,500	
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
										$ 0	$ 0				
	TOTALS			$109,436		$150,001	$408,385	$24,219	$692,041	$221,453	$913,494			$913,500	

Print Form

JAN 2008

Figure 16-2 Example Construction Estimate Detail Summary Sheet

CONSTRUCTION ESTIMATE WORKSHEET SUMMARY

SHEET 1 OF

PROJECT
CONSTRUCT PUMP PLANT A

SUBJECT
PUMP PLANT A

QUANTITY
1-JOB

SUBITEM	EQUIPMENT	LABOR	MATERIALS	SUPPLIES	SUBTOTAL	REF. PG.
CARE & DIVERSION OF WATER	$ 35,200.00	$ 7,800.00	$ 900.00	$ 1,000.00	$ 44,900.00	4
EARTHWORK FOR STRUCTURE	$ 45,100.00	$ 6,200.00	$ 0.00	$ 490.00	$ 51,790.00	7
SUBSTRUCTURE	$ 3,806.00	$ 51,581.00	$ 26,785.00	$ 12,809.00	$ 94,981.00	11
MACHINERY & APPT.	$ 12,800.00	$ 28,300.00	$265,000.00	$ 4,320.00	$ 310,420.00	18
GATES & VALVES	$ 2,200.00	$ 12,400.00	$ 38,100.00	$ 400.00	$ 53,100.00	22
AUXILIARY EQUIPMENT	$ 500.00	$ 1,200.00	$ 8,400.00	$ 100.00	$ 10,200.00	24
ASSOCIATES ITEMS	$ 1,200.00	$ 3,650.00	$ 4,100.00	$ 0.00	$ 8,950.00	26
TOTALS	$ 100,806.00	$ 111,131.00	$ 343,285.00	$ 19,119.00	$ 574,341.00	

Print Form

JAN 2008

Figure 16-3 Example Construction Estimate Worksheet Summary

CONSTRUCTION ESTIMATE WORKSHEET		SHEET 1 OF 2
PROJECT CONSTRUCT PUMP PLANT A		
SUBJECT SUBSTRUCTURE	QUANTITY 165 M3	
	SHIFTS PER DAY 1	HOURS PER SHIFT 10

PLAN OF OPERATIONS

USE READY-MIX SUPPLIER FOR 20.7 MPA CONCRETE

1. PLACE CONCRETE - 164M3 @ 7.5M3/HR = SAY 22 HRS
   - USE: HYD S. P. CRANE - 30TC 7522000
   - CONCRETE BUCKET - 2 CY B30Z1055
   - AIR COMPRESSOR - 250CFM A15Z0140
   - CONCRETE VIB -2.5 IN AIR C65XX001
   - LAB 4/M
   - 5 LABORERS
   - 1 CARPENTER

2. FINISH WORK
   - FLOAT2 CEMENT FIN - 293M2/16.3M2/HR = SAY 18 HRS
   - STEEL TROWEL -109M2/7.3M2/HR = SAY 15 HRS
   - USE I CEMENT FIN
   - 1 EA. POWER TROWEL

3. INSTALL WATER STOP - 8"
   - 1 CARP @ 2MIHR = 5312 = SAY 27 MHRS

4. CURE CONCRETE -
   - USE 2 LABORERS - 4 HR/DAY X 14 DAYS = 56 HOURS

JAN 2008

Print Form

Figure 16-4 Example Construction Estimate Worksheet (Sheet 1 of 2)

CONSTRUCTION ESTIMATE WORKSHEET		SHEET 2 OF 2
PROJECT CONSTRUCT PUMP PLANT A		
SUBJECT SUBSTRUCTURE	QUANTITY 165 M3	
	SHIFTS PER DAY 1	HOURS PER SHIFT 10

PLAN OF OPERATIONS

5. USE SUBCONTRACT QUOTE FOR RESTEEL 7.4MT

6. FORMING - USE 1 CARP 4/M + 4 CARP

A: BLDG WALL FORMS - 2 USES - 315M2/2 = 158M2
Bldg @ 3.9M2/CREW HR = 40.5 CREW HRS

B: SET & STRIP
WALLS @ 3.9M2/CREW HRS - 314M2/3.9 = 80.5 HRS
SLAB EDGE @ 7M2 /CREW HRS 53/7 = 7.6 HRS
ELEVATOR SLAB @ 3M2/CREW HRS = 109/3 = 36.3 HRS
SET/REMOVE SHORING @ 2M2/HR = 109/2 = 54.5 HOURS

TOTAL CREW HRS, BLDG/SET/STRIP = 219.4
SAY 220 HRS

C: FORM LUMBER -
SLAB @ 30BF/M2 = 30 (53) = 1590 BF
WALL @ 358F/M2 = 35 (153) = 5530 BF
ELEV SLAB @ 40BF/M2 =(I 09) = 4360 BF
TOTAL 11,480 BF

JAN 2008

Print Form

Figure 16-5 Example Construction Estimate Worksheet (Sheet 2 of 2)

CONSTRUCTION ESTIMATE DETAIL WORKSHEET A					SHEET 10 OF 29
SUBJECT SUBSTRUCTURE CONCRETE					QUANTITY 165 M3
EQUIPMENT					
UNIT OF EQUIPMENT	SIZE	NO.	HOURS*	RATE	AMOUNT
1. PLACE CONCRETE					
HYD S.P. R.T. CRANE - C75Z2000	30T	1	22.00	$ 42.61	$ 937.42
CONCRETE BUCKET - B30Z1055	2CY	1	22.00	$ 0.56	$ 12.32
AIR COMPRESSOR - A15Z0140	250CFM	1	22.00	$ 8.66	$ 190.52
CONCRETE VIBRATOR - C65XX001	2.5"	2	22.00	$ 0.85	$ 37.40
AIR HOSE - 100LF - A20Z0430	1.5"	2	22.00	$ 0.56	$ 24.64
2. FINISH CONCRETE					
STEEL POWER TROWELL - C25Z1560	46"	1	15.00	$ 1.63	$ 24.45
EQUIPMENT RATES TAKEN FROM EP-1110-1-8					
VOL #8, AUG 95. RATES HAVE BEEN ADJUSTED FOR					
50 HR WORK WEEK.					
				SUBTOTAL	$ 1,226.75
NOTE: USE WORKING HOURS	SMALL TOOLS	5.0	% OF LABOR		$ 2,579.06
				TOTAL EQUIPMENT COSTS	$ 3,805.81
LABOR					
OPERATIONS	CRAFT	NO.	HOURS*	RATE	AMOUNT
1. PLACE CONCRETE	4/M X-LABOR	1	22.00	$ 32.56	$ 716.32
	X-LABOR	5	22.00	$ 29.51	$ 3,246.10
	X-CARPENTER	1	22.00	$ 35.76	$ 786.72
	X-EQOPRMED	1	22.00	$ 38.15	$ 839.30
2. FINISH CONCRETE					
FLOAT	X-CEMTFINR	2	18.00	$ 33.63	$ 1,210.68
STEEL TROWELL	X-CEMTFINR	1	15.00	$ 33.63	$ 504.45
3. INSTALL WATER STOP	X-CARPENTER	1	27.00	$ 35.76	$ 965.52
4. CURE CONCRETE	X-LABOR	2	56.00	$ 29.51	$ 3,305.12
5. FORMWORK	4/M X-CARPENTER	1	220	$ 38.81	$ 8,538.20
	X-CARPENTER	4	220	$ 35.76	$ 31,468.80
				TOTAL LABOR COSTS	$ 51,581.21
JAN 2008					Print Form

Figure 16-6 Example Construction Estimate Detail Worksheet A

CONSTRUCTION ESTIMATE DETAIL WORKSHEET B — SHEET 11 OF 29

SUBJECT	QUANTITY
SUBSTRUCTURE CONCRETE	165 M3

MATERIALS

DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
* READY MIX CONCRETE 20.7 MPA (INCLUDES WASTE)	M3	175.00	$ 78.60	$ 13,755.00
* WATER STOP 9 PVC X 3/8" THK	M	53.00	$ 11.75	$ 622.75
SUBTOTAL : $14,378				
SALES TAX: 6%		14,378.00	$ 0.06	$ 862.68
RESTEEL SUBCONTRACTOR	MT	7.40	$1,560.00	$ 11,544.00
			TOTAL MATERIALS COST	$ 26,784.43

SUPPLIES

DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
CURING SUPPLIES	M2	476.00	$ 0.50	$ 238.00
FORM PLYWOOD ½"	M2	56.00	$ 7.00	$ 392.00
FORM PLYWOOD ¾"	M2	267.00	$ 10.00	$ 2,670.00
FORM LUMBER	MBF	12.00	$ 375.00	$ 4,500.00
FORM TIES & OIL	M2	476.00	$ 9.00	$ 4,284.00
SUBTOTAL : $12,084				
SALES TAX: 6%		12,084.00	$ 0.06	$ 725.04
			TOTAL SUPPLIES COST	$ 12,809.04

EQUIPMENT	$ 3,805.81
LABOR	$ 51,581.21
MATERIALS	$ 26,784.43
SUPPLIES	$ 12,809.04
TOTAL	$ 94,980.49

REMARKS: (Indicate by asterisk (*) prices on items which are based on quotation from manufacturers or suppliers)

DATE 3/1/10

PREPARED BY J. SMITH

CHECKED BY J. DOE

JAN 2008

Print Form

Figure 16-7 Example Construction Estimate Detail Worksheet B

CONSTRUCTION ESTIMATE DETAIL WORKSHEET C — SHEET 12 OF 29

SUBJECT: SUBSTRUCTURE CONCRETE — QUANTITY: 165 M3

EQUIPMENT

UNIT OF EQUIPMENT	SIZE	NO.	HOURS*	RATE	AMOUNT
AIR HOSE - 100LF - A20Z0430	30T	1	22	$ 42.81	$ 941.82
HYD S.P. R.T. CRANE - C75Z2000	2CY	1	22	$ 0.56	$ 12.32
CONCRETE BUCKET - B30Z1055	250CFM	1	22	$ 8.66	$ 190.52
AIR COMPRESSOR - A15Z0140	2.5"	2	22	$ 0.85	$ 37.40
CONCRETE VIBRATOR - C65XX001	1.5"	2	22	$ 0.56	$ 24.64
STEEL POWER TROWEL - C25Z156	46"	1	15	$ 1.63	$ 24.45
				SUBTOTAL	$ 1,231.15
(* NOTE: USE WORKING HOURS)				MOBILIZATION AND DEMOBILIZATION	
				SMALL TOOLS 5.0 % OF LABOR	$ 2,539.72
				TOTAL EQUIPMENT COSTS	$ 3,770.87

LABOR

OPERATIONS	CRAFT	NO.	HOURS*	RATE	AMOUNT
1. PLACE CONCRETE	4/M X-LABOR	1	22	$ 32.56	$ 716.32
	X-LABOR	5	22	$ 29.51	$ 3,246.10
	X-EQOPRMED	1	22	$ 38.15	$ 839.30
2. FINISH CONCRETE	X-CEMTFINR	1	51	$ 33.63	$ 1,715.13
3. INSTALL WATER STOP	X-CARPENTER	1	27	$ 35.76	$ 965.52
4. CURE CONCRETE	X-LABOR	2	56	$ 29.51	$ 3,305.12
5. FORMWORK	4/M X-CARPENTER	1	220	$ 38.81	$ 8,538.20
	X-CARPENTER	4	220	$ 35.76	$ 31,468.80
				TOTAL LABOR COSTS	$ 50,794.49

MATERIALS

DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
* READY MIX CONCRETE - 20.7 MPA	M3	175.00	$ 78.60	$ 13,755.00
* WATER STOP 9 PVC X 3/8" THK	M	53.00	$ 11.75	$ 622.75
SUBTOTAL : $14,377.75				
SALES TAX: 6%		14,377.75	$ 0.06	$ 862.66
* RESTEEL SUBCONTRACTOR	MT	7.40	$1,560.00	$ 11,544.00
			TOTAL MATERIALS COST	$ 26,784.42

SUPPLIES

DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
CURING FORM TIES & OIL	M2	476.00	$ 10.07	$ 4,793.32
FORM PLYWOOD ½"	M2	56.00	$ 7.42	$ 415.52
FORM PLYWOOD ¾"	M2	267.00	$ 10.60	$ 2,830.20
FORM LUMBER	MBF	12.00	$ 397.50	$ 4,770.00
			TOTAL SUPPLIES COST	$ 12,809.04
			TOTAL	$ 94,158.82

REMARKS: (Indicate by asterisk (*) prices on items which are based on quotation from manufacturers or suppliers)

DATE: 3/1/10

PREPARED BY: J. SMITH

CHECKED BY: J. DOE

JAN 2008

Print Form

Figure 16-8 Example Construction Estimate Detail Worksheet C

SHEET 13 OF 29

TELEPHONE QUOTATION SHEET			CSI NUMBER: BI 02.03
FIRM QUOTING STRONG STEEL			RFP/CONTRACT NO DACW 97-01-R-0001
ADDRESS:			PROJECT: PUMP PLANT
City ANY TOWN	State ANY	Zip Code	
Country USA			LOCATION: RM13, SPRUCE RIVER
PHONE: (503) 326-3864			
PERSON QUOTING: JOE JONES			ESTIMATOR: J. SMITH
DATE: 9/23/05	TOTAL QUANTITY QUOTED: 7.4 MT @ $1560/MT		AMOUNT: $11,544

ITEM QUOTED DESCRIPTION:

FURNISH & INSTALL ALL RESTEEL

INSTALLED: ☒ YES ☐ NO

INCLUDE SALES TAX: ☒ YES ☐ NO

PER PLANS/SPECIFICATIONS: ☐ YES ☒ NO

EXPLAIN EXCEPTIONS:

EXCEPT USING #4 BAR ILO #3
EXCLUDES SCAFFOLD & HOOK SERVICE

FREIGHT INCLUDED TO: ☐ FAS PORT ☐ FOB FACTORY ☒ FOB JOB ☐ OTHER

	TOTAL QUOTATION	**$11,544.00**
WEIGHT	EXPORT PACKING	
VOLUME	US INLAND FREIGHT	
QUOTE VALID FOR 30 DAYS	**TOTAL MATERIAL COST**	

REMARKS:

Print Form

Figure 16-9 Example Telephone Quotation Sheet

WAGE RATE CALCULATIONS

EFFECTIVE PERIOD: OCT 07-SEP 08

PROJECT: CONSTRUCT PUMP PLANT

OPERATIONAL SHIFTS: 1/10-5 DAY WEEK

LOCATION: RT. BANK, RM 13, SPRUCE RIVER

ESTIMATOR: J. SMITH

CHECKED BY: J. DOE

LABOR COST

CRAFT DESCRIPTION	BASIC HOURLY WAGE RATE	OVERTIME		SUBTOTAL (B+D)	TAXES & INS		SUBTOTAL (e + g)	FRINGE BENEFITS	TRAVEL OR SUBSIST	TOTAL HOURLY COSTS (h + i + j)
		% OF (b)	AMT		% OF (e)	AMT				
a	b	c	d	e	f	g	h	i	j	k
X-CARPENTER 4/M	$ 20.49	10	$ 2.05	$ 22.54	38.7	$ 8.72	$ 31.26	$ 5.55	$ 2.00	$ 38.81
X-CARPENTER	$ 18.49	10	$ 1.85	$ 20.34	38.7	$ 7.87	$ 28.21	$ 5.55	$ 2.00	$ 35.76
X-LABOR 4/M	$ 16.47	10	$ 1.65	$ 18.12	38.7	$ 7.01	$ 25.13	$ 4.43	$ 3.00	$ 32.56
X-LABOR	$ 14.47	10	$ 1.45	$ 15.92	38.7	$ 6.16	$ 22.08	$ 4.43	$ 3.00	$ 29.51
X-EQOPRMED	$ 18.97	10	$ 1.90	$ 20.87	29.7	$ 6.20	$ 27.06	$ 6.08	$ 5.00	$ 38.14
X-EQOPOIL	$ 14.80	10	$ 1.48	$ 16.28	29.7	$ 4.84	$ 21.12	$ 6.08	$ 5.00	$ 32.20
X-CEMTFINR	$ 17.91	10	$ 1.79	$ 19.70	29.7	$ 5.85	$ 25.55	$ 5.08	$ 3.00	$ 33.63
			$ 0.00	$ 0.00		$ 0.00	$ 0.00			$ 0.00
			$ 0.00	$ 0.00		$ 0.00	$ 0.00			$ 0.00
			$ 0.00	$ 0.00		$ 0.00	$ 0.00			$ 0.00
			$ 0.00	$ 0.00		$ 0.00	$ 0.00			$ 0.00

USE "ANY STATE" DAVIS BACON WAGER AGREEMENT #AS970004 ADM #2 2/20/97 *

50 HR WORK WEEK (5 - 10'S) - O.T. = 10 % (PER O.T. TABLE)

USE 4/M PREMIUM = $ 2.00 /HR

FICA & FED UNEMPLOYMENT 7.7%

STATE UNEMPLOYMENT 3.0%

WORKMAN COMP

CARPENTER 28%

LABOR 28%

OPERATOR 19%

CEMENT FINISHER 19%

*****LOCAL PREVAILING WAGES ARE LESS THAN DAVIS BACON WAGES**

			$ 0.00	$ 0.00		$ 0.00	$ 0.00			$ 0.00
			$ 0.00	$ 0.00		$ 0.00	$ 0.00			$ 0.00
			$ 0.00	$ 0.00		$ 0.00	$ 0.00			$ 0.00
			$ 0.00	$ 0.00		$ 0.00	$ 0.00			$ 0.00
			$ 0.00	$ 0.00		$ 0.00	$ 0.00			$ 0.00

JAN 2008

Print Form

Figure 16-10 Example Wage Rate Calculations

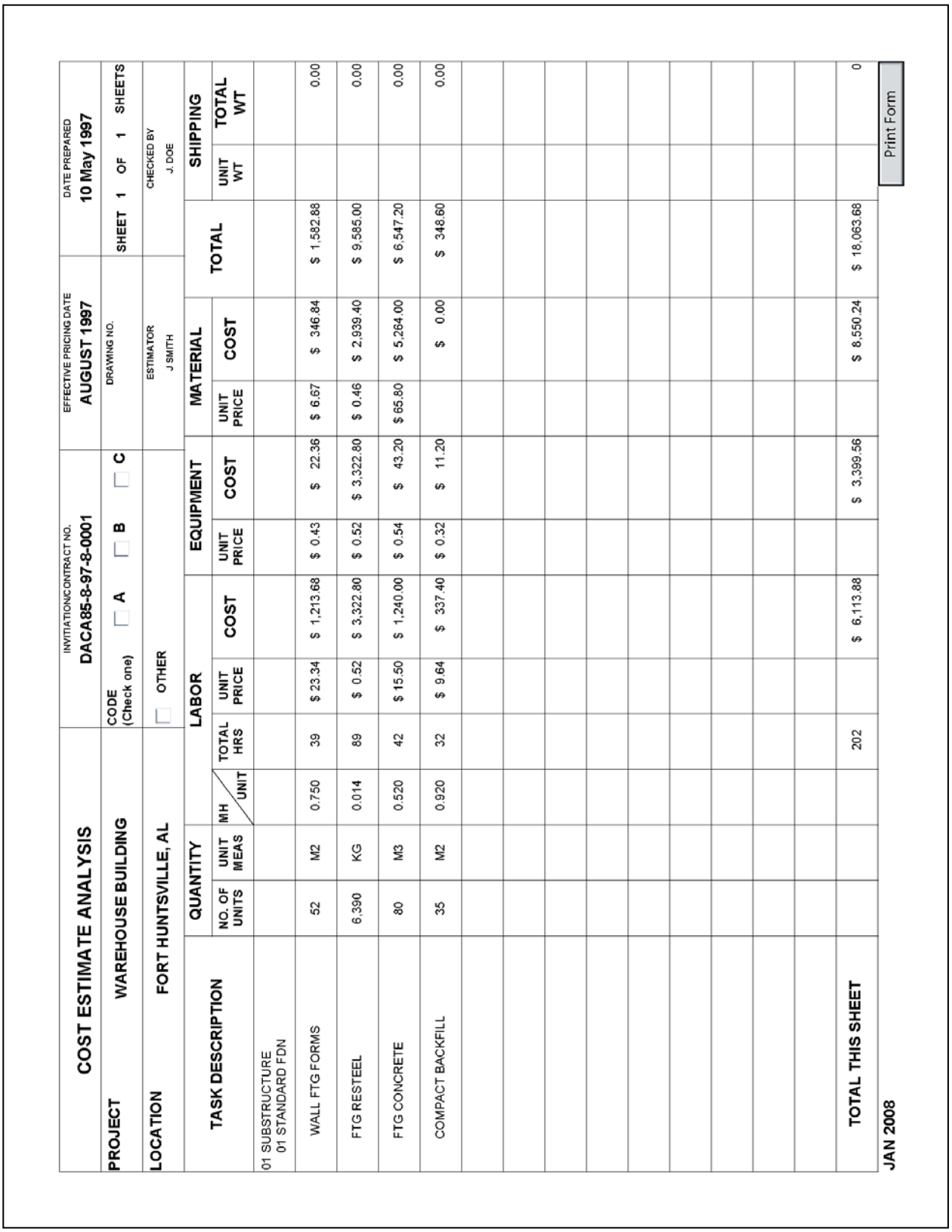
ESTIMATE DETAIL SUMMARY SHEET

PROJECT WAREHOUSE BUILDING				**ESTIMATOR** J. SMITH						SHEET 1 OF 1	
LOCATION FORT HUNTSVILLE, AL				**CHECKED BY** J. DOE						DATE PREPARED 30 Jan 2008	
BID ITEM				SUB CONTRACT COST	PRIME CONTRACT COST	TOTAL DIRECT COST	OVERHEAD 19.50	SUB-TOTAL		PROFIT 7.05	TOTAL COST
No.	Description	Quantity	Unit Meas								
1	WAREHOUSE BUILDING	JOB	L.S.	$ 335,781	$ 619,361	$ 955,142	$ 186,253	$1,141,395		$ 80,468	$1,221,863
							$ 0	$ 0		$ 0	$ 0
2	SITEWORK	JOB	L.S.		$ 294,636	$ 294,636	$ 57,454	$ 352,090		$ 24,822	$ 376,912
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
							$ 0	$ 0		$ 0	$ 0
			TOTAL	$ 335,781	$ 913,997	$1,249,778	$ 243,707	$1,493,485		$ 105,291	$1,598,775

JAN 2008

Print Form

Figure 16-11 Example Estimate Detail Summary Sheet



COST ESTIMATE ANALYSIS

INVITATION/CONTRACT NO. DACA85-8-97-8-0001 — EFFECTIVE PRICING DATE AUGUST 1997 — DATE PREPARED 10 May 1997

PROJECT: WAREHOUSE BUILDING — CODE (Check one) ☐ A ☐ B ☐ C — DRAWING NO. — SHEET 1 OF 1 SHEETS

LOCATION: FORT HUNTSVILLE, AL — ☐ OTHER — ESTIMATOR J SMITH — CHECKED BY J. DOE

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL	SHIPPING	
	NO. OF UNITS	UNIT MEAS	MH / UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT
01 SUBSTRUCTURE 01 STANDARD FDN												
WALL FTG FORMS	52	M2	0.750	39	$ 23.34	$ 1,213.68	$ 0.43	$ 22.36	$ 6.67	$ 346.84	$ 1,582.88	0.00
FTG RESTEEL	6,390	KG	0.014	89	$ 0.52	$ 3,322.80	$ 0.52	$ 3,322.80	$ 0.46	$ 2,939.40	$ 9,585.00	0.00
FTG CONCRETE	80	M3	0.520	42	$ 15.50	$ 1,240.00	$ 0.54	$ 43.20	$ 65.80	$ 5,264.00	$ 6,547.20	0.00
COMPACT BACKFILL	35	M2	0.920	32	$ 9.64	$ 337.40	$ 0.32	$ 11.20		$ 0.00	$ 348.60	0.00
TOTAL THIS SHEET				202		$ 6,113.88		$ 3,399.56		$ 8,550.24	$ 18,063.68	0

JAN 2008

Print Form

Figure 16-12 Example Cost Estimate Analysis

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED 31 Jan 2008	SHEET 1 OF 1
PROJECT	WAREHOUSE BUILDING	
LOCATION	FORT HUNTSVILLE, AL	
PLAN NO.	ESTIMATOR J. SMITH	CHECKED BY J. DOE
SITE WORK		

QUANTITY TAKE-OFF CALCULATIONS SHOULD BE PREPARED IN A MANNER THAT IS CONSISTENT WITH THE DISTRICT'S ESTABLISHED PROCEDURES

JAN 2008

Print Form

Figure 16-13 Example Construction Cost Estimate Worksheet

CREW AND PRODUCTIVITY REPORT			DATE PREPARED: 31 Jan 2008
PROJECT: WAREHOUSE BUILDING		PREPARED BY: J. SMITH	CREW REF NO.: B-25
LOCATION: FORT HUNTSVILLE, AL		CHECKED BY: J. DOE	

CREW COMPOSITION

WORK TYPE	WORK SCHEDULE	SPECIAL INFORMATION
PLACE CONCRETE	1-10 HR; 5 DAYS/WEEK	

CREW DESCRIPTION	NO. REQUIRED IN CREW		LABOR COST		EQUIPMENT COST	
	M	E	HOURLY* RATE ($/HR)	TOTAL FOR CREW ($/HR)	HOURLY* RATE ($/HR)	TOTAL FOR CREW ($/HR)
HYD SPCRANE 30T C757200		1			$ 42.61	$ 42.61
CONC BKT, 2 CY, 83071055		1			$ 0.56	$ 0.56
CONC VIE. 2 X " A. C65XX00		1			$ 0.35	$ 0.35
AIR COMP. 250 CFM. A1570140		1			$ 8.66	$ 8.66
AIR HOSE 1 K X 100'. A2070480		2			$ 0.56	$ 1.12
X-EAOPR MED	1		$ 38.15	$ 38.15		
X-LABOR 4/M	1		$ 32.56	$ 32.56		
X-LABOR	4		$ 29.51	$ 118.04		
X-CEMTFNR	1		$ 33.63	$ 33.63		
TOTAL HOURS	7	6	LABOR COST	$ 222.38	EQUIPMENT COST	$ 53.30

CREW PRODUCTIVITY

WORK TASK	PRODUCTIVITY RATE (UNIT/HR)	LABOR		EQUIPMENT $/UNIT	COMMENTS
		MH/UNIT	$/UNIT		
PLACE CONCRETE	75M3/HR	0.93	$ 29.65	$ 7.17	
	EQUIP RATES HAVE BEEN ADJ FOR 50 HR WORK WEEK				
	AND RATES TAKEN FROM EP 1110-1-8, VOL 3.				
	LABOR RATES TAKEN FROM DAVIS BACON AGREEMENT				
	GENERAL DECISION NUMBER _____				

* INCLUDING FRINGE BENEFITS

JAN 2008

Print Form

Figure 16-14 Example Crew And Productivity Worksheet

APPENDIX A

GLOSSARY

Abbreviations and Acronyms

ACO	Administrative Contracting Officer
ACF	Area Cost Factor
A-E	Architect-Engineer
AFARS	Army Federal Acquisition Regulation Supplement
AR	Army Regulation
ASA(CW)	Assistant Secretary of the Army (Civil Works)
AT/FP	Anti-Terrorism/Force Protection
BCO	Biddability, Constructability, and Operability
CACES	Computer Aided Cost Engineering System
CAP	Continuing Authorities Program
CEBBS	Cost Engineers Bulletin Board System
CECW-B	Headquarters, Civil Works Program Division
CECW-OM	Headquarters, Civil Works Operations Division
CEHNC	Corps of Engineers Engineering and Support Center
CFR	Code of Federal Regulations
COD	Contractor Officer's Decision
CONUS	Continental United States
CP	Cost Plus
CPAF	Cost Plus Award Fee
CSI	Construction Specification Institute
CWE	Current Working Estimate
DA	Department of the Army
DFARS	Defense Federal Acquisition Regulation Supplement
DM	Design Memorandum
DOD	Department of Defense
DPR	Detailed Project Report
EC	Engineer Circular
ECAS	Environmental Compliance Assessment System
E&D	Engineering and Design
EDC	Engineering during Construction
EFARS	Engineer Federal Acquisition Regulation Supplement (USACE)
EM	Engineer Manual
EP	Engineer Pamphlet
ER	Engineer Regulation
FAR	Federal Acquisition Regulation
FOA	Field Operating Activity
FOB	Freight on Board
FOIA	Freedom of Information Act

FOUO	For Official Use Only
G&A	General Home Office Overhead
GE	Government Estimate
GFE	Government Furnished Equipment
GFM	Government Furnished Material
HAG/HII	Historical Analysis Generator, HII (Second Generation)
HQUSACE	Headquarters, U.S. Army Corps of Engineers
IDT	Indefinite Delivery Type
IFB	Invitation for Bid (Sealed Bidding)
IPMP	Initial Project Management Plan
JOOH	Job Office Overhead
LCC	Life Cycle Cost
MCA	Military Construction, Army
MCACES/MII	Microcomputer Aided Cost Engineering System, MII (Second Generation)
MCP	Military Construction Program
MILCON	Military Construction
MSC	Major Subordinate Command
MWBS	Military Work Breakdown Structure
NAVFAC	Naval Facilities Engineering Command
OCONUS	Outside the Continental United States
OMB	Office of Management and Budget
O&M	Operation and Maintenance
OMRR&R	Operation, Maintenance, Repair, Rehabilitation and Replacement
OMSC	Operation Major Subordinate Command
PA	Preliminary Assessment
PACES	Parametric Cost Engineering System
PED	Preconstruction Engineering and Design
PES	Project Executive Summary
PL	Public Law
PM	Project Manager
PMP	Project Management Plan
QA	Quality Assurance
RFP	Request for Proposal
SAA	Surety Association of America
SI	Site Inspection
SIOH	Supervision, Inspection and Overhead
SOP	Standard Operating Procedure
SUCCESS©	Cost Estimating Software System
TRACES	Tri-Service Cost Engineering System
UPB	Unit Price Book
USACE	U. S. Army Corps of Engineers
VE	Value Engineering
WBS	Work Breakdown Structure
WLRC	Washington Level Review Center

APPENDIX B

REFERENCES

GOVERNMENT PUBLICATIONS

Public Law:

PL No. 74-403	Davis Bacon Act http://www.dol.gov/compliance/laws/comp-dbra.htm

Department of Defense:

FAR Sub-part 28.102	Performance and payment bonds and alternative payment protections for construction contracts http://www.arnet.gov/far
FAR Part 36	Construction and Architect-Engineer Contracts http://www.arnet.gov/far/

Department of Army:

AR 25-55	The Department of the Army Freedom of Information Act Program http://www.apd.army.mil/pdffiles/r25_55.pdf
AR 420-1	Army Facilities Management http://www.apd.army.mil/pdffiles/r420_1.pdf

US Army Corps of Engineers:

\1\UFC 3-730-01/1/	Programming Cost Estimates for Military Construction \1\ http://www.wbdg.org/ccb/DOD/UFC/ufc_3_730_01.pdf/1/
EFARS Part 36	Construction and Architect-Engineer Contracts http://www.usace.army.mil/CECT/Documents/Part36.pdf
EFARS Sub-part 36.203 (102)	Revision of Government Estimate http://www.usace.army.mil/CECT/Documents/Part36.pdf
ER 5-1-11	U. S. Army Corps of Engineers Business Process http://140.194.76.129/publications/eng-regs/er5-1-11/entire.pdf

ER 1110-1-1300	Cost Engineering Policy and General Requirements http://140.194.76.129/publications/eng-regs/er1110-1-1300/entire.pdf
ER 1110-3-1300	Military Programs Cost Engineering http://140.194.76.129/publications/eng-regs/er1110-3-1300/entire.pdf
ER 1130-2-500	Project Operations - Partners and Support (Work Management Policies) http://140.194.76.129/publications/eng-regs/er1130-2-500/toc.htm
EP 1110-1-8	Construction Equipment Ownership and Operating Expense Schedule http://140.194.76.129/publications/eng-pamphlets/

OTHER:

(DESIGN-TO-COST)Code 3 Project Engineering with Parametric Estimating
http://www.hnd.usace.army.mil/techinfo/ti/paramet.pdf

APPENDIX C

Sample Estimate Pages

The information contained in this appendix is described in Chapters 2 and 4. The information applies to all types of projects. This appendix contains sample estimate pages, Figures C-1 through C-5.

CONTROL RECORD FOR GOVERNMENT ESTIMATE

Date Received:	Date of Document:	No. of Copies:	Copy No.:

From: Engineering Division

SUBJECT
:

Number & Description of
Enclosures:

GOVERNMENT ESTIMATE

INTRA-OFFICE ROUTING DATA

Division or Branch	Date	Division or Branch	Date

NAME OF ALL PERSONS HANDLING THE ATTACHED DOCUMENT
OR WHO HAVE BEEN INFORMED OF ITS CONTENT

Name	Date	Name	Date

Figure C-1 Sample control record for Government estimates

GOVERNMENT ESTIMATE FORM

Furnishing all plant, labor, materials, and equipment and performing all work for

in strict accordance with the specifications schedules, drawings, and amendments.

See attached Price Schedule for Items.

The project manager has budgeted adequate funds to cover estimated price of this project as contained in this Government Estimate.

SUBMITTED: _____ _____
Dated:

REVIEWED AND CONCUR: _____ _____
Chief Cost Engineer Dated:

APPROVED: _____ _____
Chief Engineer Dated:

PROTECTIVE MARKINGS ARE CANCELED AFTER THIS ESTIMATE HAS BEEN PUBLICLY OPENED, READ, AND RECORDED.

_____ _____ _____
Date Canceled Signature Division

(NOTE: Completed signature page and all pages of the Government Estimate should be marked "FOR OFFICIAL USE ONLY.")

Figure C-2 Sample signature page for Government estimate

IFB No. XXX_____ - _____ - X -

PRICING SCHEDULE

FY _____ Contingency Communications Element Facility and Vehicle Maintenance Facility

CLIN	Contract Line Item No. (description of bid item)	UOM	UNIT PRICE	QTY	TOTAL PRICE
0001	All work for the Contingency Communications	LS	1,000,000.00	1	$ 1,000,000.00
0002	All work for the Vehicle Maintenance Facility.	LS	600,000.00	1	$ 600,000.00
0003	All work for the decorative screening contained in the contingency Communications Element Facility project.	LS	100,000.00	1	$ 100,000.00
0004	Site Preparation	SM	$ 5.00	10,000	$ 50,000 .00
TOTAL AMOUNT OF CLIN ITEMS 0001 THROUGH 000					$ 1,750,000.00

(Additives/deductives will also be shown on the price schedule)

NOTES TO BIDDERS (May vary according to the type of project)

1. The low bidder for purpose of award will be determined on the basis of the bidder offering the lowest total of Contract Line Items Numbers (CLIN) 0001 through 0004.

2. The bidders are required to bid on all items or their bid will be rejected.

3. Bidders are reminded that they must bid on the issued plans and specifications, as amended. Any deviations, conditions or attachment made by the bidder himself thereto may render the bid non-responsive and be cause for its rejection.

4. Any bid, which is materially unbalanced as to prices for each Contract Line Item Number, may be rejected. An unbalanced bid is one, which is based on prices significantly less than cost for some work and prices, which are significantly overstated for other work.

Figure C-3 Sample price schedule

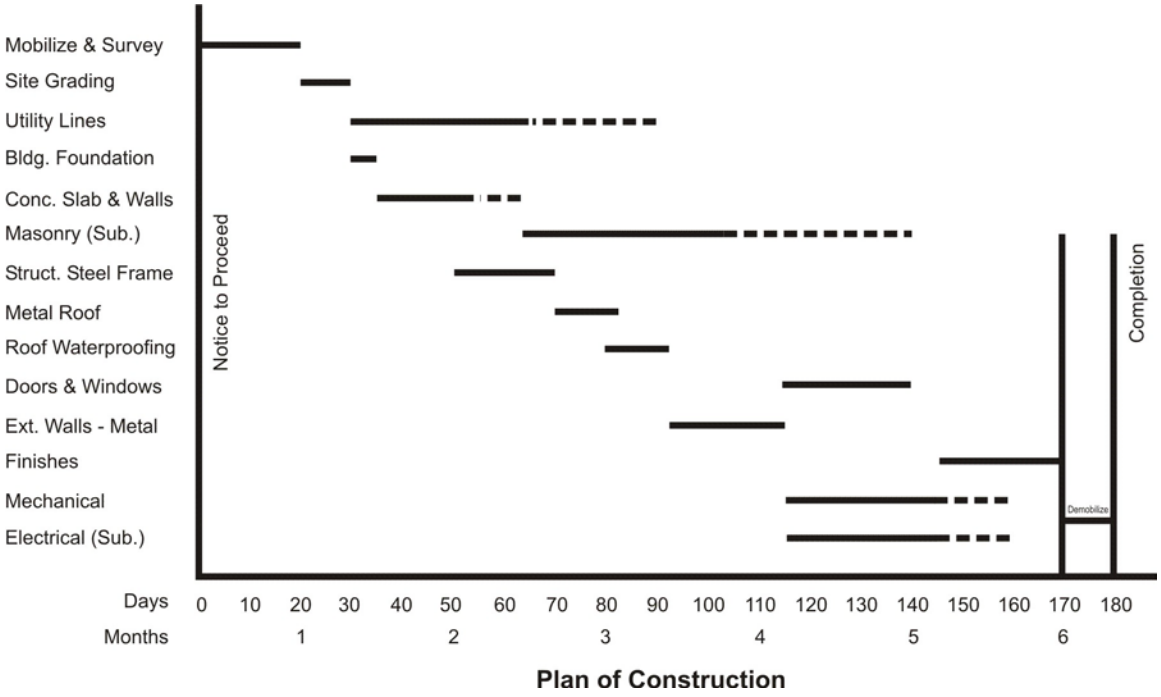


Figure C-4 Sample construction schedule

SHEET OF

TELEPHONE QUOTATION SHEET			CSI NUMBER:
FIRM QUOTING			RFP/CONTRACT NO
ADDRESS:			PROJECT:
City	State	Zip Code	
Country			LOCATION:
PHONE:			
PERSON QUOTING:			ESTIMATOR:
DATE: 9/27/05	TOTAL QUANTITY QUOTED:		AMOUNT:
ITEM QUOTED DESCRIPTION:			
INSTALLED: ☐ YES ☐ NO INCLUDE SALES TAX: ☐ YES ☐ NO PER PLANS/SPECIFICATIONS: ☐ YES ☐ NO			
EXPLAIN EXCEPTIONS:			
FREIGHT INCLUDED TO: ☐ FAS PORT	☐ FOB FACTORY	☐ FOB JOB	☐ OTHER
	TOTAL QUOTATION		
WEIGHT	EXPORT PACKING		
VOLUME	US INLAND FREIGHT		
QUOTE VALID FOR DAYS	TOTAL MATERIAL COST		
REMARKS:			

Figure C-5 Sample telephone quotation sheet

APPENDIX D

Estimate Format Structure

The information contained in this appendix is to aid in presentation of cost estimates for militaryprograms. The structure outlined in this appendix is described in Chapter 2.

D-1 WBS

- Military Construction Work Breakdown Structure. See Table D-1, Military Programs Work Breakdown Structure.

D-2 UNIFORMAT II

- Military Construction Uniformat II Structure, See Table D-3 or go to website at http://www.wbdg.org/ndbm/DevHistory_wbs_a.html?Section=wbs

Table D-1 Military Programs Work Breakdown Structure

(Systems Level)

SYSTEM	SUBSYSTEM	TITLE	UOM
01		SUBSTRUCTURE	M^2
02		SUPERSTRUCTURE	M^2
03		EXTERIOR CLOSURE	M^2
04		ROOFING	M^2
05		INTERIOR CONSTRUCTION	M^2
06		INTERIOR FINISHES	M^2
07		CONVEYING SYSTEMS	M^2
08		PLUMBING	M^2
09		HVAC	M^2
10		FIRE PROTECTION SYSTEMS	M^2
11		ELECTRIC POWER AND LIGHTING	M^2
12		ELECTRICAL SYSTEMS	M^2
13		EQUIPMENT	M^2
14		FURNISHINGS	M^2
15		SPECIAL CONSTRUCTION	M^2
16		SELECTIVE BUILDING DEMOLITION	M^2
17		SITE PREPARATION	M^2
18		SITE IMPROVEMENTS	M^2
19		SITE CIVIL/MECHANICAL UTILITIES	M^2
20		SITE ELECTRICAL UTILITIES	M^2

Table D-2 Uniformat II Structure

Section A Substructure
- A10 Foundations
- A20 Basement Construction

Section B Shell
- B10 Superstructure
- B20 Exterior Closure
- B30 Roofing

Section C Interiors
- C10 Interior Construction
- C20 Stairs
- C30 Interior Finishes

Section D Services
- D10 Conveying
- D20 Plumbing
- D30 HVAC
- D40 Fire Protection Services
- D50 Electrical

Section E Equipment and Services
- E10 Equipment
- E20 Furnishings

Section F Special Construction & Demolition
- F10 Special Construction
- F20 Selective Building Demolition

Section G Building Sitework
- G10 Site Preparations
- G20 Site Improvements
- G30 Site Mechanical Utilities
- G40 Site Electrical Utilities

General Requirements *
Field Overhead *
Quality Control *
Design Build Fee *

Note: These item (*) are not part of the Uniformat II Structure, but are required in order to produce a complete cost estimate with all markups.

APPENDIX E

Sample Checklist for Cost Estimate Preparation or Reviewer Checklist

1. Comply with applicable cost engineering guidance, e.g., ER 1110-1-1300 and ER 1110-3-1300 for Army projects. For Navy guidance refer to NAVFAC Cost Engineering Guide.

2. Prepare cost estimate using agency approved estimating software, as appropriate, and structured using the appropriate Work Breakdown Structure for military programs.

3. Prepare narrative with statement summarizing purpose of estimate and brief statement and description of the project.

4. Identify stage of estimate (programming, 10%, 30%, 60%, 90%, 100%, and bid).

5. Clearly identify and define assumptions, identify significant features upon which the cost estimate is based.

6. Identify significant findings during preparation of the estimate.

7. Develop notes throughout the estimate, particularly to identify sequencing of construction activities and crew productions.

8. Separate subcontract work from prime contract work.

9. Identify separate markups for subcontractors and prime contractor.

10. Identify sources of unit prices and vendor or subcontractor quotes.

11. Include design contingencies and construction contingencies in the cost estimate, if appropriate.

12. Include cost growth (escalation) from the date of the estimate to the mid-point of construction and/or operation. Identify source of index used for escalation, e.g., UFC 3-700-XX.

13. Determine if Current Working Estimate (CWE) is within program amount (PA).

14. Minimize use of lump sum pricing. If used, the lump sum description must indicate in detail what is included in the price and whether or not it is based on a quotation.

15. Use prevailing current location-specific wage rates in the estimate. Consider market rates for labor to ensure there is reasonable competition on-going in the area

where the construction is being performed and/or may be competing with the domestic projects being constructed.

16. Check derived unit costs with historical data when available. Override Cost Book labor and/or material unit prices as required, to fit project-specific conditions.

17. Complex or major features of a project should include a detailed breakdown for labor, equipment and material.

18. Calculate home office overhead as a percentage of total contract cost.

19. Include bond costs in estimate.

20. Calculate prime and subcontractor profit by Weighted Guidelines method.

21. Provide Cost Engineer point of contact and telephone number.

22. Include all applicable costs for permits, licenses, taxes, and fees.

APPENDIX F

Automation

This appendix provides general information on using this automation and an overview of existing systems. Detailed guidance on the use of each system can be found in the appropriate system user manual for each software program. The appropriate policy guidance on the use of automation in developing cost estimates is provided in the specific Agency cost engineering regulations.

F-1 USE OF COST ENGINEERING AUTOMATED SYSTEMS

The use of cost engineering automated systems enhances the efficiency, accuracy and credibility of project cost estimates. Automation assists in the standardization of estimating procedures and provides estimates that are easily reviewed, revised and adapted to new projects or situations. Standardization assists in collection and analysis of historical costs that can be used to develop budget estimates, for cost comparison purposes, for reporting and tracking of project cost data, and for the building of parametric models.

F-1.1 Software updates and new systems

Automation continues to develop at a rapid pace. Minor upgrades may occur annually and major system changes can occur every two or three years. Major new systems may be fielded at any time. Cost engineers should insure that they are using the latest available version of the software.

F-1.2 Limitations on the use of automation

Automation is just a tool and cannot take the place of professional cost engineering knowledge or judgment. The cost engineer should always be knowledgeable of the system's capabilities and limitations in relation to a project. The cost engineer must be especially careful using models and in adapting existing estimates to new projects to insure that there are neither duplications nor omissions in the estimate. Output should be checked for reasonableness and assumptions and methodology should be verified and documented. The best cost automated system is not a replacement for good estimator judgment.

F-1.3 Automation proponent

The Tri-Service Committee on Cost Engineering is the proponent for all the major components of the Tri-Service Cost Engineering Systems (TRACES).

F-2 OVERVIEW OF TRI-SERVICE AUTOMATED COST ENGINEERING SYSTEM (TRACES)

TRACES is the umbrella linking all automated cost engineering systems and their

associated databases. The entire system seeks to provide a user friendly cost engineering platform in a standard environment that will provide the cost engineer the tools to prepare, review, and maintain all types of cost estimates.

TRACES includes the following major systems/modules: a detailed quantity take-off, cost engineering system (MCACES/MII); a parametric systems for the preparation of less than fully detailed design estimates for military construction projects (PACES); a historical cost analysis generator (HAG/HII) to collect, store, and analyze historical cost data for facilities, and site work; a location cost factors system to adjust average historical facility cost to a specific project location (ACF) ; a dredge cost engineering system (CEDEP); a life-cycle cost (LCC) module for analysis of system design alternatives; a parametric system for preparation of HTRW budgetary estimates (RACER); a scheduling interface module; and risk analysis system (CostRisk).

F-2.1 Other Systems

Other systems/modules which are specific to each Service's requirement include: PC-Cost, DD Form 1391 for Army users and SUCCESS© for Navy users.

F-2.2 Micro Computer-Aided Cost Engineering System (MCACES/MII)

MCACES/MII is a multi-user software program used for the preparation of detailed construction cost estimates for military, civil works, and HTRW programs. The system also includes a project database and supporting databases. The supporting databases include Cost Book, crews, assemblies, labor rates, equipment ownership schedule costs and models. All databases work in conjunction with each other to produce a detailed cost estimate. The databases are described in the MCACES/MII user's manual.

F-2.3 Parametric Cost Engineering System (PACES)

PACES is a parametric cost estimating system which is used primarily for development of programming or budgetary cost estimates in support of MILCON Program such as military facilities, family Housing, medical, and operation and maintenance projects. The PACES is a comprehensive program incorporating cost models for new construction, alteration, and renovation. The system uses a parametric methodology adjusting cost models for estimating project costs. The cost models are based on generic engineering solutions for building and site work projects, technologies, and processes. The generic engineering solutions were derived from historical project information, government laboratories, construction management agencies, vendors, contractors, and engineering analysis. PACES provides the capability to prepare cost estimates of military projects based on past designs on less than fully detailed design information. It uses the appropriate Work Breakdown Structure (WBS), a database of models and assemblies from historic projects, and a series of detailed linking algorithms used to develop a cost estimate. The estimate can then, if desired, be transferred to MCACES/MII or SUCCESS© for task-by-task analysis of the cost estimate. PACES is the Air Force's primary tool for preparing programming estimates.

F-2.4 Historical Cost Analysis Generator (HAG/HII)

HAG/HII is a stand-alone software/module which is used to collect and display historical

cost data from awarded projects. HAG/HII uses the standard WBS structure to track historical bid costs by type, location, size and time, and has the capability of automatically normalizing and adjusting awarded costs. The HAG/HII system also provides a vehicle to retrieve selected statistical cost information from the historical cost database for use in the preparation of programming or budgetary cost estimates.

F-2.5 Area Cost Factor (ACF)

The ACF program calculates the area cost factor index for each specific location based on material, labor, and equipment index and matrix factors. At a given installation, the combination of local labor, material and equipment (LME) costs has the largest impact on total construction cost. Therefore, a comparison of the local LME project costs for typical military construction at different cities would give a comparison of relative construction costs. A market basket of 10 labor crafts, 20 materials and 4 pieces of construction equipment, and seven matrix factors for each location are used in the calculation of the ACF index.

F-2.6 Life Cycle Cost (LCC) module

The LCC module is a stand-alone program designed primarily to conduct life-cycle cost (LCC) analyses among competing design alternatives for a given project providing a record of the results. The program comes with an extensive maintenance and repair (M&R) database tailored for Army buildings. The most prominent capabilities are: (a) to conduct LCC analyses in accordance with the provisions of statutes, regulations, and requirements; (b) to calculate the present worth of individual building or facility components; and (c) to compare M&R costs for building components in the M&R database.

F-2.7 Risk Analysis Systems (CostRisk)

The COSTRISK analysis software program provides the capability to assess risk and uncertainty associated with any Military, Civil Works or HTRW project cost estimate, at any time during the project life cycle period. This process of “probability based” estimating can be used to revise estimates based on “confidence levels,” and can assist in the evaluation of project contingency funds. The CostRisk software is designed to work with Tri-Services parametric cost estimating programs (PACES and RACER). In addition to these interfaces, CostRisk is capable of performing a cost risk analysis on any cost estimate that is developed in Microsoft Excel. CostRisk performs cost risk analysis on the construction cost estimates using Monte Carlo simulation techniques as the basis of its calculations. Another risk analysis program that may be used is Oracle© Crystal Ball, Fusion Edition.

F-2.8 Other TRACES system/module

The need to integrate cost estimating tools with Agency specific program/project management systems has led to the development of several cost estimating tools and models. Some of these tools are stand-alone programs designed primarily for a specific requirement and for use by base/installation personnel.

F-2.8.1 PC-Cost

PC-Cost is a comprehensive software package that allows the user to prepare and submit programming or budgetary construction cost estimates based on the Department of Defense Facilities Pricing Guide and Army specific HAG/HII data. PC-Cost also allows the user to create an estimate from an existing detailed or parametric cost estimate, download a DD Form 1391 cost estimate for revisions (for Army users of PAX System), or create a new DD Form 1391 estimate from a template. PC-Cost also provides a mechanism for a user interface access capability with MCACES/MII and PACES.

F-2.8.2 DD Form 1391 Estimate Generator

The DD Form 1391 Estimate Generator is one of the modules within the Army's DD 1391 Processor. It is an interactive computer program which assists users in preparing the programming construction cost estimate shown on the DD Form 1391, Military Construction Project Data. (The DD Form 1391 is used by DOD agencies to justify the need of a military project and serves as a funding request for the Authorization and Appropriation of Military Construction funds by Congress.) The cost estimate generator of the DD Form 1391 Processor has capabilities for automatic computation of area cost factor adjustments, size factor adjustments, and automatic escalation computation. It uses the cost data from the DOD Facilities Pricing Guide and HAG/HII to generate costs of facilities.

F-2.8.3 Success©

Success© is a commercial off-the shelf multi-user software program used for the preparation of detailed construction cost estimates for Navy's military programs. The system also includes a project database and supporting databases. The supporting databases include Cost Book, crews, assemblies, labor rates, equipment ownership schedule costs and models. Commercially available databases, including those from RSMeans, are available directly from the vendor. All databases work in conjunction with each other to produce a detailed cost estimate. The databases are described in the SUCCESS© user's manual.

F-2.8.4 Electronic Project Procurement Generator

EPG, the Electronic Project Procurement Generator, is a web-based software system that supports the development, review, and approval of all NAVFAC project proposals requiring the DD1391 form. It is the paperless vehicle by which DD 1391 supported projects are entered into the NAVFAC planning, programming, and budgeting process.

F-3 OVERVIEW OF TRACES DATABASES AND FILES

Databases and files used by the TRACES modules are as follows:

F-3.1 Cost Book database

The Cost Book database is a collection of common construction detail line item tasks used in developing project estimates for military, civil works, and HTRW programs. The Cost Book is organized in accordance with the Construction Specification Institute (CSI)

numbering system. These material costs can be modified to reflect localized costs for other locations. Each task listed provides unit costs for labor, equipment, and materials. Localized Cost Book's can be developed by modifying the key rates in the national Cost Book.

F-3.2 Models database

This database contains groupings of assemblies for a whole facility or sitework entity. Linkage between assemblies and assemblies to tasks are by WBS or as exists in a historic estimate. Linkage algorithms are provided to the cost engineer for project-specific estimate refinement. At the heart of the detail pricing is the Cost Book task costs. Using models can reduce the time for estimate preparation but relies heavily on past designs using default linkages.

F-3.3 Assemblies database

The Assemblies database stores common groupings of related work tasks, each representing a composite cost required to create a larger piece of a project rather than a single task. The individual cost items within each assembly are either extracted from the Cost Book or from the labor and equipment databases. The database is broken down according to the WBS. Each assembly includes parameter worksheets, requiring only that you input the parameters appropriate for your specific job. Using assemblies can greatly reduce the amount of data entry required to build a project.

F-3.4 Other databases

Other TRACES databases include the crews' database, labor rates database, and equipment rates database.

F-3.5 Work Breakdown Structure

This data file provides a separate hierarchical work breakdown master structure for use as a template in formatting cost estimates for military projects.

F-3.6 Cost escalation index

The cost escalation index provides a historic and projected cost index for cost escalation adjustment due to inflationary factors.

F-3.7 Area Cost Factor (ACF) index

The ACF index is used in adjusting estimated costs to a specific geographical area. The factors reflect the average surveyed difference for each location in direct costs between that location and the national average location.

F-3.8 Department of Defense Facilities Pricing Guide

This guide is published by The Office of the Deputy Under Secretary of Defense for Installations and Environment through UFC 3-701-01 FOR THE CURRENT YEAR. The guide provides unit cost factors intended for macro-level analysis and planning in tools such as the Sustainment Cost Factors which are generally not suitable for individual facilities or projects. The guide also provides unit cost data and related adjustment

factors for selected DoD facility types and is intended for use in developing project-level estimates and preparing MILCON project documentation (DD Forms 1391 cost estimate).

F-3.9 Army Facilities Pricing Guide ($/SF)

This index is a listing of facility unit costs normalized to a geographical location factor of 1.00. Unit prices reflect costs forecast on the basis of an assumed midpoint of construction date. This guide is publish via PAX Newsletter 3.2.2

F-4 ASSIGNED AGENCY

The Assigned Responsible Agency (ARA) for TRACES is the U.S. Army Engineering and Support Center, Automated Systems Branch, TRACES group, Huntsville, Alabama. The ARA serves as the focal point for support usage of these software programs by providing operation, maintenance, and "Hot-Line" telephone support.