US Army Corps of Engineers

Alaska District

CONTRACT SECTION J

ENGINEERING INSTRUCTIONS

Updated September 2011

SECTION J

LIST OF ATTACHMENTS

(Bookmark Linked)

1. JBER base access procedures and map to the Alaska District. (August 2011) (POC: 673rd Security Forces Squadron - PACAF)

2. ENG 93 Payment Instructions and Forms. (August 2011) (POC: CEPOA-EN-GES-TI)

3. ACASS Overview. (August 2011) (POC: CEPOA-EN-GES-TI)

4. Alaska District CADD Guidelines. (January 2010) (POC: CEPOA-EN-GES-TI)

5. ER 1110-345-700 Design Analysis, Drawings and Specifications. (30 May 97) (POC: USACE)

6. ER 415-1-10 Contractor Submittal Procedures. (15 April 1997) (POC: USACE)

7. ER 1110-1-8155 Specifications. (10 October 2003) (POC: USACE)

8. A-E Specifications Manual w/attachments listed below. (11 July 2006) (POC: CEPOA-EN-GES-SP)

9. Fee proposal and profit forms. (POC: EFARS 15.404-73-101)

10. Uniform Facilities Criteria (UFC) 1-200-01, General Building Requirements. (16 August 2010) (POC: DOD Whole Building Design Guide)

11. Unified Facilities Criteria (UFC) 3-740-05, Design: Construction Cost Estimates. (8 November 2010) (POC: DOD Whole Building Design Guide)

12. Alaska Department of Environmental Conservation (ADEC) coordination. (September 2011) (POC: CEPOA-EN-DB-CS)

13. Reference Websites:

Architect-Engineer Contract Administration Support System (ACASS): http://www.cpars.csd.disa.mil/acassmain.htm
Army Technical Manuals – http://armypubs.army.mil/tech/index.html
Technical Information: Facilities Design - http://www.hnd.usace.army.mil/techinfo/
Engineering Regulations – http://140.194.76.129/publications/eng-regs/
Engineering Technical Letters – http://140.194.76.129/publications/eng-tech-ltrs/
Americans With Disabilities Act – http://www.usdoj.gov/crt/ada/adahom1.htm
UFAS – http://www.access-board.gov/ufas/ufas-html/ufas.htm
Alaska District – http://www.poa.usace.army.mil/
Technical Instructions - http://www.hnd.usace.army.mil/techinfo/ti.htm
Whole Building Design Guide - http://www.wbdg.org/

With the implementation of the Uniform Facilities Guide Specifications (UFGS), all references to the old Corps of Engineers Guide Specifications (CEGS) for Military Construction in any of the above documents are superseded. Updates containing references to the new UFGS will be incorporated as they become available.

Note: For any reference to MIL-HDBK-1008C, UFC 3-600-01 shall be considered the correct reference.

Point of contact in the Alaska District for questions about this document is Stephen Eldridge, CEPOA-EN-GES-TI, (907) 753-5696.

JOINT BASE ELMENDORF-RICHARDSON (JBER)
INSTALLATION ACCESS

1. CONTRACTOR ACCESS TO JBER:

1.1. All contractors wishing to access JBER must first be sponsored by a USACE Alaska District employee in possession of a Common Access Card (CAC).

1.2. The USACE Alaska District employee will meet contractor personnel at the Visitor Control Center (VCC) at Boniface Gate. This VCC is operated 24 hours a day, 7 days a week.

1.3. The VCC parking lots on JBER have been designated as short term parking areas. Vehicles left parked over 1 hour will be cited by the 673rd Security Forces Squadron utilizing a DD Form 1408 and may be towed at the vehicle owner's expense.

1.4. Personnel working at the Visitor Control Centers will not accept packages on any person's, section's or unit's behalf. Delivery personnel must deliver items directly to the intended customer.

2. DENIAL OF UNESCORTED ACCESS TO JBER

2.1. Personnel that are identified as having the following circumstances in their criminal history will be denied access and access credentials:

2.2. The individual is known to be or reasonably suspected of being a terrorist.

2.3. The Service is unable to verify the individual's claimed identity.

2.4. There is a reasonable basis to believe the individual has submitted fraudulent information concerning his or her identity.

2.5. There is a reasonable basis to believe the individual will attempt to gain unauthorized access to classified documents, information protected by the Privacy Act, information that is proprietary in nature, or other sensitive or protected information.

2.6. There is a reasonable basis to believe the individual will unlawfully or inappropriately use an access credential for unauthorized purposes.

2.7. There is a reasonable basis to believe, based on an individual's criminal history that issuance of an access credential poses an unacceptable risk to the military mission or base security; or considered their presence on the installation to be a threat to morale, good order and discipline, to include any felony conviction within the last three years.

2.8. The individual has been barred from entry to an Alaskan Command (ALCOM) Federal installation or facility.

2.9. The individual is wanted by federal or civil law enforcement authorities, regardless of

offense or violation.

2.10. The person has been convicted of espionage, sabotage, treason, terrorism, or murder at any point in their life.

2.11. Name appears on any federal agency's "watch list" or "hit list" for criminal behavior or terrorist activity.

2.12. The person has been convicted of a felony firearms or explosives violation within the past ten years.

2.13. The person has been convicted of a crime involving armed robbery, rape, sexual assault, or other sexual misconduct, human trafficking, or drug possession with intent to sell or distribute at any point in their life.

2.14. The individual has knowingly and willfully engaged in acts or activities designed to overthrow the U.S. Government by force at any point in their life.

2.15. Individuals denied access will be sent an Access Denial letter via their on base sponsor. Individuals may provide mitigating circumstances surrounding their case to the Installation Commander, through the Base Access section within 45 days of the dated letter for a final determination concerning their base access privileges. At no point in time should information from a criminal background check (APSIN or NCIC) be disseminated to the record subject or anyone not authorized to receive the information. All requests for personally identifiable information (PII) from individuals under this provision will include a Privacy Act notice. Determinations made by the installation commander for barments or denied access are considered final. Personnel who do not rebut denial letters within 45 days will be considered final and denied access for a period of one year.

3. USE OF SEAT BELTS AND CELL PHONES

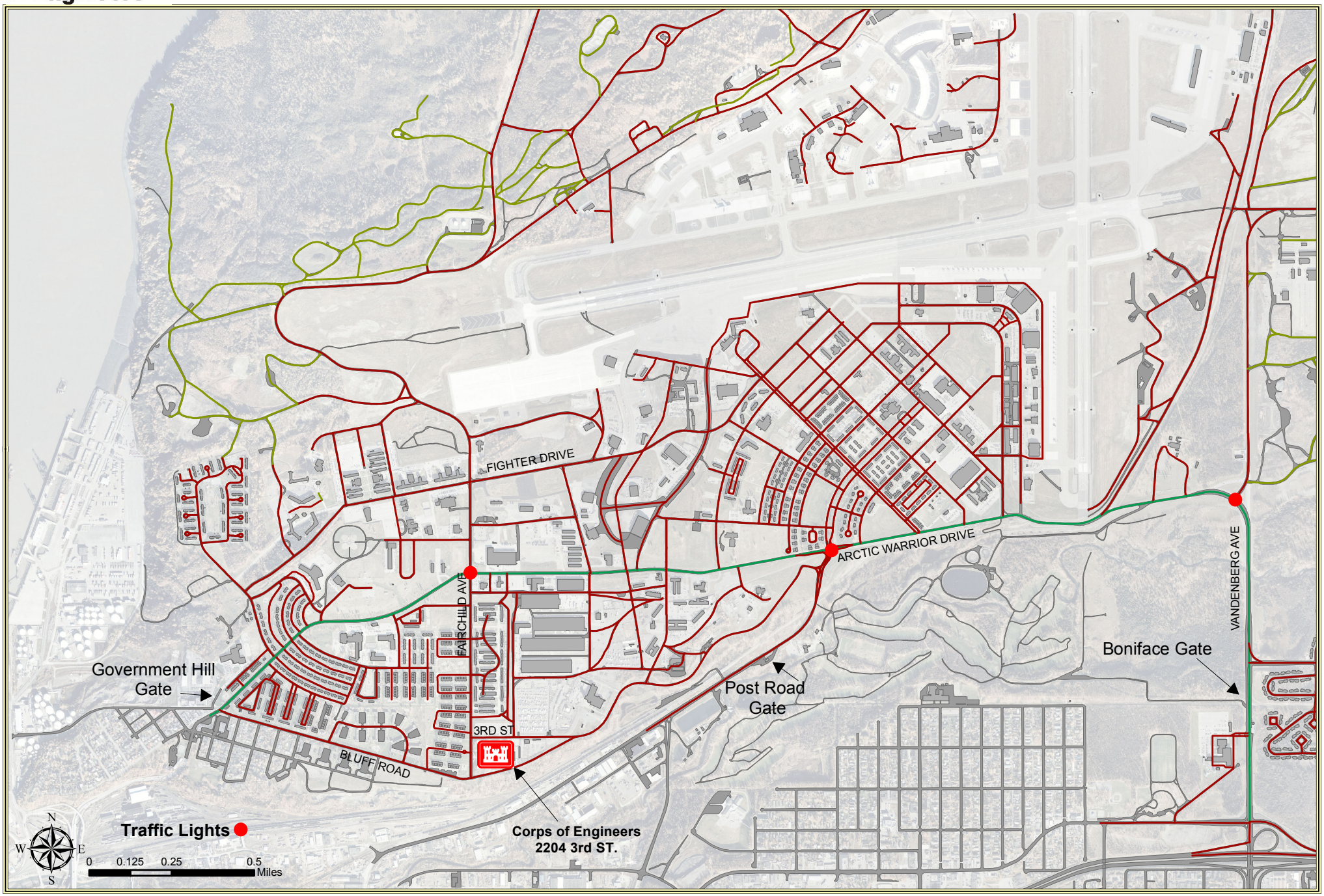
3.1. All vehicle operators are required to wear seatbelts while driving. Vehicle operators caught not wearing seatbelts will lose their driving privileges on base for 10 days on the first offense, 30 days on the second offense, and 6 months or longer on the third offense.

3.2. Visitors are advised that vehicle operators on all installations and operators of Government Owned Vehicles, both on and off-installation, will not use cell phones unless the vehicle is safely parked, or they are using a hands-free device. Violation of this policy will result in loss of driving privileges for 30 days.

3.3. These policies apply to all uniformed military personnel, DOD civilians, contractors, family members and any other non-DOD drivers operating a motor vehicle on all installations.

US Army Corps of Engineers

ALASKA DISTRICT CORPS OF ENGINEERS
2204 3RD STREET
(ON JBER)



INSTRUCTIONS FOR PREPARING PAYMENT ESTIMATE FORMS (ENG FORM 93)

1. Documents which should be maintained by the Contractor:

a. Each award document: Contract, modifications to the contract, task orders and modifications to each task order.

b. Previous ENG 93 payment estimate(s).

2. General Guidelines:

a. **Pay estimates should not be for less than $5,000** (excluding final pay requests). See section G, "Contract Administration Data," paragraph 14 entitled, "Method of Payment."

b. Payments are based upon the percentage of work that has been **completed**.

c. List each modification (and task orders on project specific contracts) as a separate line item. See example entitled, "Basic Award w/Mod."

d. **Pay estimates may not be submitted more often than every 30 days.** See section I, contract clause (52.232-10) entitled, "Payments under Fixed-Price AE Contracts."

e. For indefinite delivery AE contracts (W911KB-07-D-xxxx), submit separate pay estimates for each task order and its modifications. EXCEPTION: Pay estimates on task orders on project specific contracts (W911KB-07-C-xxxx) need not be submitted separately.

f. When the project is complete, **your final pay estimate submission must be accompanied by an originally signed Release of Claims**. The Alaska District may retain a percentage of the final payment to hold the project open for an undetermined time period if it is deemed to be in the best interest of the government.

g. Submit ONE (1) pay estimate with **original signature** in block 12 of Form ENG 93. Do not submit additional copies of pay estimates and associated documentation. They will be discarded.

h. Review and ensure that your math is correct.

i. Use one envelope when sending multiple pay estimates and direct **all** ENG 93 pay estimate submissions to the following address:

U.S. Army Engineer District, Alaska
ATTN: Engineering Contract Services Section
(CEPOA-EN-ES-CT), Room 292
POB 6898
Elmendorf AFB, AK 99506-0898

3. If You Have ANY Questions:

a. Please call: (907) 753-5783; (907) 753-5696, or fax (907) 753-2878.

PAYMENT ESTIMATE - CONTRACT PERFORMANCE

For use of this form, see ER 37-2-10 and 37-345-10.

1. DATE *Today's Date*		SHEET 1 of 1
2. CONTRACTOR AND ADDRESS XYZ & Associates, 987 K Street, Anchorage, Alaska, 99501	3. CONTRACT NO. DACA85-02-D-00**	4. DISTRICT Alaska
5. DESCRIPTION OF WORK Structural Analysis, Building 10-200	6. APPROPRIATION AND PROJECT	7. REQUIRED COMPLETION DATE
8. LOCATION Elmendorf AFB, Alaska	9. PERIOD COVERED BY THIS ESTIMATE FROM 1 May 02 THRU 31 May 02 .	10. JOB ORDER NO. 0001 / 11. ESTIMATE NO. 2

ITEM NO. a	DESCRIPTION b	CONTRACT: QUANTITY AND UNIT c	CONTRACT: UNIT PRICE d	CONTRACT: AMOUNT e	TOTAL TO DATE: QUANTITY AND UNIT f	TOTAL TO DATE: AMOUNT g
1	Task Order #0001	1	JOB	$30,253.00	25%	$7,563.00
2	Modification #1	1	JOB	$10,500.00	15%	$1,575.00
	EXAMPLE EXAMPLE EXAMPLE	EXAMPLE				
INCLUDES MODIFICATION THRU:	TOTAL CONTRACT →			$ 40,753.00	TOTAL EARNINGS TO DATE →	$ $9,138.00

BASIC AWARD WITH MODIFICATION

12. PRESENTED FOR PAYMENT		14.		
PAYEE XYZ & Associates	PER *Original Signature* James P. Smith	A. PREVIOUS DEDUCTIONS OTHER THAN RETAINED PERCENTAGE**		
		B. PREVIOUS RETAINED PERCENTAGE		
		C. PREVIOUS PAYMENTS	$7,563.00	
DATE 1 Jun 02	TITLE President	D. PREVIOUS EARNINGS (A+B+C)		$7,563.00
13. APPROVED FOR PAYMENT		E. EARNINGS THIS PERIOD (TOTAL EARNINGS TO DATE MINUS D)		$1,575.00
I CERTIFY that I have checked the quantities covered by this bill or estimate; that the work was actually performed; that the quantities are correct and consistent with all previous computations as actually checked; that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.		F. LESS RETAINED PERCENTAGE		
		G. LESS DEDUCTION OTHER THAN RETAINED PERCENTAGE FOR		
		H. TOTAL DEDUCTIONS FOR THIS PERIOD (F+G)		
SIGNATURE / TITLE / DATE		I. RETAINAGE REFUNDED		
		J. OTHER REFUNDS		
		K. TOTAL REFUNDS THIS PERIOD		
		L. AMOUNT DUE CONTRACTOR (E - H+K)		
CONTRACTING OFFICER APPROVAL (Signature) / DATE		15. RECAPITULATION: TOTAL RETAINED PCTG. (B+F - I) TOTAL PAID (C+L)		

ENG FORM 1 MAR 78 93 PREVIOUS EDITION OF THIS FORM IS OBSOLETE. **(USE REVERSE SIDE FOR DETAILED EXPLANATION AND-OR REMARKS)

PAYMENT ESTIMATE - CONTRACT PERFORMANCE

For use of this form, see ER 37-2-10 and 37-345-10.

1. DATE *Today's Date*			SHEET 1 of 1
2. CONTRACTOR AND ADDRESS XYZ & Associates, 987 K Street, Anchorage, Alaska, 99501	3. CONTRACT NO. DACA85-02-D-00**	4. DISTRICT Alaska	
5. DESCRIPTION OF WORK Structural Analysis, Building 10-200	6. APPROPRIATION AND PROJECT	7. REQUIRED COMPLETION DATE	
8. LOCATION Elmendorf AFB, Alaska	9. PERIOD COVERED BY THIS ESTIMATE FROM 1 May 02 THRU 31 May 02	10. JOB ORDER NO. 0001	11. ESTIMATE NO. 1

ITEM NO. a	DESCRIPTION b	CONTRACT QUANTITY AND UNIT c	CONTRACT UNIT PRICE d	CONTRACT AMOUNT e	TOTAL TO DATE QUANTITY AND UNIT f	TOTAL TO DATE AMOUNT g
1	Task Order #0001 EXAMPLE EXAMPLE EXAMPLE	1 EXAMPLE	JOB	$30,253.00	25%	$7,563.00
INCLUDES MODIFICATION THRU:		TOTAL CONTRACT →		$ 30,253.00	TOTAL EARNINGS TO DATE →	$ $7,563.00

BASIC AWARD

12. PRESENTED FOR PAYMENT		14.		
PAYEE XYZ & Associates	PER *Original Signature* James P. Smith	A. PREVIOUS DEDUCTIONS OTHER THAN RETAINED PERCENTAGE**		
		B. PREVIOUS RETAINED PERCENTAGE		
		C. PREVIOUS PAYMENTS		
DATE 1 Jun 02	TITLE President	D. PREVIOUS EARNINGS (A+B+C)		
		E. EARNINGS THIS PERIOD (TOTAL EARNINGS TO DATE MINUS D)		$7,563.00
		F. LESS RETAINED PERCENTAGE		
		G. LESS DEDUCTION OTHER THAN RETAINED PERCENTAGE FOR		
		H. TOTAL DEDUCTIONS FOR THIS PERIOD (F+G)		
		I. RETAINAGE REFUNDED		
		J. OTHER REFUNDS		
		K. TOTAL REFUNDS THIS PERIOD		
		L. AMOUNT DUE CONTRACTOR (E - H+K)		

13. APPROVED FOR PAYMENT

I CERTIFY that I have checked the quantities covered by this bill or estimate; that the work was actually performed; that the quantities are correct and consistent with all previous computations as actually checked; that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.

SIGNATURE	TITLE	DATE

CONTRACTING OFFICER APPROVAL (Signature)	DATE

15. RECAPITULATION:

TOTAL RETAINED PCTG. (B+F - I) TOTAL PAID (C+L)

PAYMENT ESTIMATE - CONTRACT PERFORMANCE (Continuation)	3. CONTRACT NO.	SHEET OF
2. CONTRACTOR AND ADDRESS	9. PERIOD COVERED BY THIS ESTIMATE FROM THRU	

ITEM NO. a	DESCRIPTION b	CONTRACT			TOTAL TO DATE	
		QUANTITY AND UNIT c	UNIT PRICE d	AMOUNT e	QUANTITY AND UNIT f	AMOUNT g

ENG FORM 93a 1 MAR 75 EDITION OF 1 JUN 54 IS OBSOLETE.

PAYMENT ESTIMATE - CONTRACT PERFORMANCE For use of this form, see ER 37-2-10 and 37-345-10.	1. DATE	SHEET ___ of ___

2. CONTRACTOR AND ADDRESS	3. CONTRACT NO.	4. DISTRICT
5. DESCRIPTION OF WORK	6. APPROPRIATION AND PROJECT	7. REQUIRED COMPLETION DATE

8. LOCATION	9. PERIOD COVERED BY THIS ESTIMATE FROM THRU	10. JOB ORDER NO.	11. ESTIMATE NO.

ITEM NO. a	DESCRIPTION b	CONTRACT			TOTAL TO DATE	
		QUANTITY AND UNIT c	UNIT PRICE d	AMOUNT e	QUANTITY AND UNIT f	AMOUNT g
INCLUDES MODIFICATION THRU:		TOTAL CONTRACT →		$	TOTAL EARNINGS TO DATE →	$

12. PRESENTED FOR PAYMENT	
PAYEE	PER
DATE	TITLE

13. APPROVED FOR PAYMENT

I CERTIFY that I have checked the quantities covered by this bill or estimate; that the work was actually performed; that the quantities are correct and consistent with all previous computations as actually checked; that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.

SIGNATURE	TITLE	DATE

CONTRACTING OFFICER APPROVAL (Signature)	DATE

14.		
A. PREVIOUS DEDUCTIONS OTHER THAN RETAINED PERCENTAGE**		
B. PREVIOUS RETAINED PERCENTAGE		
C. PREVIOUS PAYMENTS		
D. PREVIOUS EARNINGS (A+B+C)		
E. EARNINGS THIS PERIOD (TOTAL EARNINGS TO DATE MINUS D)		
F. LESS RETAINED PERCENTAGE		
G. LESS DEDUCTION OTHER THAN RETAINED PERCENTAGE FOR		
H. TOTAL DEDUCTIONS FOR THIS PERIOD (F+G)		
I. RETAINAGE REFUNDED		
J. OTHER REFUNDS		
K. TOTAL REFUNDS THIS PERIOD		
L. AMOUNT DUE CONTRACTOR (E - H+K)		

15. RECAPITULATION:

TOTAL RETAINED PCTG. (B+F - I) TOTAL PAID (C+L)

ENG FORM 1 MAR 78 93 PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

**(USE REVERSE SIDE FOR DETAILED EXPLANATION AND-OR REMARKS)

RELEASE OF CLAIMS
Joint Venture

The undersigned Architect-Engineer under Contract No. _____,

Task Order_____ dated _____, between the United States of America and

said Architect-Engineer for _____

located at _____, hereby releases the United States, its officers,

agents, and employees from any and all claims arising under or by virtue of said Contract or any

modification or change thereof.

Executed at _____ on this date of _____.

FIRM No 1. NAME: _____

BY: _____

TITLE: _____

FIRM No 2. NAME: _____

BY: _____

TITLE: _____

RELEASE OF CLAIMS
Partnership

The undersigned Architect-Engineer under Contract No. _____,

Task Order_____ dated _____, between the United States of America and

said Architect-Engineer for _____

located at _____, hereby releases the United States, its officers,

agents, and employees from any and all claims arising under or by virtue of said Contract or any

modification or change thereof.

Executed at _____ on this date of _____.

FIRM NAME: _____

BY: _____

TITLE: _____

This is to certify that the names and signatures of all partners are listed below and that the person who signed this contract had authority to actually bind the partnership pursuant to its partnership agreement. Each individual partner has authority to enter into and execute contractual instruments on behalf of said partnership with the United States of America as noted below:

PRINT TO TYPE NAME	SIGNATURE	AUTHORITY*
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

*NOTE:
Full – Full authority to bind partnership.
Partial – Limited authority (please describe).
None – No authority.

RELEASE OF CLAIMS
Corporation

The undersigned Architect-Engineer under Contract No. _____,

Task Order_____ dated _____, between the United States of America

and said Architect-Engineer for _____

located at _____, hereby releases the United States, its officers,

agents, and employees from any and all claims arising under or by virtue of said Contract or any

modification or change thereof.

Executed at _____ on this date of _____.

FIRM NAME: _____

BY: _____

TITLE: _____

RELEASE OF CLAIMS
Sole Proprietorship

The undersigned Architect-Engineer under Contract No. _____,

Task Order_____ dated _____, between the United States of America and

said Architect-Engineer for _____

located at _____, hereby releases the United States, its officers,

agents, and employees from any and all claims arising under or by virtue of said Contract or any

modification or change thereof.

Executed at _____ on this date of _____.

FIRM NAME: _____

BY: _____

TITLE: _____

PAYMENT ESTIMATE - CONTRACT PERFORMANCE

For use of this form, see ER 37-2-10 and 37-345-10.

1. DATE	SHEET 1 of 1
Today's Date	

2. CONTRACTOR AND ADDRESS	3. CONTRACT NO.	4. DISTRICT
XYZ & Associates, 987 K Street, Anchorage, Alaska, 99501	DACA85-02-D-00**	Alaska

5. DESCRIPTION OF WORK	6. APPROPRIATION AND PROJECT	7. REQUIRED COMPLETION DATE
Structural Analysis, Building 10-200		

8. LOCATION	9. PERIOD COVERED BY THIS ESTIMATE	10. JOB ORDER NO.	11. ESTIMATE NO.
Elmendorf AFB, Alaska	FROM 1 May 02 THRU 31 May 02	0001	3 & FINAL

ITEM NO. a	DESCRIPTION b	CONTRACT QUANTITY AND UNIT c	CONTRACT UNIT PRICE d	CONTRACT AMOUNT e	TOTAL TO DATE QUANTITY AND UNIT f	TOTAL TO DATE AMOUNT g
1	Task Order #0001	1	JOB	$30,253.00	100%	$30,253.00
2	Modifications #1	1	JOB	$10,500.00	100%	$10,500.00
	EXAMPLE EXAMPLE EXAMPLE	EXAMPLE				
INCLUDES MODIFICATION THRU:		TOTAL CONTRACT →		$ 40,753.00	TOTAL EARNINGS TO DATE →	$ $40,753.00

FINAL PAY ESTIMATE

12. PRESENTED FOR PAYMENT		14.		
PAYEE	PER	A. PREVIOUS DEDUCTIONS OTHER THAN RETAINED PERCENTAGE**		
XYZ & Associates	*Original Signature* James P. Smith	B. PREVIOUS RETAINED PERCENTAGE		
		C. PREVIOUS PAYMENTS	$9,138.00	
DATE: 1 Jun 02	TITLE: President	D. PREVIOUS EARNINGS (A+B+C)		$9,138.00
		E. EARNINGS THIS PERIOD (TOTAL EARNINGS TO DATE MINUS D)		$31,615.00
		F. LESS RETAINED PERCENTAGE		
		G. LESS DEDUCTION OTHER THAN RETAINED PERCENTAGE FOR		
		H. TOTAL DEDUCTIONS FOR THIS PERIOD (F+G)		
		I. RETAINAGE REFUNDED		
		J. OTHER REFUNDS		
		K. TOTAL REFUNDS THIS PERIOD		
		L. AMOUNT DUE CONTRACTOR (E - H+K)		

13. APPROVED FOR PAYMENT

I CERTIFY that I have checked the quantities covered by this bill or estimate; that the work was actually performed; that the quantities are correct and consistent with all previous computations as actually checked; that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.

SIGNATURE	TITLE	DATE

CONTRACTING OFFICER APPROVAL (Signature)	DATE

15. RECAPITULATION:

TOTAL RETAINED PCTG. (B+F - I) TOTAL PAID (C+L)

ENG FORM 1 MAR 78 93 PREVIOUS EDITION OF THIS FORM IS OBSOLETE. **(USE REVERSE SIDE FOR DETAILED EXPLANATION AND-OR REMARKS)

OVERVIEW OF THE ARCHITECT-ENGINEER CONTRACT ADMINISTRATION SUPPORT SYSTEM (ACASS)

The Federal Acquisition Regulation (FAR section 36.604), requires that the performance of A-E contractors be evaluated and that files of performance evaluations be maintained for use in selecting firms for A-E contracts.

Performance evaluations are prepared in the Architect-Engineer Contract Administration Support System (ACASS) sub-module of the Contractor Performance Assessment Reporting System (CPARS), at http://www.cpars.navy.mil (follow the link for ACASS logon).

The dollar threshold for completion of performance evaluations on ID contract task orders for A-E services is in excess of $30,000 but they may be prepared for lesser task order amounts in accordance with FAR 36.604 (a).

Each contract task order will have the following individuals assigned as a minimum: An Assessing Official, a Contractor Representative from the A-E firm, and a Reviewing Official (the District Chief of Engineering).

After the evaluation is prepared, but before it is signed, the system automatically routes the evaluation to the Contractor Representative for inclusion of remarks in the evaluation. After the Contractor Representative prepares the remarks (or after 30 days if he/she does not respond), the system notifies the Assessing Official who can electronically sign the evaluation. It is then automatically sent to the Reviewing Official for approval and electronic signature. PLEASE NOTE: When extenuating circumstances require additional time for a Contractor to respond, an extension of 30 additional days may be authorized by the Assessing Official.

Overall ratings are based on the ratings in the discipline and attribute matrices. While this is a matter of judgment, general guidance is given below to promote uniformity:

(1) "Exceptional." All or almost all of the significant disciplines and attributes are rated "exceptional." No discipline or attribute should be “marginal” or "unsatisfactory."

(2) "Very Good." A majority of the significant disciplines and attributes are rated "exceptional" or “very good.” No significant discipline or attribute should be “marginal” or "unsatisfactory."

(3) "Satisfactory." No significant discipline or attribute should be "unsatisfactory." Quality of final work is acceptable in an overall sense; however, it may have been necessary to get the firm to correct some unacceptable work.

(4) "Marginal." One or two significant disciplines or attributes are rated "unsatisfactory," or all or almost disciplines or attributes are rated “marginal.” An unusual amount of extra effort and follow-up on the part of the Government was required in order to get an acceptable product.

(5) "Unsatisfactory." Several significant disciplines and attributes are rated "unsatisfactory." This rating is appropriate for a firm that does not produce acceptable work despite extensive effort by the Government. This rating is required for all contracts terminated for default.

Ratings are ultimately the decision of the Government and are not subject to negotiation with A-E firms. However, overall ratings of "marginal" and "unsatisfactory" may be rebutted by A-E firms in accordance with established procedures.

For additional information, ACASS Focal Points at the Alaska District are Stephen M. Eldridge (753-5696) and Ted J. Boom (753-5783).

ALASKA DISTRICT CADD GUIDELINES

I DRAWING NAME CONVENTION

All drawing names shall be filenames that begin with the project code, abbreviated to five characters, followed by the discipline letter and the sheet number, i.e. FR001A05 for Project FTR001, Architectural sheet A-5, FR171a1_01 for Project FTR171, Architectural sheet A1.01. The Technical Lead will coordinate the drawing name for each project.

Following is a brief list of abbreviated location codes and typical discipline letters, this list is not complete, but is a guide to the major project locations and disciplines within the Alaska District. Check with the Project Manager for codes not listed here.

Location	**Code**
Clear Air Station	CR
Elmendorf A.F.B.	EM
Eielson A.F.B.	EE
Earackson A.S.	ER
Ft. Richardson	FR
Ft. Wainwright	FW
Ft. Greely	FG
King Salmon	KL

Discipline	**Code**
General	G
Location & Vicinity	LV
Survey and Mapping	V
HTRW/Environmental	V
Demolition	D
Civil/Site	C
Civil Works	W
Geotechnical	B
Utilities	U
Landscape Architecture	L
Architectural	A
Interior Design	I
Equipment	Q
Structural	S
Mechanical	M
Plumbing	P
Electrical	E
Fire Protection/Suppression	F
Telecommunications	T
Cathodic Protection	CP
Real Estate	R
Planning	P
Resource	R
Hydrology	H
Other Disciplines	X
Facility Management	N
Contractor/Shop Drawings	Z

VIII STANDARD SHEET SIZES, SCALES, TEXT SIZES

METRIC UNIT PROJECTS

DRAWING SIZES

Name	Metric Size	Imperial Size	Use
A0	1189 x 841 mm	46.8 x 33.1 inches	Master Planning/Civil Works
A1	841 x 594 mm	33.1 x 23.4 inches	Standard Sheet
A3	420 x 297 mm	16.5 x 11.7 inches	Half Size
A4	297 x 210 mm	11.7 x 8.3 inches	Reports

SCALES & TEXT

Metric Scale	Approx. Imperial Scale	Heights for Text		
		Notes and Dimensions	Title Text	Border Dimensions (Limits)
1:200	Close to 1/16"=1'-0"	600 mm	1200 mm	188200 x 118800
1:100	Close to 1/8"=1'-0"	300 mm	600 mm	84100 x 59400
1:50	Close to 1/4"=1'-0"	150 mm	300 mm	42050 x 29700
1:20	Between 1/2"=1'-0" & 3/4"=1'-0"	60 mm	120 mm	16820 x 11880
1:10	Between 1"=1'-0" & 1-1/2"=1'-0"	30 mm	60 mm	8410 x 5940
1:5	Close to 3"=1'-0"	15 mm	30 mm	4205 x 2970
Full Size		3 mm	6 mm	841 x 594

UNIT USAGE

For building dimensions use millimeters instead of feet and inches and for large site plans and civil engineering drawings use meters. Unit notations are unnecessary: if there's no decimal point, it's millimeters; if there's a decimal point carried to one, two, or three places, it's meters. Centimeters are not used in construction.

Use only one unit of measure on a drawing. Except for large scale site or cartographic drawings, the unit should be the millimeter(mm).

Delete unit symbols but provide an explanatory note (eg. "All dimensions are shown in millimeters") Whole numbers always indicate millimeters; decimal numbers taken to three places always indicate meters.

Where modules are used, the recommended basic module is 100 mm, which is similar to the 4-inch module used in building construction (4 inches = 101.6 mm).

VI Final Submittal

Drawing file format: All drawing files submitted to the District shall be Autocad drawing files, *.dwg extension.

A text file containing a complete list of all sheets with filename, reference number, drawing title, and plotting scale shall be submitted with the drawing files.

All XRefs must be bound to each drawing, not just attached.

Each file shall be a separate drawing. Multiple drawings created in a single file by using various layer schemes shall be converted into separate drawing files.

All drawings using Paperspace & Modelspace shall be in Paperspace mode.

Zoom all drawings to extents.

Drawings shall require no more than a standard version of AutoCAD and the minimum hardware requirements recommended by Autodesk in order to successfully open, manipulate and plot.

If Autodesk or third party extensions are used, drawings must still be provided in a manner consistent with the previous requirement, but they must also be provided with all additional “project” files used by the extension to allow advanced manipulation by others with the same extension.

VII Additional Standards and Guidelines

The Tri-Service CADD/GIS Technology Center has established standards, generic details, and other items of interest concerning use of CADD. The Center can be accessed on the Internet at the following address: http://tsc.wes.army.mil/

Various regulations, technical information publications, etc can be accessed on the internet at the TECHINFO page at the following address: http://www.hnd.usace.army.mil/techinfo/tiindex.html

All of the standard drawings listed in this document and these standards can be accessed from the District FTP server. Contact the Design Manager for information and permission on use of the FTP server.

II BORDERS & BACKGROUND DRAWINGS

All projects will use the new border sheet with the vertical border along the right side of the sheet. Sheet size is metric A1(841mm x 594mm) approximately 23" x 33". Civil Works and Master Planning projects have the option of using the metric A0 (1189mm x 841mm) approximately 47" x 33". See Sheet Size chart. There are two orientations for the title block, one for Army projects, one for Air Force and other projects. Coordinate with Project Manager or Technical Lead for correct border.

All changeable text on each of the standard border sheets are attributes and can be edited using DATTE.

A set of AutoCAD© templates is available in various drawing scales in both imperial and metric formats. All border sheets and templates are in the NFM Library COE Standard Drawings and on the ftp site

ftp://ftp.usace.army.mil/incoming/POA/COE_STD_DWGS/new_borders/

These files are self-extracting files.

III Text

All notes, dimension text, and general text shall be ROMANS. All general text shall have a plotted height of 1/8" or 3mm on a full size plot.

Standard text style for larger text such as titles shall be ROMAND. Title text shall have a plotted height of 1/4" or 6mm on a full size plot.

Keep the styles and fonts to a minimum to minimize the number of fonts. Only standard fonts supplied with AutoCad shall be used, no "third party" fonts shall be used. The District is frequently required to modify and/or plot various drawings created by others and the Contractor is required to use these files for "as built" drawings. Non-standard fonts cause problems opening these files.

IV Layers

The District is following the standards established by the Tri-Service CADD/GIS Technology Center. The layer naming conventions are based on the recommendations set forth in the American Institute of Architects (1990) publication "CAD Layer Guidelines".

V Plotting

In order to coordinate plotting, the following drawing colors, pen numbers, and line widths have been standardized. The District plotters have been standardized per the following chart in order to provide uniformity on all plots. The following drawing colors and pen assignments are standard on all District work

Color	Pen #	Line/Pen Width (mm)	Line Type
1 Red	1	.25	Solid
2 Yellow	2	.35	Solid
3 Green	3	.50	Solid
4 Cyan	4	.70	Solid
5 Blue	5	.18	Solid
6 Magenta	6	.35	40% Screen
7 White	7	.35	50% Screen
8 Grey	8	.35	60% Screen
9	9	1.00	Solid
10	10	1.50	Solid
11	11	2.00	Solid

If additional colors are used, all plotter configuration files and a table similar to that above shall be provided in order to ensure that drawings can be plotted with the correct symbology.

IMPERIAL UNIT PROJECTS

DRAWING SIZES

Name	Imperial Size	Use
A0	46.8 x 33.1 inches	Master Planning/Civil Works
A1	33.1 x 23.4 inches	Standard Sheet
A3	16.5 x 11.7 inches	Half Size
A4	11.7 x 8.3 inches	Reports

SCALES & TEXT

Imperial Scale	Scale Factor	Heights for Text		
		Notes and Dimensions	Title Text	Border Dimensions (Limits)
1/16" = 1'-0"	192	24”	12”	8064 x 5760
1/8" = 1'-0"	96	12”	6”	4032 x 2880
1/4" = 1'-0"	48	6”	3”	2016 x 1440
1/2" = 1'-0”	24	3”	2”	1008 x 720
3/4” = 1’-0”	16	2”	1.5”	672 x 480
1” = 1’-0”	12	1.5”	1”	504 x 360
1-1/2"=1'-0"	8	1”	.5”	336 x 240
3"=1'-0"	4	.5”	1/8”	168 x 120
Full Size	1	1/8”	1/4”	42 x 30

CEMP-EA Regulation No. 1110-345-700	Department of the Army U.S. Army Corps of Engineers Washington, DC 20314-1000	ER 1110-345-700 30 May 97
	Engineering and Design DESIGN ANALYSIS, DRAWINGS AND SPECIFICATIONS	
	Distribution Restriction Statement Approved for public release; distribution is unlimited.	

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

ER 1110-345-700

CEMP-EA

Regulation
No. 1110-345-700

30 May 1997

Engineering and Design
DESIGN ANALYSIS, DRAWINGS AND SPECIFICATIONS

1. Purpose. This regulation provides U.S. Army Corps of Engineers (USACE)-wide consistent criteria and requirements for developing design and engineering documents, such as design analysis, drawings and specifications, necessary for the construction of military construction (MILCON) and/or Hazardous, Toxic and Radioactive Waste (HTRW) projects including EPA Superfund.

2. Applicability. This regulation is applicable to all USACE Commands having MILCON, and/or HTRW design responsibility.

3. Organization. This regulation is divided into appendices that contain criteria and requirements related to the subject of the respective appendix. Each appendix is structured to provide criteria and requirements applicable to military construction and/or HTRW projects, except as may be otherwise provided for in other Engineer Regulations (ER), design directives or special instructions.

a. Appendix A, References. This appendix provides a listing of references used in this regulation.

b. Appendix B, Design Analysis. This appendix prescribes requirements and procedures for the preparation of design analysis (basis for design) of military and/or HTRW construction projects.

c. Appendix C, Drawings. This appendix prescribes requirements, procedures and drafting standards for the preparation and approval of drawings for military and/or HTRW construction projects. It includes drawings, other than shop drawings, prepared at all stages of design and construction.

d. Appendix D, Specifications. This appendix prescribes policy and requirements for the preparation of contract specifications for military and/or HTRW construction projects. It includes USACE guide specifications and project specifications, and procedures for the construction industry to follow when introducing new materials, equipment and methods into HQUSACE guide specifications.

4. Distribution. This regulation is approved for public release, distribution is unlimited.

5. General Design Policy. The Commanding General (CG) of the USACE is responsible for design, engineering and construction mission of the Army worldwide. The CG is also responsible for the execution of assigned design and construction programs or projects for other Department of Defense (DoD) agencies, other Federal agencies, and foreign governments. Highest standards of professional skills, experience and management practice are required to support this responsibility. Required facilities and component parts thereof will be carefully sited, designed, and executed so the resulting construction is of the highest quality that could possibly be provided within the cos t and time authorized, without sacrificing aesthetics, user requirements, life-cycle

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This regulation replaces ER 1110-345-700, dated 19 February 1982; ER 1110-345-710, dated 17 April 1981 and Ch.1 dated 29 October 1982; and ER 1110-345-720, dated 31 October 1989.

economy, energy conservation, environmental protection. or life safety. Additional design policy information is contained in ER 1110-345-100, Design Policy for Military Construction.

6. Proponency. Proponent for this regulation is the Architectural and Planning Branch, Directorate of Military Programs (CEMP-EA). Comments regarding improvements and/or clarifications should be submitted to the proponent office at HQUSACE, 20 Massachusetts Ave., NW, Washington, DC 20314-1000.

FOR THE COMMANDER:

OTIS WILLIAMS
Colonel, Corps of Engineers
Chief of Staff

3 Appendices:
APP A - References
APP B - Design Analysis
APP C - Drawings

APPENDIX A

REFERENCES

(References used in this regulation)

1. Public Law. Public Law 94-168, Metric Conversion Act of 1975 as amended by the Omnibus Trade and Competitiveness Act of 1988 (Public Law 100-418).

2. Executive Order. Executive Order 12770, 25 July 1991, Metric Usage in Federal Government Programs.

3. Federal Acquisition Regulation.

a. FAR, Part 10, Specifications, Standards, and Other Purchase Descriptions. Specifically cited are subparts 10.002, Policy and 10.004, Selecting Specifications or Descriptions for Use.

b. Subpart 6.3, Other Than Full and Open Competition.

4. Engineer FAR Supplement. EFARS 14.201-1(a)1, USACE Construction Contract Format.

5. Department of the Army.

a. AR 190-13, The Army Physical Security Program.

b. AR 190-50, Physical Security for Controlled Medical Substances and Other Medically Sensitive Items.

c. AR 200-1, Environmental Protection.

d. AR 380-5, Department of the Army Information Security Program Regulation.

e. AR 385-60, Coordination With Department of Defense Explosives Safety Board.

f. AR 415-1-10, Contractor Submittal Procedures.

g. AR 415-11, Air Force Contract Construction.

h. AR 415-15, Army Military Construction Program Development and Execution.

i. AR 415-17, Cost Estimating for Military Programming.

j. AR 415-28, Real Property Category Codes.

k. TM 5-802-1, Economic Studies for Military Construction.

6. U.S. Army Corps of Engineers.

a. ER 385-1-92, Safety and Occupational Health Document Requirements for HTRW and Ordnance Explosives Waste Activities.

b. ER 415-1-10, Contractor Submittal Procedures.

c. ER 415-1-11, Biddability, Constructibility and Operability.

d. ER 415-345-38, Transfer and Warranties.

e. ER 715-1-10, Architect-Engineer Responsibility Management.

f. ER 1110-1-12, Quality Management.

g. ER 1110-1-263, Chemical Data Quality Management for Remedial Activities.

h. ER 1110-1-1300, Cost Engineering Policy and General Requirements.

i. ER 1110-1-8152, Professional Registration.

j. ER 1110-3-113, Department of the Army Facilities Standardization Program.

k. ER 1110-3-1300, Military Programs Cost Engineering.

l. ER 1110-3-1301, Cost Engineering Policy and General Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Remedial Action Cost Estimates.

m. ER 1110-345-100, Design Policy for Military Construction.

n. ER 1110-345-122, Interior Design.

o. ER 1180-1-6, Construction Quality Management.

p. ENG Form 3078, Recommended Changes to Engineering Documents.

q. EP 310-1-6, Graphics Standard Manual.

r. EP 1110-1-21, Air Pathways Analysis for Design of HTRW Remedial Action Projects.

s. EP 1110-345-2, Index of Drawings.

t. EM 200-1-2, Technical Project Planning Guidance for HTRW Data Quality Design.

u. Architectural and Engineering Instructions (AEI).

(1) Design Criteria, issued by HQUSACE (CEMP-E). Copies are available from the Huntsville Engineering Support Center (CEHNC-ED-ES-1), P.O. Box 1600, Huntsville, AL 35807-4301.

(2) Medical Design Standards, issued by HQUSACE (CEMP-EM).

(3) Simplified Design Methods, issued by HQUSACE (CEMP-EA).

v. USACE Supplement 1 to AR 190-13, The Army Physical Security Program.

w. USACE Supplement 1 to AR 380-5, Department of the Army Information Security Program Regulation.

7. National Building Codes.

a. International Conference of Building Officials, Uniform Building Code (UBC), 5360 South Workman Mill Road, Whittier, CA 90601.

b. National Fire Protection Association (NFPA) 101, Life Safety Code, Batterymarch Park, Quincy, MA 02269.

8. National Standards Organizations.

a. American National Standards Institute. 28 October 1992. "American National Standard for Metric Practice," ANSI/IEEE 268-1992, IEEE Standards Coordinating Committee 14 on Quantities, Units, and Letter Symbols, New York.

b. American Society for Testing and Materials. 1991. "Standard Practice for the Use of Metric (SI) Units in Building Design and Construction," ASTM E 621-84 (Reapproved 1991), Committee E-6 on Performance of Building Construction, Philadelphia, PA.

c. American Society for Testing and Materials. 1992. "Standard Practice for the Use of the International System of Units (SI) (the Modernized Metric System)," ASTM E 380-92, Committee E-43 on Metric Practice, Philadelphia, PA.

d. National Institute of Building Sciences.1991. "Metric Guide for Federal Construction," Interagency Council on Metric Policy, Washington, DC.

e. MasterFormat™, Construction Specifications Institute (CSI), 601 Madison Street, Alexandria, VA 22314-1791.

APPENDIX B

DESIGN ANALYSIS

1. General. This appendix prescribes the requirements and procedures for the preparation of design analysis (basis for design) for military and/or HTRW construction projects.

2. Design Analysis Requirement.

a. A design analysis will accompany project drawings and specifications required for all new construction and/or HTRW remedial action projects, and projects involving major alteration or expansion of existing facilities, unless specifically exempted.

b. A design analysis shall be developed by the architect-engineer (design agency in-house or contracted design professional) of record for the military and/or HTRW construction project being designed.

c. The design analysis is developed in coordination with installation or customers, and summarized in a format appropriate for:

(1) Review, approval and record purposes.

(2) Revision of designs during construction, as required.

(3) Use in adapting designs to other sites.

(4) Operations and maintenance (O&M) enhancement and cost reduction.

(5) Post-occupancy evaluation.

d. Design analysis shall be prepared in metric. Where computer programs or technical references are used, the metric version of the program or reference is preferred and should be used. Where metric versions are not readily available or practical, that portion of the design analysis based on non-metric program or reference may use inch-pound (IP) units. In these cases, the final values that are to be placed in the contract documents shall be converted to their metric equivalent in the design analysis prior to use in project drawings or specifications. Unit designations and conversions shall be in accordance with ASTM E 621-84 as modified by the Metric Guide for Federal Construction, unless specifically indicated otherwise.

3. Definition. A design analysis is a document that contains written material covering general parameters, functional and technical requirements, design objectives, design assumptions, and provides design calculations applicable to a project's design.

4. Organization and Content. The design analysis will be organized into three parts; Part 1 - "General Description," Part 2 - "Design Requirements and Provisions," and Part 3 - "O&M Provisions." Characteristics of the three parts of a design analysis are as follows:

a. General Description (Part 1). This part of the design analysis will state the purpose, authorization, applicable criteria and the project description for the project, and provide a summary of the factors influencing the choice of the civil, environmental, architectural, structural, mechanical, electrical, communications, fire protection, physical security systems, and HTRW aspects used in the project along with an indication of how the initial and life cycle costs were considered. Identify all additional utility requirements,

calculate the total requirement, and compare the total existing capabilities. The requirements of the Record of Decision or other decision document will be included for HTRW projects.

b. Design Requirements and Provisions (Part 2). This part of the design analysis will include subparts for each major design discipline and basic project design requirements that should be addressed in the design analysis with justifications to validate the design decisions. Additional facility requirements are provided in Architectural and Engineering Instructions (AEI), Design Criteria, and its appendices, and special medical facility design requirements in AEI, Medical Design Standards.

(1) Civil. This includes soil analysis and survey data, site design, site improvements, planting and landscaping, paving, grading and drainage, water, waste-water and soil treatment, contaminant containment, utilities systems analysis and design, and provisions for airfields, ports and railroads, if required.

(2) Environmental. This includes an impact assessment checklist covering air, water and noise effects from the project and construction; worker health and safety; HTRW remediation cleanup and action levels; transportation and disposal regulation requirements; quality control for chemical sampling/analysis; wetlands determination (tidal and nontidal); special wildlife, plant, and endangered species considerations; ground water, waterway and floodplain protection assessment; pollution prevention control requirements; and design measures to be implemented (i.e., construction site sediment and erosion control requirements by Federal, state and local governments); and hazardous material management, natural and cultural resources, and environmental permits.

(3) Architectural. This includes space allowance, functional layout, interior design, furniture planning, signage, accessibility, security, energy conservation, space-mass composition, materials used and details with respect to image, safety, maintenance and cost effectiveness.

(4) Structural. This includes foundation, structural, seismic, hardened structure, nuclear radiation and blast protection systems analysis and design.

(5) Mechanical. This includes heating, ventilation and air conditioning systems, refrigeration, plumbing, elevators and cranes, energy conservation, pollution control, noise and vibration control, heating and chilled water distribution, gas distribution, fuel storage and dispensing, and process systems design.

(6) Electrical. This includes power generation, transmission and distribution systems, lighting (interior and exterior), voice and video communications, intrusion detection, utilities monitoring control systems (UMCS), cathodic protection, lightning and static electricity protection systems analysis and design, aviation lighting, and electromagnetic protection.

(7) Fire Protection and Life Safety. This includes building construction, exit requirements, fire extinguishing systems, fire protection water supplies, surge analysis, and alarm and detection systems analysis and design.

(8) Physical Security. This includes fencing, vaults, protective lighting, security systems, locks, arms rooms, controlled substances, entrances, guard facilities, classified material, patrol roads, clear zones, restricted areas, surveillance and penetration resistance.

c. Operation and Maintenance (O&M) Provisions (Part 3). This part of the design analysis will describe the design provisions

made to enhance and to reduce the cost of operating and maintaining the facility when completed.

(1) This part of the design analysis should include the O&M design intentions for the major design disciplines covered in Part 2.

(2) This part of the design analysis will be in a format that can be used separately to supplement the completion records required by Army Regulation (AR) 415-1-10, or to form the basis for assembling a facility user's manual.

d. Special Aspects for HTRW Projects. The design analysis for HTRW projects will include all applicable regulatory, chemical sampling/analytical, safety and occupational health, geotechnical, cost engineering, and process engineering provisions and criteria required by the HTRW guidance references listed in Appendix A and the HTRW examples listed in Appendix B (Part 2).

5. Preparation.

a. Assembly and Identification.

(1) The design analysis should be assembled, when possible, into a single volume with a complete table of contents. When more than one volume is required, each volume should be labeled, numbered sequentially and assembled under a cover page. The cover page should indicate the volume number and the total number of volumes in the design analysis for the project. Likewise, the cover page should indicate the name and location of the project, the project number and fiscal year, and the identification of the design agency. Applicable local file numbers and references to drawings, including Computer Aided Drafting and Design (CADD) file numbers, and specification numbers will be included as appropriate.

(2) Studies performed as part of the design process, such as life cycle cost analysis, energy use budget and design energy use calculations and simulations, solar feasibility analysis, treatability studies, and hydro geological modeling will be stand alone reports and included in the design analysis as appendices (referenced in the design analysis as appropriate).

b. Size and Layout.

(1) The table of contents, cover page layout and page layouts, as appropriate, will be guided by the standards prescribed and delineated in this ER. Supplemental guidance may be found in Engineer Pamphlet (EP) 310-1-6.

(2) The design analysis will be clearly and legibly expressed.

(3) All materials will be prepared in relation to a vertically oriented A4 metric, 210 mm x 297 mm (8.3 inches x 11.7 inches) standard page size (8-1/2 x 11-inch when metric paper stock is not available). Larger material may be folded to the standard page size, i.e., when reduction is not feasible, the A3 metric sheet, 297 mm x 420 mm (11.7 inches x 16.5 inches), easily accommodates folding in to the A4 metric sheet as a half-size of a standard A1 metric construction drawing.

(4) When drawings, published data or automated data processing printouts are used, these materials will be trimmed, reduced or folded to conform to the standard page size.

c. Classified Material. Every effort will be made to prepare the design analysis to be an unclassified document with proper references to sources of classified material.

d. Design Calculations. Design calculations will be computed and checked for accuracy and initialed or signed by qualified design professionals, applicable by discipline,

other than the project's designer. The names or initials of these individuals will be indicated on the page, or an insert, carrying the calculation.

(1) All design assumptions, loads and conditions, as applicable, will be clearly indicated and legible with tabulations indicated on the page, or an insert, carrying the calculation, and will be clear and legible with the tabulation. The sources of loading conditions, design assumptions, formulas and references will be identified. Assumptions and conclusions will be explained and cross-referenced.

(2) When a commercial computer program (software) is used:

(a) The program will be named and described to include a flow chart, or other documentation, showing how the program attains the solution. This description must be sufficient to verify the validity of methods, assumptions, theories and formulas, but should not require source code documentation or otherwise compromise any proprietary programs.

(b) The input shall be reviewed for accuracy and initialed or signed by a registered architect or engineer, or design professional as applicable to the input being checked. The output shall be reviewed to ensure the reasonableness and applicability of the result and initialed or signed by the design professional that reviewed the input.

e. Use of Existing Design Analysis. If a standard design or other design is being site adapted, the design analysis for the new project will include appropriate material from the existing design analysis modified to incorporate site adaptations and other essential requirements.

6. <u>Exceptions to Appendix B Requirements</u>.

a. Medical Facility Projects.

b. Family Housing Projects.

c. Army Reserve Projects.

d. Non-appropriated Funds (NAF) Projects.

e. Design-Build Projects.

f. Simplified Design Method (SDM) Projects.

g. Defense Environmental Restoration Program, Superfund, and BRAC time critical removal actions (including Ordnance and Explosives projects).

- PART 1 -

GENERAL DESCRIPTION

1. **Design Analysis.** The design analysis -Part 1- will comprise five (5) sections with subsections as follows:

a. Purpose. A purpose section will be provided with a description of the project's functional purpose and other supporting dialogue from project information prepared by the installation and the organization for which the project is to be designed.

b. Authorization.

(1) Directives. A synopsis of applicable design directives for the project will be included in this part of the design analysis. For HTRW projects, include a discussion of the appropriate Federal and/or state regulations governing the project (RCRA, CERCLA, Clean Water Act, etc.).

(2) Scope of Work. A synopsis of the project authorized under the DD Form 1391 program, A106, FUDS work plan or ROD (record of decision) will be included in this part of the design analysis, to include the authorized project scope of work and programmed amount.

c. Criteria. References will be made to applicable Technical Manuals (TM), ER, AEI, Engineering Instructions (EI), other prescribed criteria, specific studies and minutes of meetings held to define the scope of the project, cost limitations and the character of the design.

d. Project Description.

(1) Project Site. A synopsis will be provided that indicates the general site conditions, project siting requirements, existing utilities available to the site, topography, wetlands designated areas, unusual environmental characteristics to be impacted by the project, and conformance with the installation master plan.

(2) Functional Objective. The basic functional objective or objectives of the proposed project and the estimated functional life will be described.

(3) Personnel and Equipment. The number of civilian and military personnel and visitors, and the types of service and/or organizational equipment to be accommodated in the project will be described.

(4) Constructibility. The basic construction materials and systems selected, and the estimated structural life of the project will be described.

e. Economic Summary. Economic factors affecting the project will be described, especially those factors influencing the choice of basic materials, and the civil, architectural, structural, mechanical, electrical and fire protection systems selected to include:

(1) Results of economic studies which consider not only the initial construction cost but also costs incurred over the estimated functional life of the project. Applicable requirements in ER 1110-1-1300, ER 1110-3-1300, ER1110-3-1301, and TM 5-802-1 must be adhered to in preparation of cost estimates.

(2) Results of value engineering studies performed on the project design.

(3) Design analysis prepared so that they may be edited using computer systems and

software standards by the design agency.

2. **Review and Approval.** Review and approval of design analysis will coincide with the review and approval of the project drawings and specifications in accordance with Appendices C and D of this ER including:

a. Project Engineering with Parametric Estimating Design Stage (Code 3). The general summary statement will be in accordance with Architectural and Engineering Instructions (AEI), Code 3 Design.

b. Concept Design Stage (Code 2). The design analysis will cover the progress of all of the design disciplines (refer to Part 2).

c. Final Design Stage (Code 6). All parts of the design analysis, including the O&M provisions (refer to Part 3), will be complete within themselves, without requiring reference back to earlier design analysis. Review and approval of final design drawings and specifications will be done concurrently with the review and approval of the final design analysis.

d. Drawing Modifications. When modifications of project drawings are authorized, as set forth in Appendix C of this regulation, the design analysis for the changed conditions will be added to the design analysis and the revision date or dates noted.

3. **Disposition and Reference Copy.** The final design analysis with revisions and the as-built drawings will be transferred to the using service after acceptance of the project. A reference copy of the design analysis will be retained separately by the design agency for possible use in adapting the project design to another site or in evaluating lessons learned. Reference copies of the design analysis will be retained by the design agency for at least two years after the beneficial occupancy date (BOD) of the project.

- PART 2 -

DESIGN REQUIREMENTS AND PROVISIONS

1. Civil.

a. General Parameters. Examples of general civil parameters that need to be addressed are:

(1) Site boundaries controlled and uncontrolled access, limits (boundries) of contaminated soil and/or ground water, and total area.

(2) Topography and soil drainage characteristics.

(3) Results of geotechnical explorations, laboratory and field testing; soil and rock elevations, classifications and characteristics; and groundwater elevations.

(4) Special considerations, such as dynamic loading, expansive soils, permafrost or dewatering, and precautions during construction.

(5) Prevailing winds, sun angles, design temperatures and precipitation.

(6) Existing structures, parking, vegetation, open spaces and outdoor recreation areas. Functional relationships relative to adjacent facilities, exclusion zone, or decontamination facilities.

(7) Disposition of major utilities, transportation arteries and access roads to include other planned projects by title, fiscal year and line item number.

(8) Proposed facilities, buildings, support buildings, parking, access roads, service areas, utilities and helipads.

(9) Former use, demolition responsibilities and location (with justification) of borrow pits, disposal areas and contractor plant areas, including HTRW wastes.

(10) Local construction practices, availability of materials, labor and skills, and use of industrialized components.

(11) Installation compatibility, and future use considerations.

(12) Permit requirements, as applicable.

(13) Contaminant characteristics and final treatment parameters

(14) Treatment facilities startup.

(15) Any other civil parameters necessary for special project designs.

b. Functional and Technical Requirements. Examples of civil related functional and technical requirements that need to be addressed are:

(1) Orientation of elements of the project to conserve energy and to reduce site preparation.

(2) Exterior functional areas, relationships and space allowances for operational, storage and support activities.

(3) Accessibility for handicapped (physically impaired or disabled) persons.

(4) Grading, storm drainage and irrigation.

(5) Landscape design and planting.

(6) Exterior signage and outdoor furnishings.

(7) Area and sign lighting.

(8) Sidewalks, retaining walls, fencing, traffic controls and barriers.

(9) Parking, access roads, including haul roads for transport of hazardous material for disposal, and access for service and emergency vehicles, to include paving design, and railroads and airfields.

(10) Service areas for pick-up and deliveries, bulk waste storage or disposal and exterior utility elements (transformer, chillers, etc.).

(11) Building set-backs, spacing of structures and maximum walking distances.

(12) Exterior utility support systems, to include fire protection water and storm drainage.

(13) Heliport and airfield clear approach and landing.

(14) Heliport and airfield illumination, and marking.

(15) Treatment equipment layout and operational flexibility.

(16) Operation, maintenance, and staffing levels at treatment facilities.

(17) Material selection for monitoring and extraction well construction and associated discharge piping.

c. Design Objectives and Provisions. Examples of civil related design objectives and provisions that need to be addressed are:

(1) Vehicular and pedestrian circulation patterns.

(2) Landscape preservation, composition and perception.

(3) Functional relationships of buildings and support facilities, to include off-site facilities and areas impacting on the site design.

(4) Barrier-free design for handicapped (physically impaired) persons.

(5) Utility support and isolation.

(6) Economy of construction and the operations and maintenance of the project relative to life-cycle cost effectiveness in accordance with TM 5-802-1, ER 1110-1-1300, ER 1110-3-1300, and/or ER 1110-3-1301.

(7) Future expansion, if applicable.

(8) Economy of construction and procurement, and life-cycle cost effectiveness in accordance with TM 5-802-1, ER 1110-1-1300, ER 1110-3-1300, and/or ER 1110-3-1301.

(9) Instrumentation requirements at treatment facilities.

(10) Evaluation of construction materials.

d. Calculations. The calculations for civil design elements, such as those listed below, will utilize metric units. If the project is permitted to use inch-pound (IP) units, the calculations shall be performed in normally accepted and recognized IP units.

(1) Soil bearing capacities, settlement analysis, slope stability, erosion control, lateral earth pressures and frost design.

(2) Road, paving, grading and storm drainage design.

(3) Landscape design irrigation systems, if applicable.

(4) Parking allowances for civilian, military and visiting personnel, handicapped (physically impaired) persons and organizational equipment.

(5) Verification of the adequacy of existing and planned utility systems required for complete project support.

(6) Sizing of domestic water and fire protection systems.

(7) Sizing of waste-water collection systems, to include maximum flow rated in liters per second for waste-water and sewage, and the total flow per day.

(8) Railroad design, if applicable.

(9) Cost comparison of competitive designs and materials, in terms of both construction costs, acquisition costs, and life-cycle costs in accordance with TM 5-802-1, ER 1110-1-1300, ER 1110-3-1300, and/or ER 1110-3-1301.

(10) Estimated cost of construction.

(11) Treatment equipment sizing and selection

(12) Treatment facility mass balances for all major process streams.

(13) Aquifer parameter determination, fluid (ground water or air) production rates and/or velocities, extraction/injection well spacings, filter pack design, and documentation of modeling used in system design.

e. Coordination with Installation or Outside Agencies. Coordination should include, but not be limited to:

(1) Siting in accordance with the Major Army Command (MACOM) approved installation master plan.

(2) Utility service capacities and central plant support.

(3) Water supply and sanitary discharge, including on-site treatment plant discharge.

(4) Demolition and debris disposal.

(5) Fire fighting support.

(6) Bulk trash and non-hazardous waste disposal procedures.

(7) Signage makeup and maintenance.

(8) Construction and other permits, as applicable.

(9) Safety siting approval for explosives-handling facilities as required in AR 385-60 for coordination with the DoD Explosives Safety Board, if applicable.

(10) Waste Manifesting.

2. Environmental.

a. General Parameters. Examples of general environmental parameters that need to be addressed are:

(1) Completed Environmental Impact Assessment (EIA) checklist covering the air, water and noise effects of the project on the site and adjacent sites. This is often already completed by the installation, but validation by the design agency or contract Architect-Engineer (A-E) is required.

(2) Identification of wildlife and plants that are adversely impacted by the placement and operation of the project on the site. Rare or endangered species must be identified and

specifically reported.

(3) Maps indicating wetland designations on the site or adjacent sites affected by the project or the construction of the project.

(4) Archeological preservation, to include cemetery identification.

(5) Ground water and waterway locations.

(6) Pollution prevention and control measures during construction and the operation of the project.

(7) A comprehensive environmental permit/regulation analysis which addresses air, water, solid and hazardous waste as appropriate. Examples include Clean Water Act operating permits, storm water and point source discharge permits, hazardous waste storage and treatment permits, emergency planning and community right-to-know (EPCRA) and state and local environmental permits and related issues.

(8) Health and Safety Design Analysis (HSDA) in accordance with ER 385-1-92.

(9) Air Pathways Analysis (APA) in accordance with EP 1110-1-21.

(10) Data Quality Objectives (DQOs) for cleanup verification/process performance chemical sampling and analysis developed in accordance with EM 200-1-2.

(11) Media-specific cleanup levels on ARARs or acceptable residual risk calculations.

(12) Contaminant-specific ambient air action levels for health protection of offsite human receptors.

(13) Substantive elements of the Quality Assurance/Quality Control (QA/QC) program to be utilized in generation of any chemical analytical data. (Refer to ER 1110-1-263 for QA/QC program elements).

b. Functional and Technical Requirements. Examples of environmental related functional and technical requirements that need to be addressed are:

(1) Project orientation relative to environmentally sensitive areas on or adjacent to the site.

(2) Site modification and storm water runoff affects on ground water, waterways and wetlands.

(3) Discharges relative to the affects on the immediate environs.

(4) Sound and vibration control.

c. Design Objectives and Provisions. Examples of environmental related design objectives and provisions that need to be addressed are:

(1) Functional relationship of the project to the environment.

(2) Roadway and parking areas storm water runoff effects.

(3) Utilities placement relative to environmentally sensitive areas.

(4) Economic aspects for environmental protection measures and methods.

(5) Future expansion possibilities affects on the environs.

(6) Economic aspects of construction and procurement, and life-cycle cost effectiveness in accordance with TM 5-802-1, ER 1110-1-1300, ER 1110-3-1300, and/or ER 1110-3-1301.

(7) For HTRW remediation designs, an evaluation of remediation goals (i.e., projected endpoints) as they relate to proposed remediation goals and the remedial design.

d. Calculations. The calculations for environmental design elements, such as those listed below, will utilize metric units. If the project is permitted to use IP units, the calculations shall be performed in normally accepted and recognized IP units.

(1) Erosion control protection measures and methods.

(2) Ratio of the paved areas and the building area relative to the total site area.

(3) Storm water runoff.

(4) Air, water, HTRW and sanitary discharge, and impacts on receiving media.

(5) Pollution abatement systems and their scopes.

(6) Cost comparison of competitive designs and materials, in terms of both construction costs, acquisition costs, and life-cycle costs in accordance with TM 5-802-1, ER 1110-1-1300, ER 1110-3-1300, and/or ER 1110-3-1301.

(7) Estimated cost of construction.

e. Coordination with Installation or Outside Agencies. Coordination should include, but not be limited to:

(1) Validation (check) of the approved siting relative to the designated areas of the installation for preservation and pollution protection requirements.

(2) Federal, state, and local governmental approvals as required for wetlands and other environmental protection laws.

(3) Storm water runoff.

(4) Air, water, HTRW, and sanitary discharges.

(5) Sediment and erosion control during construction.

3. Architectural.

a. General Parameters. Examples of general architectural parameters that need to be addressed are:

(1) Purpose, functions and capacities of the project.

(2) Desired image or visual appearance to include the design of the exterior and interiors of the building, refer to Engineer Regulation (ER) 1110-345-122 regarding interior design.

(3) Number of civilian, military and visiting personnel to use the project.

(4) Types of activities, equipment and vehicles involved.

(5) Anticipated life of the functions to be accommodated.

(6) Type and method of construction; permanent, temporary or relocatable.

b. Functional and Technical Requirements. Examples of architectural related functional and technical requirements that need to be addressed are:

(1) Functional areas, occupant capacities and space allowances.

(2) Exterior and interior finish materials, to include textures, colors and damage resistant.

(3) Equipment, furniture and furnishings, to

include all items required regardless of funding; refer to ER 1110-345-122 regarding funding distinctions.

(4) Directional, informational and motivational signage.

(5) Accessibility for handicapped (physically impaired) persons, barrier free design, and provisions for blind vending areas operated by State agencies.

(6) Energy conservation, to include solar energy applications and energy use budget goals.

(7) Occupational safety and health.

(8) Sound and vibration control.

(9) Interior parking and service areas.

c. Design Objectives and Provisions. Examples of architectural related design objectives and provisions that need to be addressed are:

(1) Adaptation of the building to the size, shape and orientation of the site, to include benefits from natural warming and cooling effects afforded by the site.

(2) Organization of functional spaces to establish workable adjacency relationships.

(3) Building layout to establish convenient circulation flows for people, services, materials and equipment, to include evacuation during emergencies.

(4) Consolidation of spaces into sound-compatible zones and protective construction zones, to include fire, storm and fallout.

(5) Space layout compatible with modular (structural and environmental) support systems.

(6) Types of construction materials, architectural systems and finishes, to include the basis for their selection.

(7) Composition of masses and spaces, and architectural details to reflect the desired image, and the scale and nature of the activities involved.

(8) Perception of the building details and volumes. Specific provisions made, to include an identifiable sequence of viewing positions for experiencing the architectural and interior design.

(9) Building expandability and changeability.

(10) Energy conservation.

(11) Acoustical design.

(12) Enhancement of materials and systems operations and maintenance.

(13) Economy construction and procurement, and life-cycle cost effectiveness in accordance with TM 5-802-1.

d. Calculations. The calculations for architectural design elements, such as those listed below, will utilize metric units. If the project is permitted to use IP units, the calculations shall be performed in normally accepted and recognized IP units.

(1) Net room areas, occupant capacity and gross building areas. Categorize these areas and capacities under administrative, operational, storage and support requirements.

(2) Ratio of exterior window and room area, where applicable.

(3) Thermal conductance values for each

building section, which should be selected in coordination with the mechanical engineer design professional to satisfy life cycle cost and energy conservation requirements.

(4) Estimated annual unit energy consumption, which is, in coordination with the mechanical engineer, to determine the design energy use and compliance with the energy use budget.

(5) Acoustics, if applicable.

(6) Roof drainage.

(7) Estimated cost of construction.

(8) Cost comparison of competitive designs and materials, in terms of both construction costs, acquisition costs, and life-cycle costs in accordance with TM 5-802-1.

e. Coordination with Installation or Outside Agencies. Coordination should include, but not be limited to:

(1) Blind vending area operations.

(2) Make-up of signage.

(3) Government-furnished furniture and equipment.

(4) Occupational safety and health, as required.

(5) Operations and maintenance support.

4. Structural.

a. General Parameters. Examples of general structural parameters that need to be addressed are:

(1) Foundation characteristics based on geotechnical survey and subsurface investigation.

(2) Conditions related to possible seismic events, wind, storms and blast.

(3) Size of areas and volumes to be inclosed, and floor loads.

(4) Permanency of construction and expediency of erection.

(5) Apparent competitive structural systems in view of local constructibility parameters to include potential use of building systems fabricated off of the site.

(6) Need for fallout protection or shelter space in accordance with the Installation's Army Survival Measures Plan.

b. Functional and Technical Requirements. Examples of structural related functional and technical requirements that need to be addressed are:

(1) Allowable settlement soil bearing capacity and pile loads, as applicable.

(2) Dead, live, wind, snow and seismic design loads.

(3) Allowances for future loads or expansion.

(4) Dynamic loads, to include weapons effects, as applicable.

(5) Design methods; allowable working stress or strength (load factor).

(6) Design stresses; allowable unit stress or yield stress of materials.

(7) Deflection, to include maximum limits.

(8) Nuclear radiation (fallout) protection.

c. Design Objectives and Provisions. Examples of structural related design objectives and provisions that need to be addressed are:

(1) Foundation design as required by foundation or soil characteristics.

(2) Bay sizes and module spacing for functional requirements and economy.

(3) Seismic protection, to include symmetrical configuration of framing system, where applicable.

(4) Type and fabrication or construction of structural system, to include the basis for selection for at least three competitive systems.

(5) Speed of erection.

(6) Fallout protection or shelter space potential.

(7) Economy of construction and procurement, and life-cycle cost effectiveness in accordance with TM 5-802-1.

d. Calculations. The calculations for structural design elements, such as those listed below, will utilize metric units. If the project is permitted to use IP units, the calculations shall be performed in normally accepted and recognized IP units.

(1) Wind, snow, seismic and dynamic loads, as applicable.

(2) Shears, moments and axial loads, to include stress analysis diagrams and torsional effects, where applicable.

(3) Deflection of members and walls.

(4) Type and sizing of foundations, structural members and connections.

(5) Uplift and stability of the structure.

(6) Expansion and crack control.

(7) Construction or erection limitations.

(8) Structural adequacy of existing structures, where applicable, to account for new functional loads or new criteria.

(9) Fallout protection factors as required, or to identify Protection Factor (PF) 40 and above shelter spaces. Include single line plans showing the location of shelter areas and minimum PF rating.

(10) Cost comparison of competitive designs and materials, in terms of both construction costs, acquisition costs, and life-cycle costs in accordance with TM 5-802-1.

(11) Estimated cost of construction.

e. Coordination with Installation or Outside Agencies. Coordination should include, but not be limited to:

(1) Construction or erection limitations.

(2) Need for fallout shelter space.

5. Mechanical.

a. General Parameters. Examples of general mechanical parameters that need to be addressed are:

(1) Temperature extremes and other impacts of climate such as wind, precipitation, sun angles and humidity.

(2) Apparent competitive mechanical systems relative to fuel alternatives, energy use budgets and environmental impacts.

(3) Indoor environmental conditions

including temperatures, humidity, pressurization, ventilation and exhaust requirements.

(4) General Heating, Ventilation and Air Conditioning (HVAC) zones and occupant capacities.

(5) General toilet and sanitation zones, and occupant capacities.

(6) Water supply pressure.

(7) Existing or planned sanitary sewer capacities.

(8) Toxic or hazardous pollutant sources.

(9) Functions and occupancies requiring mechanical lifts, elevators and cranes.

(10) Special waste and drainage systems such as acid waste.

(11) Energy sources and capacities including heating and chilled water distribution, gas distribution, and fuel storage.

(12) Building and related mechanical system commissioning.

b. Functional and Technical Requirements. Examples of mechanical related functional and technical requirements that need to be addressed are:

(1) Design temperatures.

(2) Heating and/or cooling (air conditioning), and humidity control.

(3) Mechanical ventilation (air circulation) and special exhausts.

(4) Energy conservation, to include solar and recovery systems.

(5) Total energy and selective energy systems.

(6) Standby heating and cooling, and emergency environmental systems.

(7) Toilet fixture allocation.

(8) Hot and cold water systems, to include recovery systems.

(9) Heating and chilled water distribution, gas distribution and special liquid storage and distribution systems.

(10) Compressed air and vacuum production components.

(11) Sanitary waste and vent piping.

(12) Acid waste and chemical piping, and neutralization.

(13) Coordination with the connection to site utilities.

(14) Mechanical lifts, hoists and elevators.

(15) Control of airborne-polluting substances within the project.

(16) Control of polluting substances from energy systems.

(17) Treatment and disposal of toxic and/or polluting substances within the project.

(18) Accessibility and features for handicapped (physically impaired or disabled) persons.

c. Design Objectives and Provisions. Examples of mechanical related design objectives and provisions that need to be addressed are:

(1) Impacts and benefits from natural warming and cooling effects afforded by the site and coordination with passive solar design.

(2) Zoning of HVAC by occupancy.

(3) Heating and/or cooling system life cycle cost design, to include the basis for selection of the system. Provide an analysis of each competitive system.

(4) System expandability and feasibility.

(5) Energy conservation.

(6) Vibration and noise isolation and control.

(7) Consolidation of toilet and sanitation facilities.

(8) Supply and waste piping systems.

(9) Connection to utilities.

(10) Mechanical lift, hoist, crane and elevator designs.

(11) Control of polluting substances.

(12) Enhancement of systems operations and maintenance.

(13) Economy of construction and procurement, and life-cycle cost effectiveness in accordance with TM 5-802-1.

(14) Provisions for building and related mechanical system commissioning, and the testing adjusting and balancing of mechanical systems.

d. Calculations. The calculations for mechanical design elements, such as those listed below, will utilize metric units. If the project is permitted to use IP units, the calculations shall be performed in normally accepted and recognized IP units.

(1) Heating and cooling design loads. Computerized calculations will indicate the basis of all input data.

(2) Estimated annual unit energy consumption (see architectural).

(3) Determine the design energy use and compliance with the energy use budget.

(4) Energy recovery systems.

(5) Total energy and selective energy studies.

(6) Complete system and unit capacities, indicating the dimensions of all equipment.

(7) System vibration and noise isolation and control, safety, security and fire protection.

(8) Allocation of toilet and other fixtures.

(9) Maximum flow rates in liters per minute [gallons per minute] for hot and cold water, and the total flow per day.

(10) Size of hot and cold water supply systems, to include storage tanks inside the building and the supply of water for fire protection.

(11) Size of heating and chilled water distribution, gas distribution, fuel storage, and special liquid, compressed air and vacuum systems.

(12) Size of waste water and sewage drainage systems inside the building.

(13) Sizing of mechanical lifts, hoists and passenger and service elevators. Indicate the peak hour capacities for passenger elevators.

(14) Energy system pollution abatement.

(15) Disposal systems for toxic and/or polluting substances within the project.

(16) Outside air, ventilation and exhaust air design.

(17) Supply, return and exhaust air duct sizing, and pressures.

(18) Acoustic analysis including system noise isolation and reduction.

(19) Safety, security and fire protection and suppression.

(20) Building and related mechanical system commissioning, and the testing, adjusting, and balancing of mechanical systems.

(21) Surge analysis of closed loop systems.

(22) HVAC control system parameters and constraints.

(23) Cost comparison of competitive designs and materials, in terms of both construction costs, acquisition costs, and life-cycle costs in accordance with TM 5-802-1.

(24) Estimated cost of construction.

e. Coordination with Installation or Outside Agencies. Coordination should include, but not be limited to:

(1) Total energy and selective energy planning.

(2) Operations and maintenance support.

(3) Indoor environmental requirements including temperatures, humidity, and outside and exhaust air requirements.

(4) Type, number, schedule and activity level of occupants.

(5) Equipment to be installed along with utility requirements, environmental requirements, and heat release.

(7) Requirements for mechanical lifts, hoists, cranes, and elevators.

6. Electrical.

a. General Parameters. Examples of general electrical parameters that need to be addressed are:

(1) Type of occupancies.

(2) Specialized functions and equipment.

(3) Communications support.

(4) Electrical characteristics of the power supply.

(5) Adequacy of the existing system supporting the project site.

b. Functional and Technical Requirements. Examples of electrical related functional and technical requirements that need to be addressed are:

(1) Point of interface between the existing electrical system and the system to be constructed needs to be defined.

(2) Load characteristics including connected load, demand load, diversity factors, power factor, load profiles, nonlinear loads, transformer(s) peak loading and load growth provisions.

(3) Basis for selection of primary and secondary distribution voltages.

(4) Overhead and underground exterior distribution; voltage drop, interrupting requirements, physical characteristics of the circuits including types of conductors, ampacity of service, feeder and branch conductors, pole line and duct bank, conduit, or direct buried equipment characteristics.

(5) Illumination levels, to include general and task lighting, and visual qualities of lighting requirements .

(6) Low and high system voltage.

(7) Low and high voltage switching.

(8) Loads and load factors, to include allowances for future loads.

(9) Installation and equipment standards.

(10) Emergency lighting, distribution, security, communications and standby generation systems.

(11) Power, lighting, communications and security for site elements.

(12) Communications, to include call systems.

(13) Electronic clock systems.

(14) Electronic security, surveillance and Intrusion Detection Systems (IDS).

(15) Audio visual systems, to include central television (TV) systems.

(16) Energy conservation and energy monitoring.

(17) Power generation.

(18) Electromagnetic protection (EMP).

(19) Explosion-proof connections in hazardous environments.

c. Design Objectives and Provisions. Examples of electrical related design objectives and provisions that need to be addressed are:

(1) Electrical feeder and distribution systems.

(2) Spare capacities.

(3) General illumination and task lighting coordinated with interior layouts, safety and security requirements.

(4) Relamping and adjustments.

(5) Nonlinear loads and harmonics.

(6) Communications systems.

(7) Emergency power generation and distribution.

(8) Energy conservation.

(9) Enhancement of systems operations and maintenance, to include systems flexibility.

(10) Economy of construction and procurement, and life-cycle cost effectiveness in accordance with TM 5-802-1.

d. Calculations. The calculations for electrical design elements, such as those listed below, will utilize metric units. If the project is permitted to use IP units, the calculations shall be performed in normally accepted and recognized IP units.

(1) Maintained lux [Foot candle (FC)] levels in all areas. Where areas are similar in size and usage, only a typical calculation is required.

(2) Individual circuit and system loads

tabulated in amperes for each panel board or switchboard.

(3) Transformers, generators, switchboards and feeders indicating all demand, diversity, and ambient-temperature or conductor-grouping factors considered in the selection of equipment or conductor sizes.

(4) Cost comparison of illuminating, power and communication systems.

(5) Nonlinear loads and harmonic contributions, kilowatt rating of transformers, etc.

(6) Ground fault and its circuitry protection.

(7) Selective system protection.

(8) Voltage-drop on all service and feeder circuits, and on worst-case branch circuits supplied by each panel board and switchboard.

(9) Weight, dimensions and electrical characteristics of each major item of equipment supported by manufacturer's names, and catalog and model numbers.

(10) Cost comparison of competitive designs and materials, in terms of both construction costs, acquisition costs, and life-cycle costs in accordance with TM 5-802-1.

(11) Estimated cost of construction.

(12) Short circuit calculations.

(13) Electromagnetic Protection.

e. Coordination with Installation or Outside Agencies, i.e., electrical utility company, and the Installation's electrical distribution organization. Coordination should include, but not be limited to:

(1) Telephone system requirements and availability.

(2) Central TV.

(3) Power requirements of the installation's service and cleaning equipment of the installation.

(4) Provost Marshal or police response to IDS alarms.

(5) AR 190-13 for Army physical security, IDS design approvals, when required.

(6) Incorporation of maintenance and commissioning requirements of the Installation.

(7) Intrusion Detection System (IDS) Center of Expertise, Huntsville Engineer Technical Center, for design assistance.

(8) Utility Monitoring and Control System (UMCS) Center of Expertise, Huntsville Engineer Technical Center, for UMCS/EMCS design assistance.

7. Fire Protection and Life Safety.

a. General Parameters. Examples of general fire protection parameters that need to be addressed are:

(1) Types of occupancies.

(2) Hazard classification of specific areas and list of hazards.

(3) Specific criteria; standards and codes.

(4) Type of construction.

(5) Type of fire protection.

(6) Water supply.

b. Functional and Technical Requirements. Examples of fire protection related functional and technical requirements that need to be addressed are:

(1) Fire resistance of building components, to include floor and ceiling assemblies, exterior and interior walls, permanent partitions, shafts, and location of fire separation walls and partitions.

(2) Allowable floor area and building height in accordance with the Uniform Building Code (UBC) based on occupancy classification, construction, separations and fire suppression or protection.

(3) Exit requirements in accordance with NFPA 101, Life Safety Code (LSC). The design and analysis must address exit types, required exit widths, maximum travel distance for exiting, dead-end distances and common exit paths of travel limitations, arrangement of exits, remoteness of exits, discharge from exits, illumination of exits and exit marking.

(4) Flame spread and smoke development rating of interior finishes and insulations.

(5) Building access for local fire department fire fighters.

(6) Building separation and exposure protection.

(7) Smoke control methods.

(8) Automatic extinguishing systems.

(9) Fire alarm evacuation systems.

(10) Fire detection systems.

(11) Fire hydrants and standpipes.

(12) Water supply, to include new or additional water storage, pumping, and/or water distribution mains.

(13) Special hazards and methods for protection.

c. Design Objectives and Provisions. Examples of fire protection related design objectives and provisions that need to be addressed are testing and field investigation reporting requirements:

(1) Water flow tests at the point of connection for sprinklered buildings.

(2) Existing water supply.

(3) Existing fire hydrants.

(4) Existing fire alarm reporting system information for connection of new fire alarm systems.

(5) Economy of Construction and procurement, and life-cycle cost effectiveness in accordance with TM 5-802-1.

d. Calculations. The calculations for fire protection design elements, such as those listed below, will utilize metric units. If the project is permitted to use IP units, the calculations shall be performed in normally accepted and recognized IP units.

(1) Complete exit requirement calculations based on the LSC.

(2) Allowable floor area and building height calculations based on UBC.

(3) Water supply calculations indicating the adequacy of the design to meet sprinkler and hose stream flow demands. Calculations must be based on residual and static pressures and flow data obtained from water flow tests.

(4) Sprinkler calculations to determine water flow and pressure demands.

(5) Fire alarm system calculations for elements such as, wire sizing, battery, and alarm annunciator sound level.

(6) Complete hydraulic design calculations for detailed sprinkler and Aqueous Film Forming Foam (AFFF) system designs.

(7) Layout and sizing of special fire extinguishing systems, such as carbon-dioxide, halon, and AFFF (low pressure foam system).

e. Coordination with Installation or Outside Agencies. Coordination should include, but not be limited to:

(1) Fire fighting support, to include tie-ins with local fire department alarm and communication systems.

(2) Adequacy of water supply, to include flow tests.

(3) Inspection and testing of systems performance.

(4) Obtain the specific fire alarm type(s), fire protection and central reporting requirements of the Installation's Fire Marshall/Chief.

8. Physical Security.

a. General Parameters. Examples of general physical security parameters that need to be addressed are:

(1) Mission of the project.

(2) Size of the site.

(3) Installation threat statement.

(4) Anticipated aggressor tactics.

(5) Personnel and materials being protected.

(6) Activities performed.

(7) Security forces available.

b. Functional and Technical Requirements. Examples of physical security related functional and technical requirements that need to be addressed are:

(1) Defensible site layout.

(2) Securable building layout.

(3) Resistance to aggressor penetration.

(4) Vandal-proofing.

(5) Intrusion denial.

c. Design Objectives and Provisions. Examples of physical security related design objectives and provisions that need to be addressed are:

(1) Maximum security.

(2) No detraction from mission.

(3) Cost effective security features.

(4) Provisions for expansion.

(5) Efficient security zoning.

(6) Maximum use of standard designs.

(7) Economy of construction and procurement, and life-cycle cost effectiveness in accordance with TM 5-802-1.

d. Calculations. The calculations for physical security design elements, such as

those listed below, will utilize metric units. If the project is permitted to use IP units, the calculations shall be performed in normally accepted and recognized IP units.

(1) Time for aggressor to penetrate.

(2) Time for security force to respond.

(3) Power requirements for security systems.

(4) Protective lighting intensities.

(5) Costs.

e. Coordination with Installation or Outside Agencies. Coordination should include, but not be limited to:

(1) Conformance to the installation security plan.

(2) Appropriate local police agencies regarding patrol and alarm responses.

(3) Signal office regarding security communications.

(4) Security office regarding any AR 380-5 for classified material protection requirements.

(5) Protective Design Center of Expertise (Omaha District Engineer Office).

(6) Intrusion Detection System Center of Expertise, Huntsville Engineering and Support Center, for design assistance.

(7) Installation military police regarding any Army physical security of arms, ammunition and explosives, protection requirements.

(8) Intrusion detecting system approval in accordance with Army physical security criteria, when required.

(9) Installation medical office regarding any AR 190-50 requirements.

(10) Facility user regarding any automation security requirements.

- PART 3 -

OPERATION AND MAINTENANCE (O&M) PROVISIONS

1. Using Service Responsibilities For O&M. The following are using service responsibilities for O&M that should be considered by the design agency during the design development process:

a. Control Responsibilities.

(1) Parking allowances and assignment.

(2) Pavement and floor loadings.

(3) Spare parts, equipment, consumables, and miscellaneous storage.

(4) Energy use.

(5) Site access restrictions.

b. Service Responsibilities.

(1) Access-egress maintenance.

(2) Landscape maintenance.

(3) Snow and ice removal.

(4) Housekeeping, trash collection and disposal.

(5) Signage.

(6) Mail handling, shipping and receiving.

(7) Food service and supply.

(8) Health (dispensary) and sanitation.

(9) Reproduction (copy) service.

(10) Vending (state blind agencies and others).

(11) HVAC systems.

(12) Electrical and communications services.

(13) Security and fire protection.

(14) Shop support.

(15) Plumbing systems.

(16) Lifts, hoists, cranes, and elevators.

(17) Compressed air and vacuum systems.

(18) Fuel storage and dispensing systems.

(19) Industrial gas systems.

(20) Treatment facility operation and maintenance.

(21) Residuals disposal and manifesting.

(22) Permit compliance monitoring.

(23) Extraction/injection remediation system maintenance.

(24) Worker safety and occupational health.

2. Provisions For O&M Enhancement and Cost Reduction. The following are provisions for O&M enhancement and cost reduction that should be considered by the design agency during the design development process:

a. Control Related.

(1) Preventive overloading factors.

(2) Food service efficiency maximizers, preparation, serving, seating and dish washing.

(3) HVAC efficiency maximizers; sub- and main plant.

(4) Lighting efficiency maximizers, intensities and switching.

(5) Communications efficiency maximizers.

(6) Elevator efficiency maximizers.

(7) System expandability and flexibility.

b. Service Related.

(1) Below-grade flood protection.

(2) Above grade solar, water, and wind protection and resistance.

(3) Finish materials, textures and colors.

(4) Window washing provisions.

(5) Provisions for cleaning equipment.

(6) Vibration and expansion contraction controls.

(7) Energy conservation and pollution control measures.

(8) Access to mechanical systems; HVAC, elevators, plumbing, process and special equipment.

(9) Provisions for building and system recommissioning and testing, adjusting and balancing of mechanical, electrical and communications systems.

(10) Relamping and lighting relocation.

(11) Electrical distribution allowance for future loads.

(12) Emergency power system testing, and monitoring power quality.

(13) Vandalism and intrusion resistance.

(14) Confined spaces reduction/elimination or identification.

(15) Toxic or hazardous pollutant sources and exposure potentials.

APPENDIX C

DRAWINGS

1. General. This appendix prescribes the requirements, procedures and drafting standards for the preparation and approval of drawings for military construction and/or HTRW projects. It includes drawings, other than shop drawings, prepared at all stages of design and construction.

2. Standard Drawings. Standard drawings are developed under the guidance and criteria issued by HQUSACE (CEMP-E). A listing of current standard drawings is available from the TECHINFO system accessed through the USACE Home Page on the Internet, *http:/www.hnd.usace.army.mil*, or by direct telephone dialing the system data line at (205) 895-1826. The purpose of standard drawings is to aid in project planning and design, and to reduce the cost and time for the preparation of project drawings.

a. Types of Drawings. Types of standard drawings are described as follows:

(1) Standard Design Drawings. Standard design drawings can range in completeness from definitive or sketch level, to completed construction documents with the drawings of sufficient detail as to materials and methods of construction to serve as project construction drawings after the necessary field modifications covering site adaptations and deletion of inapplicable materials.

(a) Standard designs generally provide for site adaptation in widely separated geographical areas with design data for different climatic and seismic conditions, and building materials. Alternate wall sections, details and building elevations are included as required to illustrate these variations.

(b) These drawings are sometimes accompanied by a standard technical guide specification.

(2) Definitive Design Drawings. Definitive design drawings delineate functional layouts, space allowances, special features or requirements, and the configuration of elements both horizontally and vertically. Definitive design drawings usually recommend basic building systems; materials and construction details; architectural treatments; and structural, mechanical, electrical and fire protection systems with criteria and guidance necessary for making selection. These drawings typically include floor plans, elevations and cross sections with controlling and critical dimensions, gross and net area tabulations. Definitive design drawings also address the most likely and alternative site support facilities and utility requirements for mechanical and electrical systems. These drawings are sometimes accompanied by a design analysis.

(3) Department of the Army (DA) Facilities Standardization Program Standard Design Packages. The drawings in these packages are normally developed to a level of design that is similar to definitive design drawings. The basic DA Standard Design Package includes both standard design drawings and design analysis. Additional requirements and information on the DA Facilities Standardization Program are contained in ER 1110-3-113 and AR 415-15.

(4) Sketch Design Drawings. Sketch designs are usually single-line drawings delineating functional layouts, space allowances

and the basic features of a facility type. These drawings typically include plans, and elevations and cross sections with controlling dimensions and area tabulations.

(5) Design Guide Drawings. Design guides are published and issued in printed form with both narrative and graphic data to describe the functional layout, space allowance and special features of a facility type. Design guides typically include drawings delineating individual space requirements, and drawings showing the organization of spaces into alternative facility layouts and designs. These designs are usually illustrated further by plans, and elevations and cross sections with controlling dimensions and area tabulations. Perspective sketches may be included to illustrate recommended interior designs and exterior design treatments. Drawings are reduced to manual size for publication.

(6) Project Design Drawings from the CADD Library. These drawings are completed facility specific project documents available for site adapt use to reduce cost and time for the preparation of project drawings.

b. Modification of Standard Drawings. The design agency responsible for the development of a project design is authorized to modify standard drawings, except those drawings contained in the DA Facilities Standardization Program standard design packages, to meet local siting, foundation, topographic, climatic and seismic conditions, energy and utility availability, and life cycle cost. Criteria and waiver request procedures for DA Facilities Standardization Program designs are governed under ER 1110-3-113, and DAIM-FDR memorandum, 7 Oct 95, SUBJECT: Request for Waivers from the Use of DA Standard Design and Space Planning Criteria.

(1) Modifications. Modifications to standard drawings are authorized to avoid unnecessary construction features or costs, to correct errors, and to adapt the drawings to local materials and methods of construction, metric measurements (when originally prepared in IP unit measurement), or CADD techniques.

(2) Directed Modifications. Other modifications may be directed by HQUSACE (CEMP-E) in AEI or design directives. Modifications and changes may be promulgated through Engineer Technical Letters (ETL) or revisions to guide specifications.

(3) Deviations. Modifications that cause deviations from functional and operational requirements, space criteria or cause significant increases in cost shall be avoided. Deviations to the functional and operational requirements contained in DA Facilities Standardization Program standard design drawings are unauthorized.

c. Deficiency Reports and Recommendations. HQUSACE (CEMP-EA) will be promptly informed of any errors or omissions in DA Standard Designs, including drawings. Under the provisions in ER 1110-345-100, ENG Form 3078 may be used for this purpose or the deficiency may be reported directly to HQUSACE (CEMP-EA), Washington, DC 20314-1000.

3. Project Drawings.

a. Concept Design Drawings. Concept designs are used to define the functional, technical, and architectural and engineering aspects of a project, and to help verify project costs in order to provide a firm basis upon which to initiate the final project design. Completion of concept design drawings, together with a design analysis, outline specifications and cost estimate, normally represents about one-third of the total design effort. Concept designs will be prepared in accordance with AR 415-15, utilizing the

project requirements documents and applicable standard drawings.

(1) When standard design drawings are used, the drawings for the new project will include appropriate sheets from those drawings modified to depict site adaptations and other essential requirements. Duplication will be avoided except as required for clarity.

(2) Concept design drawings will generally include the following information:

(a) Project site plan showing existing and proposed buildings, roads, parking, landscape planting masses, contours, and the utilities in the immediate vicinity of the project.

(b) Building floor plans, cross sections and elevations showing the functional layout, space configuration and form, and building system characteristics, to include the required properties and/or performance of the construction materials and methods.

(c) Design details of exterior and interior elements; schedule of windows, doors, and finishes and colors; details related to architectural, structural, mechanical, electrical and fire protection systems; and energy usage and other special requirements.

(d) Foundation plans and details showing geotechnical investigation results, boring data, subsurface soil classification, allowable soil bearing capacity, ground water elevations, etc.

b. Final Design Drawings. Final design drawings will be prepared from the approved concept designs. When standard design drawings are used, additional sheets will be incorporated as appropriate. Final design drawings together with a complete design analysis, construction specifications, and a cost estimate covering all technical, architectural and engineering details will form the basis for construction contracting. The drawings will be sufficient in detail to provide for fair and competitive bids from contractors, and to provide for the construction of the project without additional drawings, except for shop drawings or as may be required to deal with unforeseen conditions encountered during construction.

c. Shop Drawings. These are drawings submitted by a contractor, manufacturer, vendor or others, which show in detail the proposed fabrication and assembly of specific building components or which show the installation details (i.e., form, fit and attachment) of materials or equipment. Preparation, approval and transmittal of shop drawings are outside the scope of this regulation.

d. As-built Drawings. As-built drawings will be prepared as part of the completion records transferred to the using service upon completion of the project. The contract drawings will be revised and corrected to indicate the actual construction of the project, including all change orders. Site plans, building plans, cross sections and elevations, schedules and all other portions of the drawings to include the location of mechanical services, utility lines and outlets, will be revised to provide a clear understanding of the project, as built. As-built drawings, together with as-built construction specifications, final shop drawings and the design analysis will be furnished to the using service in accordance with ER 415-345-38.

4. Drawing Preparation. Drawings will be prepared so as to clearly and adequately delineate the work to be accomplished.

a. Quality. Because of the number of copies of drawings normally required for a project, most drawings are reduced to half-size for reproduction. Original drawings and details; therefore, must be of adequate size, and be

clear and sharp, so that the use of half-size reproducibles will result in legible and easy to read copies.

b. Drafting Standards and Practices. Format and organization, control data blocks, drawing conventions, schedules and standard details will conform to the requirements and guidance contained in paragraph 5 of this appendix.

c. Codification. Drawing sheets will be assigned a drawing code in accordance with the guidance contained in paragraph 10 of this appendix.

d. Metrication. The criteria and requirements for the application of metric measurements in drawings were addressed in paragraph 4 of this regulation. The following ANSI and ASTM standards will be used in the preparation of drawings:

(1) American National Standards Institute. 28 October 1992. "American National Standard for Metric Practice," ANSI/IEEE 268-1992, IEEE Standards Coordinating Committee 14 on Quantities, Units, and Letter Symbols, New York.

(2) American Society for Testing and Materials. 1991. "Standard Practice for the Use of Metric (SI) Units in Building Design and Construction," ASTM E 621-84 (Reapproved 1991), Committee E-6 on Performance of Building Construction, Philadelphia, PA.

(3) American Society for Testing and Materials. 1992. "Standard Practice for the Use of the International System of Units (SI) (the Modernized Metric System)," ASTM E 380-92, Committee E-43 on Metric Practice, Philadelphia, PA.

e. Computer-Aided Design and Drafting (CADD). Commercially available CADD systems have demonstrated significant potential for improving the efficiency and quality of drawing production. Standards for USACE CADD application are contained in Tri-Service CADD/GIS Technology Centers Architectural, Engineering and Construction (A/E/C) CADD Standards available at Internet site *http://mr2.wes.army.mil.* Those criteria that meet the quality requirement in the paragraph above are acceptable for use in preparing project and other drawings. Manually prepared drawings will also follow the general guidance in this manual as it applies to general drafting standards.

5. Drafting Standards and Practices.

a. Format and Organization.

(1) Concept and final design drawings, and drawings for standard and definitive designs, will be prepared on standard A1 metric size sheets, 594 mm x 841 mm (23.39 inches x 33.11 inches); an American National Standards Institute (ANSI) "D" equivalent sheet.

(2) When preparing large maps, i.e., installation master plans and drawings for Civil Works projects, the standard A0 metric sheets; 841 mm x 1189 mm (33.1 inches x 46 inches) should be used; an ANSI "E" equivalent sheet.

(3) When preparing half-size drawings for inclusion to booklets such as "Design Analysis," the standard A3 metric sheet; 297 mm x 420 mm (11.7 inches x 16.5 inches) should be used; an ANSI "B" equivalent sheet, that conveniently folds in to the standard A4 metric size; 210 mm x 297 mm (8.3 inches x 11.7 inches), an ANSI "A" equivalent sheet.

(4) The sheet layout, including the standard title and information blocks, for drawings are provided at Figure C-1 and Figure C-2 which depict expanded views of the title, revision and other information blocks on the

standard sheet.

b. Cover Sheet.

(1) Project drawings will have a cover sheet or sheets with the project name, project location, design agency logo and identification, project number and fiscal year. Applicable file numbers will be included as appropriate. The overall sheet layout of title and other information blocks shall follow the theme in Figure C-1 and Figure C-2.

(2) Cover sheets for in-house work shall comply with the requirements of ER 1110-1-8152, paragraph 6 concerning signatures, and will include the following statement:

"This project was designed by the (name of district) District of the U.S. Army Corps of Engineers. The initials or signatures and registration designations of individuals appear on these projects documents within the scope of their employment as required by ER 1110-1-8152."

c. Index Sheets. Project drawings, and drawings for standard and definitive designs, will have an index sheet or sheets. The index sheet or sheets will identify by reference number, date and title, each of the other sheets in the set of drawings, and indicate the total number of sheets in each design discipline group. The overall sheet layout of title and other information blocks shall follow the theme in Figure C-1 and Figure C-2.

d. Legend Sheets. A legend sheet or sheets should follow the index sheet or sheets, or may be combined with the index sheet or sheets. The legend sheet or sheets will include definitions of abbreviations used; legends for materials, mechanical and electrical symbols; a graphic illustration of details and cross section reference indicators; and other information as required for that particular set of drawings. The overall sheet layout of title and other information blocks shall follow the theme in Figure C-1 and Figure C-2

e. Drawing Sheets. Drawing sheets will follow the cover, index and legend sheets in order of the following design discipline groups: civil to include the site design; architectural to include interior design; structural; mechanical; electrical; and others. The architectural drawings should normally show plans, elevations, cross sections and details in that order. The overall sheet layout of title and other information blocks shall follow the theme in Figure C-1 and Figure C-2.

f. Supplemental Drawing Sheets. When it is required that any drawing sheet for a specific project be redrawn and/or new drawing sheets added, such as in the preparation of as-built drawings or contract modifications, the redrawn or new drawing sheets will be consecutively numbered to follow the last drawing sheet of the design discipline group. The basic sheet that is replaced or supplemented by a supplemental drawing sheet will be retained in its original position with a note in the revision block indicating the sheet number where the changed conditions are shown.

6. Control Data Blocks.

a. Title Blocks. Except for the cover sheet, title blocks will be placed on each individual drawing sheet in the space inside the right hand margin of the drawing sheet, as indicated in Figure C-1, to identify the name of the project, the project number and fiscal year, and the installation where the project is located. Title block data will also include the title of the drawing on the sheet, the sheet reference number, the drawing code assigned in accordance with paragraph 10 of this appendix, applicable local file numbers, and the approval date of the drawing sheet. Local design agency standards may be used for recording in the title

blocks of individual drawing sheets, the names or initials of the person or persons responsible for the design, drawing and checking of each drawing sheet, and for overall review and approval in accordance with ER 1110-1-8152 . However, the local design agency standard shall comply with the sheet size standards in the appendix, and the standard configuration at Figures C-1 and C-2.

b. Authentication Blocks. Authentication blocks will be placed on the index sheet or sheets to the left of the title block. Authentication blocks will provide spaces for the signatures of those individuals responsible for the preparation, review and approval of the drawings. Approval is required for both technical and functional adequacy. Space will also be provided to indicate the date of approval next to the signature. Use of authentication blocks on other drawing sheets will be at the discretion of the design agency responsible for the design.

c. Revision Blocks. Except for the cover sheet, revision blocks will be placed on each drawing sheet above the title block to describe any revision made to the drawings, to indicate the number and date of the revision, and the initials of the official approving the revision; see Figure C-1.

7. Drawing Conventions. Methods used for drawing, lettering, dimensioning and cross-referencing must be economical and assure legibility when drawing sheets are reduced to half-size sheets. Lettering styles and sizes should be standardized within a set of drawings regardless of the design discipline involved.

a. Symbols. Symbols used in the preparation of civil, architectural, structural, mechanical, electrical and other drawings will reflect usage, for example, established by the American National Standards Institute (ANSI) standards or generally accepted professional standards.

b. Abbreviations. Abbreviations will reflect common usage.

c. Scales. Graphic scales will be provided on drawings to allow for measured scaling. Project drawings, standard and definitive designs will generally be drawn to the scales indicated in Table C-1.

Table C-1
Drawing Scales

Type	SI Metric	Inch-Pound (IP) Customary Equivalent
Site Plan	1:250 /1	(1" = 25')
	1:200	(1/16" = 1'-0")
Floor Plan	1:50 /2	(1/4" = 1'-0")
	1:100	(1/8" = 1'-0")
	1:200	(1/16" = 1'-0")
Roof Plan	1:200	(1/16" = 1'-0")
Exterior	1:10	(1" or 1-1/2" =1'-0")
Elevation	1:100	(1/8" = 1'-0")
	1:200	(1/16" = 1'-0")
Interior	1:50	(1/4" = 1'-0")
Elevation	1:100	(1/8" = 1'-0")
Boring	1:10	(1" or 1-1/2" = 1'-0")
Logs	1:100	(1/8" = 1'-0")
	1:200	(1/16" = 1'-0")
Cross-	1:50	(1/4" = 1'-0")
Section	1:100	(1/8" = 1'-0")
	1:200	(1/16" = 1'-0")
Wall Section	1:20	(1/2"or 3/4" = 1'-0")
Stair Detail	1:10	(1"or 1-1/2" = 1'-0")

Table C-1
Drawing Scales, Continued

Type	SI Metric	Inch-Pound (IP) Customary Equivalent
Details	1:5	(3" = 1'-0")
	1:10	(1" or 1-1/2" = 1'-0")

/1 May be necessary for landscape plans
/2 May be used for partial floor plans

d. Keys. All cross-referencing conventions, symbols and abbreviations will be keyed, and shown on the legend and other drawing sheets as appropriate.

e. Revisions. Conventions for describing revisions will include marking of the area of the drawing sheet revised so that the area can be easily located.

7. Schedules.

a. Window Schedules. A tabular schedule of windows will also be included on the drawings. Each type of window will be assigned a number preceded by the letter "W." An elevation drawing of each type of window will be provided along with pertinent details. Every window will be clearly indicated by type on the elevation drawings.

b. Door Schedules. A tabular schedule of doors will be included on the drawings. Every door will be assigned a separate number and this number will be clearly indicated on the plans. Door numbers should be as nearly consecutive as possible, by floor, beginning with the principal building entrance area and progressing counter-clockwise through the plan. An elevation drawing of each type of door, identified by an upper case letter will indicate the material of which the door is made and other pertinent details. Details of each type of door frame will be shown and each type will be identified.

c. Finish and Color Schedules. A tabular schedule of interior finishes and colors will be included on the drawings. Finish and color schedules should identify by room number the finish materials and colors to be used for the floor to include the base, the walls to include any wainscoting and trim, and the ceiling. The meaning of the abbreviations used in naming the materials and finishes will appear on the legend sheet or on the same sheet as the schedules.

8. Standard Details. The classification and type of standard details on drawings will conform as "CLASS 40" listed in Table C-2. When sequence numbers for standard details, i.e., DET 40-06-04 is Lighting Fixtures, are established; the sequence numbers are obtained from the U.S. Army Engineering and Support Center, Huntsville (CEHNC-ED-ES), telephone (205) 895-1402.

Table C-2
Class 40 - Standard Details

Type No.	Type of Detail
01	Architectural Details
02	Structural Details
03	Heating Details
04	Equipment Layouts & Details
05	Legends, Notes, Schedules, and Symbols
06	Electrical Details
07	Water System Details
08	Sanitary Sewer Details
09	Gas System Details
10	Field Survey Details
11	Athletic Equipment Details
12	Railroad Details
13	Plumbing details
14	Air Conditioning Details
15	Fire Protection Details
16	Fence Details
17	Pavement, Curb and Sidewalk Repair Details

Table C-2
Class 40 - Standard Detail, Continued

Type No.	Type of Detail
18	Storage Racks, Grounds & Equipment Details
19	Tent Frame Details
20	Storm Water Details
21	Standard Component Layouts and Details
22	Kitchen Equipment Layouts and Details
23	Overhead Carrier System Details
24	Aircraft Arresting Barrier Details

9. **Area Computations and Room Numbering.**

a. Area Computations. Gross area of buildings and net area breakdowns for each floor will be provided on plans and computed in accordance with the method specified in AR 415-17, AEI Design Criteria.

b. Room Numbering. Every room will be assigned a separate number and this number will be clearly indicated on the plans. Room numbers will generally be assigned as shown in Table C-3. Room numbers should be as nearly consecutive as possible, beginning with the principal entry area and progressing counter-clockwise through the plan. Spaces added by revision should be given the number of the primary or nearest room followed by the letter "A," or if more than one additional space "B."

Table C-3
Room Numbering

Floor	Numbering Sequence
Basement	01 through 99
First	100 through 199
Second	200 through 299

10. **Drawing Codification.** Drawings will be assigned a drawing code consisting of a letter prefix and three numerical parts as follows:

a. Prefixes. Letter prefixes will be used to differentiate between the various types of drawings, and between drawings prepared for Army, Air Force, and other projects as shown Table C-4.

Table C-4
Drawing Prefixes

Drawing other	Type	Army Prefix	Air Force Prefix	
Project Drawings	Concept	C	AC	XC
	Final	F	AF	XF
	As-Built	AS-BLT	AS-BLT	AS-BLT
Standard Drawings	Standard	STD	AW	XW
	Definitive Design	DEF	AD	XD
	Sketch Design	SK	ASK	XSK
	Design Guide	DG	-	-

b. Class Number. The first numerical part of the drawing code is a class number based on the first three digits of the facility category codes given in AR 415-28, and for Air Force projects obtain the information from the project Air Force command.

c. Type Number. The second numerical part of the drawing code is a type number based on the last two digits of the facility category codes given in AR 415-28 for Army projects, and the last three digits given Air Force Command for an Air Force project.

d. Sequence Number. The third numerical part of the drawing code is a chronological

sequence number to indicate succeeding numbers of drawings for a particular class and type of building or structure prepared within a particular design agency.

(1) Sequence numbers for project drawings will be assigned by the design agency responsible for the project and follow the criteria in this appendix. The first sequence number will be 01 after implementation of the coding system herein.

(2) Sequence numbers for standard drawings will be assigned by HQUSACE (CEMP-EA).

e. Examples. The following subparagraphs show how prefixes and numbers are combined to form a complete drawing code:

(1) To establish the drawing code for a training facility; the class number is 171, training buildings. If the facility is for the Army and for general instruction, the type number is 20; if the facility is for the Air Force and for pilot training, the type number is 213. Assuming this coding is the first design for this type of facility by the design agency since implementation of the coding system herein, the sequence number is 01.

(2) For the above example, the drawing code at the concept design stage becomes C-171-20-01 for an Army project and AC 171-213-01 for an Air Force project. A sequence number once assigned, is henceforth fixed for that particular set of drawings.

(3) During the development of drawings from the concept to final design stage, the numbers are retained but the prefix is changed from C to F. The drawing code at the final design stage becomes F-171-20-01 for an Army project and AF 171-213-01 for an Air Force project.

(4) In the case of an Army project standard design, the drawing code is STD 171-20-01, or AW 171-213-01 for an Air Force project. These drawing codes will be assigned by HQUSACE (CEMP-EA). The drawing code assigned by the design agency in site adapting this standard to an Army project would be F-171-20-01, assuming this was the first set of drawings for this type of facility prepared by the design agency.

(5) When modifying the final drawings to reflect as-built conditions, the numbers are retained but the prefix will be changed from F to AS-BLT. The drawing code becomes AS-BLT 171-20-01 for an Army project and AS-BLT 171-113-01 for an Air Force project (confer with the project's Air Force Command.

(6) If a final project drawing is designated as a standard drawing, the basic class and type numbers are retained, but the sequence number is changed to that assigned by HQUSACE (CEMP-EA). The prefix is also changed from F to FD to indicate designation as a field design.

11. Use of Additional SE Coding or Numbering Systems. No changes will be made in the coding system prescribed herein without prior approval of HQUSACE (CEMP-EA). If a design agency requires a class or type number not clearly covered by the facility category codes in AR 415-28, an appropriate number will be furnished upon request to HQUSACE (CEMP-EA). All requests concerning Air Force definitive numbers and facility nomenclature should be made to the Air Force Civil Engineer Support Agency, Tyndall AFB, FL 32403-53191, and the project's Air Force Command. When a design agency requires an additional coding or numbering system to comply with an existing system, these additional codes or numbers may be included on the drawings.

12. Review and Approval of Project Drawings.

a. Using Service. Submittal of drawings to the using service for review and approval of the functional aspects of the design will be compatible with the provisions of AR 415-15 .

b. Corps of Engineers Design Agency. Review and approval of drawings by the design agency will be in accordance with the design verification provisions set forth in ER 1110-345-100.

c. Headquarters, U.S. Army Corps of Engineers (HQUSACE). Project drawings shall not be submitted to HQUSACE (CEMP-E), except as provided by specific regulations, design directive or other HQUSACE instructions. Review or approval by HQUSACE (CEMP-E), that is directed by regulation or HQUSACE (CEMP-E) instruction, will in no way relieve the design agency of its approval responsibility.

13. Drawing Authentication. Approved drawings will be so designated by authentication on an index sheet or sheets that identifies by reference number, date and title, each of the other sheets in the set. This sheet or sheets will bear the signature of the appropriate officials responsible for the preparation, review and approval of the drawings. Drawings will be certified as official and final, see ER 1110-1-8152.

14. Modification of Project Drawings After Approval. The design agency responsible for the project design is authorized to make modifications to the project drawings that have been approved in accordance with paragraph 12 of this appendix to correct errors, omissions and ambiguities, or to meet changes in local conditions occurring during construction.

a. Modifications after Approval. Modifications may be undertaken provided that the modifications are necessary or desirable to allow construction to proceed in an efficient and economical manner, and do not alter the quality of construction, general functions, appearance or scope of the project.

b. Identifying Modifications. Modification of project drawings will be clearly indicated and identified by date and the office authorizing the change.

15. A-E Prepared Drawings. A-E contractor drawings shall comply with Figure C-1 and Figure C-2, and ER 1110-1-8152, paragraph 7. A-E contractor prepared drawings shall not be signed as accepted or approved by Corps of Engineers' personnel.

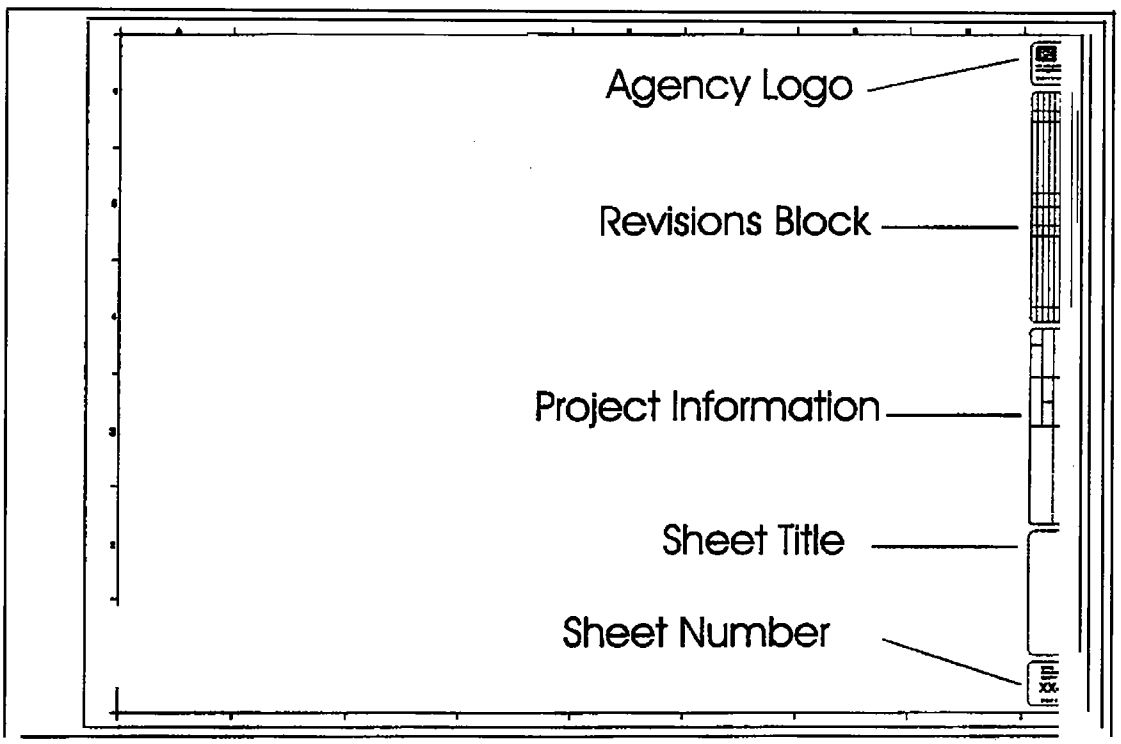

Figure C-1 Metric Sheet with
Vertical Title Block

1\ Cover Sheets for in-house work must include the statement as indicated in Appendix C, paragraph 15 of this ER.

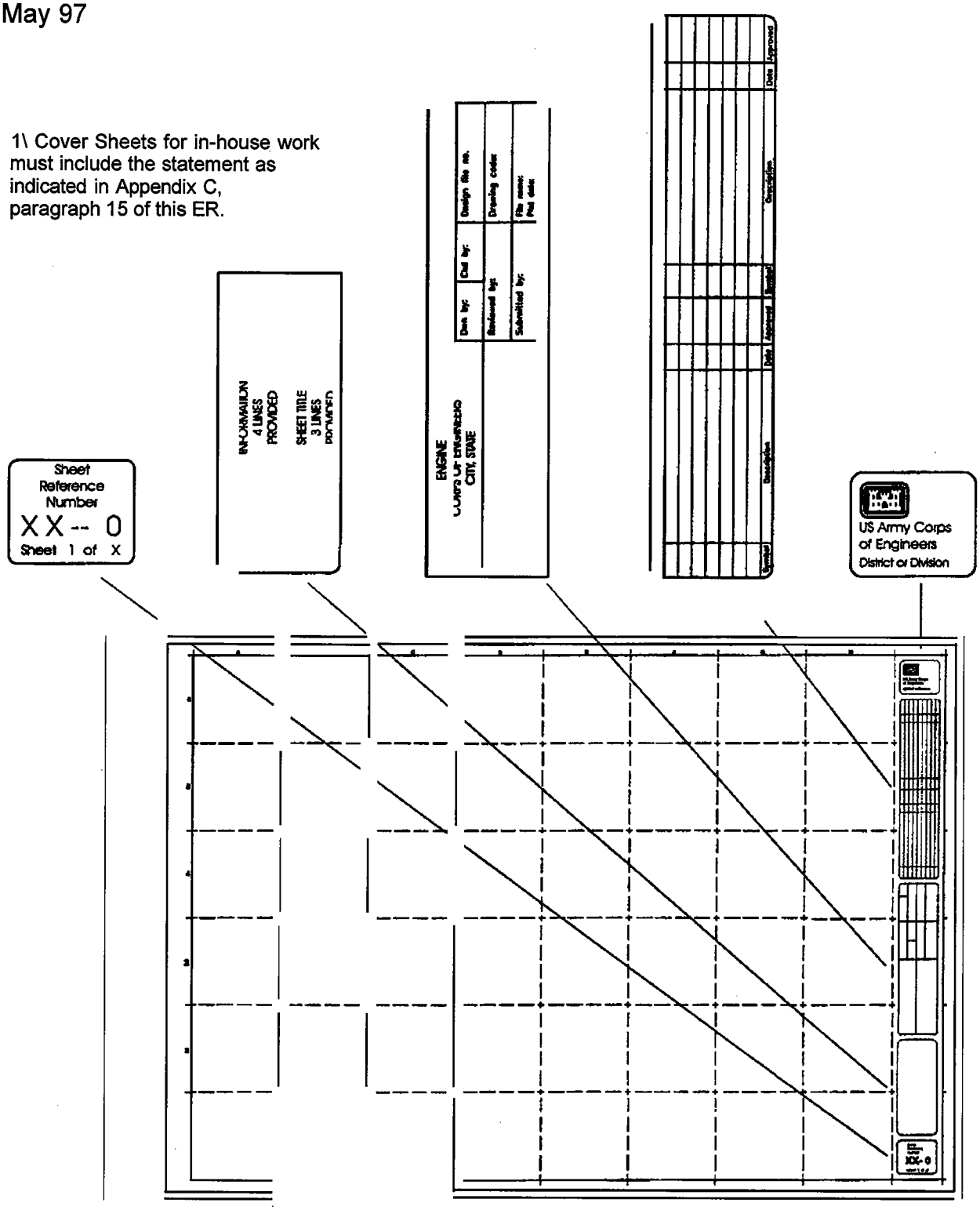

Figure C-2 1\
Metric Sheet with
Vertical Title Block

CEMP-CE
CECW-OC

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

Regulation
No. 415-1-10

15 April 1997

Construction
CONTRACTOR SUBMITTAL PROCEDURES

1. Purpose. The purpose of this regulation is to establish a system whereby the contractor can maintain effective scheduling, control and processing of submittals required by the contract in order to regulate the timely flow of materials to be incorporated into the construction.

2. Applicability. This regulation is applicable to all Major Subordinate Commands (MSC) and District Commands (DC) awarding and/or supervising any contracts requiring construction activities and shall be considered in conjunction with, and as a supplement to, ER 1180-1-6 during its implementation.

3. References.

a. ER 37-2-10

b. ER 37-345-10

c. ER 415-1-16

d. ER 1180-1-6

e. EP 415-1-260

4. General. The submittals referred to in this regulation include all shop drawings, samples, letters of certification, tests and other engineering information that may be required for quality control and assurance. The contractor is required to furnish a specified quality of construction, including materials and equipment to be incorporated in the work. Control of the quality of materials and equipment requires timely review, testing, or other evaluation. All required submittals must be made in time to allow for evaluation, approval, procurement, and delivery prior to the preparatory control phase and before the item is needed in the construction process.

5. Policy. This regulation prescribes standard procedures which are applicable to all contracts containing construction activities. The primary responsibility for the overall

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This regulation supersedes ER 415-1-10, 30 May 1995

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE *(Read instructions on the reverse side prior to initiating this form)*	DATE	TRANSMITTAL NO.

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

TO:	FROM:	CONTRACT NO.	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITTAL _____
SPECIFICATION SEC. NO. *(Cover only one section with each transmittal)*	PROJECT TITLE AND LOCATION		CHECK ONE: THIS TRANSMITTAL IS FOR ☐ FIO ☐ GOV'T. APPROVAL

ITEM NO. *a.*	DESCRIPTION OF ITEM SUBMITTED *(Type size, model number/etc.)* *b.*	MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. *(See instruction no. 8)* *c.*	NO. OF COPIES *d.*	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE *g.*	VARIATION *(See instruction No. 6)* *h.*	FOR CE USE CODE *i.*
				SPEC. PARA. NO. *e.*	DRAWING SHEET NO. *f.*			

REMARKS

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

_____
NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED *(List by Item No.)*	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE

ENG FORM 4025-R, MAR 95 *(ER 415-1-10)* EDITION OF SEP 93 IS OBSOLETE. SHEET ___ OF ___ *(Proponent: CEMP-CE)*

c. Submittals will be received from the contractor as directed by the specifications. ENG Form 4025 (Transmittal of Shop Drawings, Equipment Data, Material Samples, or Manufacturer's Certificates of Compliance) will be used as the transmittal document. Review will be as previously determined. The cost for reviewing shop drawings will be charged in accordance with ER 415-1-16, ER 37-2-10 and ER 37-345-10. Approval actions and correspondence with the contractor shall be made by the Area/Resident Engineer Office (ACO/COR) . Government personnel shall perform quality assurance reviews of information only submittals to assure that the contractor's quality control program is properly handling submittals. The number of reviews will be at the DC discretion, however, a minimum of 10 percent of all information only submittals will be reviewed.

9. Implementation. The contract documents will include a section based on CEGS 01300 which will establish contractual procedures for submittals. MSC/DC will establish necessary internal procedures to carry out the intent of this regulation.

FOR THE COMMANDER:

OTIS WILLIAMS
Colonel, Corps of Engineers
Chief of Staff

2 Appendices
APP A - ENG Form 4288-R
APP B - ENG Form 4025

8. Government Responsibilities.

a. The designer will prepare a list of submittals required for each contract. This list must be very specific to allow the construction contractor to know exactly what it is that is required to be submitted. This list will be prepared electronically on ENG Form 4288-R (Submittal Register) (Appendix A) and will be limited to columns "d" thru "o". This list will be provided in hard copy and on computer disc which is compatible with the Resident Management System (RMS) software. Prior to advertisement, construction and engineering elements of the FOA will jointly determine what submittals require government approval and what submittals are for information only. This will be noted in columns "p" and "q" on the ENG Form 4288-R. Column "r" will be used to designate the reviewer in accordance with MSC/DC procedures. The information on ENG Form 4288-R will be incorporated into the specifications prior to advertisement. ENG Form 4288-R is authorized for electronic generation in accordance with existing guidelines on electronic generation of forms. Further guidance on electronic generation of forms is available through the local Forms Management Officer (FMO).

b. The appropriate elements of the MSC/DC will review the contractor's submittal control document in accordance with procedures established by the MSC/DC. The review will be coordinated within the MSC/DC to assure that all required submittal schedules, review time, and procurement lead times are reasonable. In addition, the document shall be checked against the Network Analysis System or other approved construction schedule. The master copy of the control document shall be maintained in the Area/Resident Office. Control at this level is necessary to ensure effective management of the contractor and timely response by the government. It is essential that a complete record of all action dates be maintained and that the document reflect current information for each contract. It is important that certifications required after completion of construction, like roofing systems and underground heat distribution systems, be monitored and obtained at the appropriate times. The Area/Resident Engineer should monitor progress at all times and take appropriate action for any delay. Examples of appropriate actions for contractor caused delays include letters advising of delinquency, retainage for unsatisfactory progress, and nonpayment for unapproved materials.

management and control of contractor submittals, in context with ER 1180-1-6, lies with the prime contractor. Monitoring of the contractor's quality management control to assure that submittals are timely, appropriately certified, and in compliance with the contract is the responsibility of the government.

6. Submittal Classifications. Submittals are classified as "government approved" or "information only." Submittals which will always require government approval are: extensions of design, critical materials, deviations, O&M manuals or those involving equipment that must be checked for compatibility with the entire system. The number of submittals requiring government approval should be kept to a minimum. All submittals not requiring government approval are for information only. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", government approved submittals are considered to be "shop drawings" whereas information only submittals are not. Examples of extensions of design are fire alarm and sprinkler protection systems, prefabricated buildings, structural steel drawings, standing seam metal roof drawings, coordination studies such as short circuit analysis of contractor selected electrical equipment, etc. Critical materials are defined as materials which must meet specific quality performance standards required by design parameters, the failure of which will have a major impact on the operation, maintenance, quality of life or life safety of the system. Examples of critical materials are coatings for cathodic protection of storage tanks, high pressure piping and controls, acid and hazardous waste systems, or architectural finishes for customer approval. Deviations are any submittal by the construction contractor which varies from the construction contract specifications. Examples of equipment which must be checked for compatibility with existing systems or the entire new system are equipment for sewage treatment and water purification plants, energy management control systems, intrusion detection systems, power generation and distribution systems, etc. The examples provided here are not all inclusive and are used only for illustration purposes.

7. Contractor Responsibilities. The contractor is responsible for total management of his/her work. This includes the scheduling, control, and certification of all submittals. The contractor's responsibilities will be established by the inclusion of properly edited CEGS-01330 in the contract specifications.

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box: on resubmittals, insert transmittal number of last submission well as the new submittal number.

3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.

4. Submittals requiring expeditious handling will be submitted on I separate form.

5s. Separate transmittal form will be used for submittals under separate sections of the specifications.

6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications-also a written statement to that effect shall be included in tea space provided for "Remarks".

7. Form is self-transmittal, letter of transmittal is not required.

8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section L

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section 1, column 1 to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section 1, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A -- Approved as submitted.

B -- Approved, except as noted on drawings.

C -- Approved, except as noted on drawings. Refer to attached sheet resubmission required.

D -- Will be returned by separate correspondence.

E - Disapproved (See Attached).

F - Receipt acknowledged.

FX - Receipt acknowledged, does not comply as noted with contract requirements.

G - Other (Specify)

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

(Reverse of ENG Form 4025-R)

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

ER 1110-1-8155

CECW-E

Regulation
No. 1110-1-8155

10 October 2003

Engineering and Design
SPECIFICATIONS

1. Purpose. This regulation prescribes specifications policy and requirements for both Civil Works and Military Construction, incorporates Total Army Quality principles and the Project Management Business Process, implements MIL-STD-3007, "Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications," and enables Headquarters U.S. Army Corps of Engineers (HQUSACE) elements and U.S. Army Corps of Engineers (USACE) commands to produce quality project specifications.

2. Applicability. This regulation is applicable to all HQUSACE elements and USACE commands having design or construction responsibilities.

3. Distribution. This regulation is approved for public release; distribution is unlimited.

4. References. Required and related publications are listed in Appendix A.

5. Definitions.

a. Design Agency. A HQUSACE element or USACE command having military and/or civil works design responsibilities.

b. Specifications Engineer. An Architect or Engineer within a design agency who is assigned primary responsibility for overseeing the preparation of project specifications and coordination of the specifications with the other construction documents.

c. Designer. An Architect or Engineer within a design agency who has design responsibility for certain features of a project involving one or more engineering and design disciplines, e.g., architectural, structural, mechanical, electrical.

d. HQUSACE Specifications Proponent. The individual within HQUSACE designated to address the needs and concerns of design agencies related to the preparation of quality guide specifications and project specifications.

e. MIL-STD-3007, "Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications." The standard that establishes procedures for the development and maintenance of Unified Facilities Criteria (UFC) and Unified Facilities Guide

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This regulation supercedes ER 1110-1-8155 dated 24 December 1998 and rescinds ER 1110-2-1200, Plans and Specifications for Civil Works Projects, and the reference to ER 1110-2-1200 in ER 1110-2-1150, Engineering and Design for Civil Works Projects, dated 31 August 1999.

Specifications (UFGS) and prescribes their use by the Army, Navy, Marine Corps, Air Force, Department of Defense (DOD) agencies and DOD Field Activities.

f. USACE Unified Facilities Criteria (UFC) Technical Proponent. An individual assigned the responsibility for coordinating the unification and maintenance of a criteria document or UFGS in accordance with MIL-STD-3007.

g. USACE Unified Facilities Criteria (UFC) Technical Representative. An individual designated to serve as technical expert for a certain guide specification or criteria document where USACE has been designated the Participating Organization for the UFGS specification or criteria document.

h. Unified Facilities Guide Specifications (UFGS). A system of master guide specifications that define the qualitative requirements for products, materials, and workmanship for work features that occur in construction projects on a repetitive basis. The UFGS system is established by MIL-STD-3007.

i. USACE UFGS Database Manager. The person responsible for maintaining a master database of UFGS sections for which USACE is responsible.

j. TECHINFO. An Internet-based construction criteria information system that is managed for HQUSACE by the U.S. Army Engineering and Support Center, Huntsville (CEHNC-ED-ES).

k. Construction Criteria Base (CCB). A database developed by the National Institute of Building Sciences and available in CD-ROM and DVD media and on the Internet. The database contains design and construction documents from federal and private organizations, including Unified Facilities Guide Specifications, and National Aeronautics and Space Administration (NASA) guide specifications.

l. SPECSINTACT. A software program, copyrighted by the NASA, mandated for use in producing USACE project specifications and maintaining guide specifications. The software provides state-of-the-art specification automation to users and incorporates a wide range of quality control features. The software is a cooperative effort by Army, Navy, and NASA that provides greater uniformity and better transportability of guide specifications between other departments and agencies. SPECSINTACT software is available from the SPECSINTACT web site and CCB.

m. Construction Specifications Institute (CSI). A non-profit organization with members from all areas of the construction and engineering industry that establishes and publishes formats and organization standards for use in the preparation of construction specifications and other construction documents.

n. CSI Manual of Practice (MOP). An industry-recognized reference manual that contains recommended methods and practices for preparing, organizing, and formatting construction specifications and other construction documents.

o. Project Specifications. Specifications (also known as construction specifications but excluding those produced by a construction or design-build contractor) produced using the CSI format under the oversight of a Specifications Engineer that define construction requirements applying to a specific project. For design-build projects, only those specifications that form a part of

the Request for Proposal (RFP) are project specifications.

p. Standard Specifications for Military Construction. Specifications that are developed under direction of HQUSACE (CECW-E) as part of a standard design package that provides unique requirements for facilities intended for site adaptation at several locations, e.g., Petroleum, Oil, and Lubricant (POL) Storage Facilities. Standard specifications are based on UFGS format and are developed in sufficient detail to serve as construction documents after site-specific requirements are incorporated. Standard specifications are packaged with the design drawings to which they apply and are available from the U.S. Army Engineering and Support Center, Huntsville (CEHNC-ED-ES).

q. Federal Specifications and Standards (FED-SPECS and FED-STDS). Documents issued or controlled by the General Services Administration (GSA) that are sometimes referenced in UFGS to define requirements. Active FED-SPECS and FED-STDS cited in DOD documents are available from the GSA Federal Supply Service Bureau.

r. Military Specifications and Standards (MIL-SPECS and MIL-STDS). Documents issued or controlled by one of the military departments that are sometimes referenced in UFGS to define requirements. Active MIL-SPECS and MIL-STDS are available from the DOD Single Stock Point (DoDSSP).

s. Reference Standards. Documents that contain requirements set by authority, custom, or general consensus and are established as accepted criteria. They are published by trade associations, professional societies, standards-writing organizations, governments, and institutional organizations, e.g., the American National Standards Institute (ANSI) and ASTM International (ASTM). These documents are incorporated by reference into UFGS and project specifications to define qualitative and performance requirements for materials, equipment, systems, test methods, and workmanship.

6. HQUSACE Specifications Proponent. The HQUSACE specifications proponent uses input from a variety of sources to ensure that specifications issues affecting USACE are addressed at the headquarters level. The specifications proponent maintains a liaison between the Military Programs and Civil Works Directorates at HQUSACE, as well as the specifications proponents from other agencies and DOD departments. The HQUSACE specifications proponent represents USACE specifications concerns and issues in discourse with other agencies and departments as appropriate, e.g., SPECSINTACT enhancements and CCB issues.

7. Specifications Steering Committee. The Corps of Engineers Specifications Steering Committee (CSSC) has been established by ER 15-1-41 to provide recommendations for improving UFGS and project specifications.

8. Unified Facilities Guide Specifications (UFGS).

a. Purpose. UFGS provide design agencies and their contractors a set of master guide specifications reflecting DOD technical policy that will enhance productivity, quality, and uniformity of DOD construction. UFGS are revised and reissued periodically to incorporate lessons learned and technological advances.

(1) UFGS promote full and open competition in procurement in accordance with Federal

Acquisition Regulation (FAR) Subpart 11.002 and maximize construction economy consistent with sound functional, aesthetic, environmental, energy conservation, and architectural and engineering practices.

(2) UFGS contain designer notes providing guidance on use of the specifications and the coordination required with the other project specification sections and with the project drawings. UFGS also contain "tailoring options" in many sections that allows SPECSINTACT to globally delete products or requirements with a minimum of effort. Additionally, through the use of "brackets," the guide specifications identify blanks to be filled in and alternative text for selection by Designers.

(3) UFGS used in combination with SPECSINTACT automated processing methods improve project specification production, uniformity, consistency, and overall quality in accordance with DOD policy. Uniformity and consistency of project specifications aid contractors in their preparation of bids, improve quality of construction, and reduce cost to DOD customers.

b. UFGS Development and Update Process. UFGS are developed and maintained under the "Department of Defense Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications," MIL-STD-3007.

c. Recommended Changes. Design agencies are encouraged to submit proposals for new criteria and UFGS that may have DOD-wide application. Proposals for technical or editorial changes to existing criteria and UFGS that are necessary or desirable for general application or to reflect local availability of materials and construction practice are also encouraged. Such proposals may be submitted to DOD electronically using the Criteria Change Request (CCR) System. Recommended changes may also be presented to CSSC members. A current list of members is provided on TECHINFO.

d. UFGS Points of Contact. Questions about an individual UFGS may be directed to the designated technical proponent for the document. A current list of technical proponents and their phone numbers is provided on TECHINFO.

9. Project Specifications.

a. General Requirements. Design agencies will ensure that high-quality and concise specifications are prepared, that the preparation of project specifications is fully coordinated with agency construction and contracting representatives, and that the project specifications comply with industry standards for format and content as established by the CSI Manual of Practice. It is recommended that each design agency designate a Specifications Engineer to oversee and coordinate the preparation of project specifications to ensure compliance with these requirements. A Specifications Engineer should have knowledge and experience in developing construction contract documents and project specifications.

b. Use of Existing Project Specifications. Where a previous project design is adapted for use on a project, where standard specifications are used for military construction, or where a project design has been completed and held in abeyance for more than six months, the project specifications will be reviewed and revised as necessary.

c. Use of UFGS. UFGS provide a set of master guide specifications that shall be used for

developing project specifications (Under Secretary of Defense memo; subject: Department of Defense Unified Facilities Criteria). UFGS must be tailored to fit specific project requirements. The intent and wording of UFGS should be preserved to the extent practicable as they incorporate public laws, federal mandates, DOD policy, industry coordination, and lessons learned.

d. SPECSINTACT. The use of SPECSINTACT is mandatory for production of all project specifications, except for overseas area projects designed to host nation standards. Maximum efficiency and quality are obtained when project specifications are prepared using SPECSINTACT and the latest UFGS edited to suit the specific requirements of projects.

e. Specifications Development During Project Phases. Project specifications, when combined with the project drawings, must provide a comprehensive set of construction documents that can be bid fairly and competitively and executed without change, except as necessary to resolve unforeseen conditions or changes made during construction. (See ER 1180-1-6 and ER 415-1-11 for guidance on biddability, constructibility, operability, and environmental review.) Design agencies will identify and resolve unusual design or contract administration problems and assure that project specifications comply with technical policy established by HQUSACE. Close coordination between the Specifications Engineer and the Designers is important throughout all design phases to produce complete and accurate project specifications. Specifications Engineering and Designing are distinct professional functions that must be performed during specifications development. In some organizations, a person performing the Specifications Engineering function for a project specification may also perform some Design functions; in other organizations a person may be exclusively devoted to performing the Specifications Engineering function with Design functions being performed by others.

(1) Specifications Engineers should assist Designers in identifying UFGS sections that are to be used in the project, operating the SPECSINTACT software, and incorporating a Designer's technical requirements into the project specifications.

(2) Designers are responsible for the design of technical project features and are responsible for the technical content of the project specifications for those features. Specifications Engineers are responsible for the format of all project specification sections and for ensuring that proper and non-contradictory contract language is used throughout. Specifications Engineers are also responsible for determining the project-specific information that must be inserted into the non-technical provisions and the Division 1 General Requirements sections.

(3) Designers will prepare technical requirements for which no UFGS exists. When a new specification section must be developed for a particular project, the Designer will provide the technical information and technical requirements to be included in the specification section. The Specifications Engineer will work with the Designer to ensure that the section contains proper language and is properly formatted in accordance with the document "Unified Facilities Guide Specifications (UFGS) Format Standard" UFC 1-300-02.

(4) Project Bid Schedules will be prepared in close coordination with Contracting, Counsel, Project Management, Design, Cost Engineering, and Construction. For Civil Works projects, the lump sum and unit-priced items defined for incorporation in the bid schedule must be consistent with the work breakdown structure. Bid schedules will conform to USACE guidance

and all aspects of the FAR (FAR Subpart 36.207).

(5) As part of the routine quality assurance/quality control (QA/QC) process, Specifications Engineers should perform quality checks (e.g., SPECSINTACT reports, visual scan of pages for errors, verification of specification inserts such as the submittal register, etc.) on project specifications prior to advertisement.

(6) Appropriate design staff should make field trips during the construction phase of projects to identify specifications and contract administration problems to be avoided in future project specifications. Corrective action will be implemented to resolve problems identified during all project phases that could have been prevented by improved specifications, e.g., recommend changes in UFGS.

(7) The Resident and Area Engineers should be contacted during the design process and their input solicited, particularly for Division 1 sections.

f. Specifications Prepared by Architect-Engineer (A-E) Firms. The requirement to use SPECSINTACT for production of project specifications will be included in all procurement of A-E design services. Design agencies will assist the A-E by providing copies of regulations, manuals, engineer technical letters, and other information not available on TECHINFO and CCB. Design agencies will provide guidance to A-E firms on preparation of Division 1 sections and provide agency-unique information to be incorporated into the Division 1 sections. Previous project specifications may be furnished as samples of the form and content for completed work but should not be used where applicable guide specifications exist.

g. Construction Documents Format. Construction contracts shall be prepared in accordance with the HQUSACE format for construction contracts in Engineering FAR Supplement (EFARS) Subpart 14.2, Solicitation of Bids, using the Electronic Contract Solicitation (ECS) process prescribed in ER 715-1-21, unless exempted therein. Specification section numbering will follow CSI MasterFormat (latest edition). The format of the sections within the specifications will be based on the CSI SectionFormat as modified under the "Unified Facilities Guide Specifications (UFGS) Format Standard" UFC 1-300-02.

h. Reference Publications. Materials, workmanship, and equipment will be described, where possible, by reference to industry and government standards generally known to the construction community, citing the type, class, or other designation necessary to identify fully the item required. The reference approval date and the dates of any applicable amendment and revisions shall be included in the solicitation (FAR Subpart 11.201a). Reference standards should not be used to describe minor, non-critical items (such as incidental fasteners) when any commercially available product of that nature would be adequate. To the maximum extent practicable, references will be to nationally recognized industry and technical society specifications and standards. If industry documents are unavailable or unsuitable, applicable Commercial Item Descriptions (CID) may be referenced. Publications referenced in project specifications need be no later than the editions cited in the current notice for the corresponding UFGS. Publications not readily available to bidders, such as locally developed policy or guidance, should not be referenced but if referenced shall be furnished with the solicitation (FAR Subpart 11.201b). In accordance with DOD direction, FED-SPECS, FED-STDS, MIL-SPECS, and MIL-STDS shall not to be used in

contracts unless exempted by HQUSACE. These publications cited in UFGS are approved for use. Federal Specifications, Standards, and Commercial Item Descriptions can be found on the GSA Federal Supply Service Bureau WEB Site. Government specifications and standards, and policy can be located through the Defense Standardization Program Office (DSPO) WEB site.

i. Submittals. Construction submittals, such as shop drawings, samples, test reports, certificates, and manufacturer's instructions should not be required for non-critical items of relatively low value when the cost of making the submittal exceeds the benefit to the project (see ER 415-1-10). Avoidance of such submittal requirements is particularly encouraged for small projects. Design agencies must keep submittals requiring government approval to a minimum due to funding limitations. Only those submittals that are critical to safety, construction execution, or system or facility operation should be required for government approval. Submittals not requiring government approval should be used when it is important to verify that the contractor is complying with contract requirements. Critical submittals requiring government approval are extensions of design, critical materials, deviations, O&M manuals, or those involving equipment that must be checked for compatibility with the entire system.

j. Testing. Ordinarily, testing is the responsibility of the contractor under the Contractor Quality Control (CQC) provisions of the specifications (see ER 1180-1-6). Requirements in the specifications making testing the contractor's responsibility will not be written in such a way as to void the right of the contracting officer to perform confirmation testing and Quality Assurance (QA) testing or to witness testing by the contractor. Specifying testing that will be performed by the government at government expense (i.e. outside of the tests to be preformed by the contractor under the CQC procedures) should be kept to a minimum and should be done only when necessary to assure the quality of critical construction.

k. Warranties. Warranty requirements extending beyond the normal one-year construction warranty period or such other period required by UFGS will be specified only for materials, equipment, or systems for which longer warranties are normally provided in the industry. The increased cost of the extended warranties and the costs of administering and enforcing such warranties should be evaluated prior to their specification.

l. New Materials and Methods. Designers are encouraged to consider the use of new, unusual, or innovative materials, equipment, systems, or methods in designs when evidence shows that such use is in the best interest of the government in terms of value, lower life-cycle costs, and quality of construction. Manufacturers are to prove the merits of their product by certified laboratory results, evidence of satisfactory installation under conditions similar to those anticipated for the proposed construction and compliance with appropriate industry standards, if they exist. For a specific project, where different requirements from those in UFGS are specified, and where the requirements may have application beyond that specific project, design agencies will submit a recommended change using the Criteria Change Request (CCR) web site to report the new, unusual, or innovative items to DOD. The recommended changes will allow DOD to implement changes to criteria.

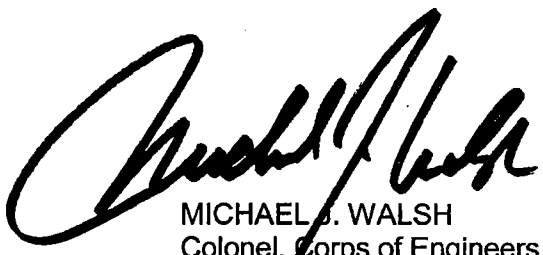
m. Brand Names and Proprietary Items. Specifying items peculiar to one manufacturer (closed proprietary), either by brand name or by peculiar characteristic, is prohibited unless specially justified and approved (FAR, Subpart 11.105). Brand name or equal (open

proprietary) descriptions should be used with great care and discretion. Where the brand name or equal description is used, the contract provisions shall include those salient features of the item or items specified upon which equality can be determined (FAR, Subpart 11.104, Subpart 11.107, and Subpart 36.202(c).

n. Contractor's Options. Optional materials and methods of construction that are acceptable are included in UFGS as a means of increasing competition and reducing project costs. Project specifications should include all contractors' options contained in UFGS. Additional optional materials and methods may be specified if a study of conditions affecting a particular project shows that other options are consistent with good architectural and engineering practice, are economically justifiable, and provide the best value to the government. Where a contractor's option is specified that is not part of a UFGS section and the specified contractor's option may have application beyond that specific project, the design agencies will submit recommended changes electronically using the Criteria Change Request (CCR) web site.

10. Training. Design agency staff involved in preparation of specifications should attend the Proponent-Sponsored Engineer Corps Training (PROSPECT) Course "Specifications for Construction Contracts." Training should also be provided in bidding procedures and the preparation of the non-technical provisions of contract documents, personal computer software, SPECSINTACT, and, if SPECSINTACT is used on a network, in network operation and software. Specifications staff should be encouraged to become certified under the CSI Certified Construction Specifier Program.

FOR THE COMMANDER:



1 Appendix
APP A - References

MICHAEL J. WALSH
Colonel, Corps of Engineers
Chief of Staff

APPENDIX A

REFERENCES

A-1. Required Publications.

a. Federal Acquisition Regulation (FAR), Part 11.

b. Federal Acquisition Regulation (FAR), Part 36.

c. MIL-STD-3007, current edition, Department of Defense Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications.

d. UFC 1-300-02, Unified Facilities Criteria (UFC) Unified Facilities Guide Specifications (UFGS) Format Standard

e. The Under Secretary of Defense memo dated 29 May 2002, subject: Department of Defense Unified Facilities Criteria.

f. ER 5-1-11, U. S. Army Corps of Engineers Business Process

g. ER 15-1-41, Corps of Engineers Specifications Steering Committee (CSSC).

h. ER 415-1-10, Contractor Submittal Procedures.

i. ER 415-1-11, Biddability, Constructibility, Operability, and Environmental Review.

j. ER 715-1-21, Electronic Contract Solicitations

k. ER 1180-1-6, Construction Quality Management.

l. Engineering FAR Supplement (EFARS) Subpart 14.2, Solicitation of Bids.

m. Manual of Practice (MOP), Construction Specifications Institute (CSI), 601 Madison Street, Alexandria, VA 22314.

A-2. Related Publications.

a. AR 5-1, Army Management Philosophy.

b. ER 690-1-414, Proponent-Sponsored Engineer Corps Training (PROSPECT).

c. ER 1110-1-12, Quality Management.

d. ER 1110-2-1150, Engineering and Design for Civil Works Projects.

e. ER 1110-2-1302, Civil Works Cost Engineering.

f. ER 1110-3-1300, Military Programs Cost Engineering.

g. ER 1110-345-100, Design Policy for Military Construction.

h. ER 1110-345-700, Design Analysis, Drawings, and Specifications.

i. ER 1180-1-9, Design-Build Contracting.

Alaska District A-E Specifications Manual Placeholder Page

This document is currently under review for update.

Point of contact for this information in Engineering Division is CEPOA-EN-GES-SP, 907-753-5681.

ESTIMATE OF ARCHITECT ENGINEER PROFESSIONAL SERVICES Date_____19____

☐ Revised ☐ Original

Project:_____ Location:_____

Estimated by:_____ Sheets of Drawing Required:_____

CONTRACT NO:_____ DO/MOD NO:_____

REMARKS:

Item a. Direct Labor Costs	Hours	Rate	Total
DISCIPLINE			
SUBTOTALS			

TOTAL DIRECT COST $_____

Item b. Overhead charge applicable to direct labor, _____ % of Item a. $_____

Item c. General and Administrative Overhead, _____ % of Item a. $_____

Item d. Materials and incidental reproduction:

_____

_____ $_____

Item f. Profit _____ % of subtotal of Items a, b, c, d, and e. (attach profit computations)

_____

_____ $_____

Item g. Subcontracts for this contract (attach breakdown for each subcontract):

ARCH_____ STRUC_____ ELEC_____

CIVIL_____ MECH_____ OTHER_____ SUBTOTAL $_____

_____ % Profit on subcontracts $_____

Item h. Travel expenses: (No labor - EXPLAIN)

PER DIEM:_____ man days at $_____ PER DAY $_____

GR TRANS:_____ days at $_____ PER DAY $_____

AIR FARE:_____ rd trips at $_____ PER ROUND TRIP $_____

PER DIEM:_____ rd trips at $_____ PER ROUND TRIP $_____

(round to the nearest dollar) TOTAL FEE $_____

SIGNATURE_____ DATE_____

TITLE_____

AEESTFRM.DOC

PROFIT EVALUATION SHEET
Weighted Guideline Method

RFP/Contract No. _____ Modification/DO No. _____

Title _____

Technical Complexity Factor	Length Factor	Support of Socioeconomic Programs Factor	Profit Objective
(0.05 - 0.10)	(0.02 - 0.04)	(0.00 - 0.02)	

Technical Complexity + Length + Support of Socioeconomic Programs = Profit Objective

EXPLANATION–

Technical Complexity Factor: _____

Length Factor: _____

Support of Socioeconomic Programs Factor: _____

.....

The prenegotiation profit objective for a firm-fixed-price architect-engineer (including surveying and mapping) contract, contract modification, or delivery order will be determined as described below. The profit objective for all other types of A-E contracts will be determined in accordance with DFARS 215.971.

Where:

(1) Cost is the total estimated costs, including general; and administrative costs, of the prime contractor and any subcontractors, exclusive of any profit. However, normal profit need not be deducted from the prices of commercial supplies and services (such as airfares, reproduction, lab tests, express mail, and materials) in developing the cost base.

(2) Technical complexity factor will vary from 0.05 for low complexity (design of simple road repaving or routine boundary survey verification) to 0.10 for high complexity (design of nuclear chemistry laboratory or the design of the remediation of a very unusual and complex hazardous waste site). Consider the nature of the work, degree of management involvement required, schedule constraints, amount of government assistance, and availability of design criteria.

(3) Length factor is 0.02 for a contract action of 1 month or less, and increases proportionately to 0.04 for a contract action of 21 months or longer. Consider the time necessary to complete the substantive portion of work, including option periods.

(4) Support of socioeconomic programs factor will vary from 0.00 for a prime contractor (including a small business prime contractor) who plans no subcontracting, to 0.02 for a contractor who demonstrates exceptional program support. Consider the contractor's past record as well as this contract action with regard to mentoring and subcontracting with small businesses, small disadvantaged businesses, and historically black colleges and universities and minority institutions.

When the facilities capital cost of money is proposed by the contractor and verified, reduce the profit objective as described in DFARS 215.973(b)(2).

UFC 1-200-01
16 August 2010
Change 1, 19 July 2011

UNIFIED FACILITIES CRITERIA (UFC)

GENERAL BUILDING REQUIREMENTS

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

UNIFIED FACILITIES CRITERIA (UFC)

GENERAL BUILDING REQUIREMENTS

U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING COMMAND (Preparing Activity)

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

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

Change No.	Date	Location
1	7-19-2011	Throughout document: Applicability has been revised to include non-permanent facilities in support of military operations. The terms "Building Official" and "Authority Having Jurisdiction" have been expanded and clarified. DOD use of references for accessibility in the ABA have been clarified. Target publication dates for criteria guidance that are presently in production have been updated. Additional requirements and references for Munitions and Explosives facilities and Sensitive Compartmented Information Facilities have been added. New explanations for levels of construction have been added.

This UFC supersedes UFC 1-200-01, dated 27 November 2007, including change 2, implemented 27 January 2010.

FOREWORD

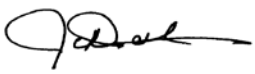
The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD-3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD(AT&L) Memorandum 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.



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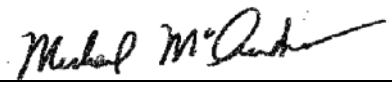

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UNIFIED FACILITIES CRITERIA (UFC)
REVISION SUMMARY SHEET

Subject: UFC 1-200-01, *GENERAL BUILDING REQUIREMENTS, dated 16 August 2010 with Change 1 dated 19 July 2011.*

Replaces: UFC 1-200-01, *GENERAL BUILDING REQUIREMENTS, dated 16 August 2010.*

Cancels: UFC 1-200-01, *GENERAL BUILDING REQUIREMENTS*, dated 27 November 2008, with change 1, implemented 6 May 2009 and change 2, implemented 27 January 2010.

Description of Change: This update to UFC 1-200-01 represents another step in the joint Services effort to bring uniformity to the military use of existing non-government building codes. Technical representatives of each of the four Services developed this document to require the use of the International Building Code 2009 consistent with the scope of current military requirements and procedures. The International Building Code (IBC) 2000 was used with modifications as the basic building code for the Department of Defense, in the first UFC 1-200-01 published 31 July 2002. Subsequent revisions of UFC 1-200-01 referenced the 2003 and 2006 versions of the International Building Code. This revision of UFC 1-200-01 contains modifications in the following areas:
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- Applicability has been revised to include non-permanent facilities in support of military operations.
- The terms "Building Official" and "Authority Having Jurisdiction" have been expanded and clarified.
- DOD use of references for accessibility in the ABA have been clarified.
- Target publication dates for criteria guidance that are presently in production have been updated.
- Additional requirements and references for Munitions and Explosives facilities and Sensitive Compartmented Information Facilities have been added.
- New explanations for levels of construction have been added.

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Reasons for Change: The existing guidance was inadequate for the following reasons:

- The existing UFC 1-200-01 required the use of the IBC 2006 which was revised and replaced in 2009 by the International Code Council.
- The existing UFC did not properly reference and identify recently updated and published codes and standards.

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Impact: The following direct benefits will result from the update of UFC 1-200-01:

- Creation of a single source reference for modifications to a building code that provides guidance for the design of DoD facilities.
    - Reduces interpretation and ambiguity that could lead to design and construction conflicts.
    - Continues DoD reliance upon NFPA Fire Code and Life Safety Code, and where they are to be specifically used and applied.

TABLE OF CONTENTS

CHAPTER 1 - INTRODUCTION

1-1 APPLICABILITY

This UFC applies to the design and construction of all new and renovated Government-owned facilities for the Department of Defense. It is applicable to all methods of project delivery \1\ and levels of construction, but it /1/ is not applicable to public-private ventures (PPV).

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1-1.1 Facilities in Support of Military Operations

Military operations are those performed by military or civilian personnel in a designated Joint Operational Area including but not limited to contingency operations, humanitarian or peacekeeping operations and military exercises. For non-permanent facilities in support of military operations, comply with requirements contained in this UFC associated with:

- Fire protection, including the following:
  - Active fire protection systems (fire suppression, fire alarm systems)
  - Passive fire protection (fire rated walls, floors)
  - Limits on building heights and areas, limits on combustible construction types
  - Egress requirements
- Structural integrity
- Electrical systems
- Plumbing and mechanical systems
- Water treatment, storage and distribution
- Wastewater collection and treatment
- Telecommunications networks

1-1.2 Levels of Construction

Permanent Construction. Buildings and facilities designed and constructed to serve a life expectancy of more than 25 years.

Semi-permanent Construction. Buildings and facilities designed and constructed to serve a life expectancy of more than five years but less than 25 years. This construction level is typically only used to support military operations. Expediency of construction and material availability may be a factor. Facility intended for a more enduring presence with operational

characteristics and functional performance similar to permanent construction. Maintainability of finishes and systems shall be commensurate with the facility life expectancy and available maintenance capabilities. A moderate level of energy and water efficiency shall be considered.

Temporary Construction. Buildings and facilities designed and constructed to serve a life expectancy of five years or less using low-cost construction. Temporary construction typically cannot be economically converted to a higher construction level. Temporary facilities have limited flexibility for conversion and re-use.

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1-2 BUILDING CODE

Except as indicated below, use the 2009 International Building Code (IBC-2009) as modified by Chapter 2 and Chapter 3 of this UFC as the building code for the Department of Defense.

1-2.1 Substitutions

All references in the International Building Code to the International Fire Code shall be considered to be references to NFPA 1.

All references in the International Building Code to the International Fuel Gas Code shall be considered to be references to NFPA 54 and NFPA 58.

1-3 CORE UFC'S

The International Building Code is modified in Chapters 2 and 3 of this UFC through reference to "core" UFCs (Appendix A, References) and other military criteria. Core UFCs provide the unique military building criteria that parallel the building code and apply to building systems found in most DoD facilities. In the case of conflicts between the International Building Code and the military criteria, use the military requirements.

1-4 ADMINISTRATION AND ENFORCEMENT

\1\ For enforcement of the building code and standards for facility projects, the terms "Building Official" and the "Authority Having Jurisdiction" (AHJ) mean the Contracting Officer or the Contracting Officer's Authorized Representative (COAR) of the Component Office.

For approval and deviation of criteria, the AHJ is the Chief Engineer of each Service which are the signatories of the UFC documents and their designated representatives i.e., US Army, HQ USACE/CECW-CE; US Navy, NAVFACENGCOM HQ Code CHE; US Marine Corps, HQMC Code LF; and the US Air Force, AFCESA/AFCEE. See MILSTD 3007./1/

CHAPTER 2 - MODIFICATIONS TO THE INTERNATIONAL BUILDING CODE (IBC)

2-1 CHAPTER 1 – ADMINISTRATION

Use Sections 101, 102, 110, and 112 of IBC Chapter 1.

2-2 CHAPTER 2 – DEFINITIONS

Use IBC Chapter 2. Definitions apply to terms used in the model code and are not intended to replace definitions and terms in military documents.

2-3 CHAPTER 3 – USE AND OCCUPANCY CLASSIFICATION

Use IBC Chapter 3 and UFC 3-600-01. If any conflict occurs between IBC Chapter 3 and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence.

2-4 CHAPTER 4 – SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

Use UFC 3-600-01 in lieu of IBC Chapter 4.

2-5 CHAPTER 5 – GENERAL BUILDING HEIGHTS AND AREAS

Use IBC Chapter 5. The building area for funding and planning purposes may be calculated differently than the method defined in IBC Chapter 5.

2-6 CHAPTER 6 – TYPES OF CONSTRUCTION

Use IBC Chapter 6 and UFC 3-600-01. If any conflict occurs between IBC Chapter 6 and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence.

2-7 CHAPTER 7 – FIRE-RESISTANCE-RATED CONSTRUCTION

Use IBC Chapter 7 and UFC 3-600-01. If any conflict occurs between IBC Chapter 7 and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence.

2-8 CHAPTER 8 – INTERIOR FINISHES

Use UFC 3-600-01 in lieu of IBC Chapter 8.

2-9 CHAPTER 9 – FIRE PROTECTION SYSTEMS

Use UFC 3-600-01 in lieu of IBC Chapter 9.

2-10 CHAPTER 10 – MEANS OF EGRESS

Use UFC 3-600-01 in lieu of IBC Chapter 10.

2-11 CHAPTER 11 – ACCESSIBILITY

Use the *ABA Accessibility Standard for Department of Defense Facilities* as adopted by the Deputy Secretary of Defense memorandum dated October 31, 2008, in lieu of IBC Chapter 11. \1\ Where the ABA references the IBC 2000-3 and supplements, the latest version of the IBC is acceptable when it meets or exceeds the ABA requirements./1/

2-12 CHAPTER 12 – INTERIOR ENVIRONMENT

Use IBC Chapter 12, except as modified below:

2-12.1 Delete paragraph 1204.1, including the exception, and replace with the following:

> "1204.1 Use the applicable Unified Facilities Criteria and individual military service standards for temperature control criteria."

2-12.2 For Navy and Marine Corps bachelor housing facilities, delete paragraphs 1207.2, 1207.3, 1208.3 and 1208.4, and use UFC 4-721-10 for air-borne and structure-borne sound transmission criteria, for minimum room sizes, and for dwelling unit criteria.

2-13 CHAPTER 13 – ENERGY EFFICIENCY

Use UFC 3-400-01 in lieu of IBC Chapter 13.

2-14 CHAPTER 14 – EXTERIOR WALLS

Use IBC Chapter 14.

2-15 CHAPTER 15 – ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

Use IBC Chapter 15.

2-16 CHAPTER 16 – STRUCTURAL DESIGN

Use IBC Chapter 16 as modified by UFC 3-301-01. Use IBC Chapter 16 and UFC 3-310-04 for seismic design.

2-17 CHAPTER 17 – STRUCTURAL TESTS AND INSPECTIONS

Use IBC Chapter 17 as modified by UFC 3-301-01.

2-17.1 In Paragraph 1704.1 General, add the following after the first paragraph:

> "When the construction contractor is required by the Government to provide special inspections as part of his work, the contractor shall retain third-party quality assurance agencies to conduct the special inspections required by the IBC. The inspecting agency shall provide reports of the special inspections directly to the government."

2-18 CHAPTER 18 – SOILS AND FOUNDATIONS

Use IBC Chapter 18 as modified by UFC 3-301-01. For Navy and Marine Corps facilities, also use UFC 3-220-01N.

2-19 CHAPTER 19 – CONCRETE

Use IBC Chapter 19 as modified by UFC 3-301-01.

2-20 CHAPTER 20 – ALUMINUM

Use IBC Chapter 20.

2-21 CHAPTER 21 – MASONRY

Use IBC Chapter 21 as modified by UFC 3-301-01.

2-22 CHAPTER 22 – STEEL

Use IBC Chapter 22 as modified by UFC 3-301-01.

2-23 CHAPTER 23 – WOOD

Use IBC Chapter 23.

2-24 CHAPTER 24 – GLASS AND GLAZING

Use IBC Chapter 24.

2-25 CHAPTER 25 – GYPSUM BOARD AND PLASTER

Use IBC Chapter 25.

2-26 CHAPTER 26 – PLASTIC

Use IBC Chapter 26.

2-27 CHAPTER 27 – ELECTRICAL

Use IBC Chapter 27 and the following:

1. Use UFC 3-501-01 for general electrical requirement criteria.
2. Use UFC 3-520-01 for interior electrical systems criteria.
3. Use UFC 3-530-01 for interior and exterior lighting and controls criteria.
4. Use UFC 3-550-01 for exterior power distribution systems criteria.
5. Use UFC 3-560-01 for electrical safety and electrical O&M criteria.
6. Use UFC 3-580-01 for interior telecommunications criteria.

7. Use UFC 4-021-01 for mass notification systems criteria.

2-28 CHAPTER 28 – MECHANICAL SYSTEMS

2-28.1 Use IBC Chapter 28 and UFC 3-400-10N for Navy and Marine Corps facilities.

2-28.2 Use UFC 3-410-01FA in lieu of IBC Chapter 28 for Army and Air Force facilities.

2-28.3 Use UFC 3-400-02 to access climatological data for use in designing mechanical systems.

2-29 CHAPTER 29 – PLUMBING SYSTEMS

Use IBC Chapter 29 and UFC 3-420-01.

2-30 CHAPTER 30 – ELEVATOR AND CONVEYING SYSTEMS

Use IBC Chapter 30, UFC 3-600-01, and ITG 01-01.

2-31 CHAPTER 31 – SPECIAL CONSTRUCTION.

Use IBC Chapter 31.

2-32 CHAPTER 32 – ENCROACHMENT INTO THE PUBLIC RIGHT-OF-WAY

Use IBC Chapter 32.

2-33 CHAPTER 33 – SAFEGUARDS DURING CONSTRUCTION

Use IBC Chapter 33 and UFC 3-600-01. If any conflict occurs between IBC Chapter 33 and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence.

2-34 CHAPTER 34 – EXISTING STRUCTURES

Use IBC Chapter 34 and the International Existing Building Code, except as modified below.

2-34.1 Use Section 3410 with UFC 3-600-01. If any conflict occurs between Section 3410 or the International Existing Building Code and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence.

2-34.2 Use IBC Chapter 34 with UFC 3-310-04 for seismic evaluation and seismic rehabilitation of existing buildings. Existing buildings inside the United States, its territories and possessions must comply with ICSSC RP6 / NISTIR 6762. All references in ICSSC RP6 / NISTIR 6762 to FEMA 310 and FEMA 356 shall be considered to be references to ASCE/SEI 31-03 and ASCE/SEI 41-06 respectively.

2-35 CHAPTER 35 – REFERENCED STANDARDS

Use IBC Chapter 35 and Appendix A of this UFC.

2-36 APPENDICES

Delete Appendix A through Appendix K of the IBC.

CHAPTER 3 - OTHER CRITERIA

In addition to the International Building Code as modified in Chapter 2 of this UFC, comply with the following criteria:

3-1 HIGHER AUTHORITY MANDATES

All construction must be in compliance with all Public Laws (P.L.), Executive Orders (E.O.), Code of Federal Regulations (CFR), Department of Defense Instructions (DODI), and Department of Defense Directives (DODD) or other higher authority documents as applicable, as listed in MIL-STD-3007F, Appendix B

3-2 UFC'S

Comply with UFC's (Latest Version)

3-3 CORE UFC'S

See Appendix A - References.

3-3.1 Antiterrorism

Use UFC 4-010-01 and Geographic Combatant Commander Antiterrorism construction standards for antiterrorism requirements.

3-3.2 Sustainability

Use UFC 4-030-01 for sustainability requirements.

3-3.3 Architectural

a. Use UFC 3-101-01 for architectural design criteria, target publication date \1\August 2011/1/. Use UFC 3-100-10 for Navy and Marines as interim criteria until publication of UFC 3-101-01.

b. Use UFC 3-110-03 for roofing criteria.

c. Use UFC 3-120-10 for interior design criteria.

3-3.4 Civil Engineering

a. Use UFC 3-210-10 for low-impact development criteria.

b. Use UFC 3-201-01 for general civil engineering, and site planning and design criteria, target publication date, \1\March 2012/1/. Use UFC 3-210-01A and UFC 3-200-10N as interim criteria until publication of UFC 3-201-01.

c. Use UFC 3-230-01 for water supply, target publication date, \1\October 2011/1/December 2010. Use UFC 3-230-03A and UFC 3-200-10N as interim criteria until publication of UFC 3-230-01.

d. Use UFC 3-240-01 for wastewater collection, target publication date \1\Sept 2011/1/. Use UFC 3-240-04A and \1\UFC 3-200-19N\1\ as interim criteria until publication of UFC 3-240-01.

3-4 OTHER MILITARY CRITERIA

Military criteria other than those listed in this UFC may be applicable to specific types of structures, building systems, or building occupancies. Such structures, systems, or buildings must meet the additional requirements of the applicable military criteria.

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3-4.1 Explosives Safety

This document does not contain requirements for explosives safety. All facilities that involve DoD Ammunition and Explosives (AE) storage, handling, maintenance, manufacture or disposal, as well as any facilities within the explosives safety quantity distance (ESQD) arcs of AE facilities, must comply with the explosives safety requirements found in DoD Manual 6055.09-M, as well as implementing Service criteria found in DA PAM 385-64 (Army), NAVSEA OP 5 (Navy and Marine Corps), and AFMAN 91-201 (Air Force). DoD facilities exposed to potential explosion effects from AE belonging to other nations are also required to meet DoD and Service explosives safety criteria.

It is essential that the planning and design of new facilities and occupation and renovation of existing AE-related facilities or any facilities within ESQD arcs be accomplished in close coordination with knowledgeable explosives safety professionals in theater or with the Services' explosives safety centers. This coordination should occur as early as possible in the planning/design process to avoid issues/problems and ensure compliance.

All facility construction or use within ESQD arcs requires review for compliance with explosives safety criteria and must have either an approved explosives safety site plan or an approved explosives safety deviation. Refer to the DoD and Service documents mentioned above for further guidance in this area.

3-4.2 Physical Security

Physical security is that part of security concerned with physical measures designed to safeguard personnel; to prevent unauthorized access to equipment, installations, material, and documents; and to safeguard them against espionage, sabotage, damage, and theft.

Many buildings require some level of physical security. When required, integrate physical measures into the site, building, room(s), or area(s) as applicable. The Intelligence Community (IC) and DoD document the requirements for physical security related to specific assets in IC and DoD publications, directives, and instructions. Services have related documents that implement the IC and DoD policy for the Services. Below are the main DoD and IC documents that contain the physical security requirements for the protection of specific DoD assets. This does not include the policy documents associated with the protection of nuclear and chemical assets.

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Table 3-1 Policy Related to Physical Security

ASSET	POLICY
Classified Information	DoD 5200.1-R, *DoD Information Security Program* http://www.dtic.mil/whs/directives/corres/pub1.html
Sensitive Compartmented Information (SCI)	UFC 4-010-05, *Sensitive Compartmented information Facilities Planning, Design, and Construction* (currently in Draft) Intelligence Community Directive (ICD) 705, *Sensitive Compartment Information Facilities* (Effective: 26 May 2010). http://www.dni.gov/electronic_reading_room/ICD_705_SCIFs.pdf Intelligence Community Standard Number 705-1 (ICS 705-1), *Physical and Technical Security Standards for Sensitive Compartmented Information Facilities* (Effective: 17 September 2010) http://www.wbdg.org/pdfs/dod_at/ics_705_1.pdf Intelligence Community Standard Number 705-2 (ICS 705-2), *Standards for the Accreditation and Reciprocal Use of Sensitive Compartmented Information* (Effective: 17 September 2010) http://www.wbdg.org/pdfs/dod_at/ics_705_2.pdf IC Tech Spec-for ICD/ICS 705, *Technical Specifications for Construction and Management of Sensitive Compartmented Information Facilities* (Effective: 5 May 2011) http://www.wbdg.org/pdfs/dod_at/ic_techspec_705.pdf
Special Access Program (SAP) Information	JAFAN 6/9 Manual, Physical Security Standards for Special Access Program Facilities http://www.ncms-isp.org/documents/JANAF_6-0.pdf
Arms, Ammunition and Explosives	DoD Manual 5100.76-M, *Physical Security of Sensitive Conventional Arms, Ammunition and Explosives* http://www.dtic.mil/whs/directives/corres/pub1.html
Weapon Systems and Platforms	DoD 5200.08-R, *Physical Security Program* http://www.dtic.mil/whs/directives/corres/pub1.html
Bulk Petroleum Products	
Communications Systems	
Controlled Inventory Items	

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APPENDIX A-REFERENCES

GOVERNMENT PUBLICATIONS

ABA Accessibility Standard for Department of Defense Facilities, http://www.access-board.gov/ada-aba/aba-standards-dod.cfm

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AFMAN 91-201, Explosives Safety Manual, 12 January 2011, www.epublishing.af.mil

DA PAM 385-64, Ammunition and Explosives Standards, https://acc.dau.mil/CommunityBrowser.aspx?id=237824

DoD Manual 5100.76-M, *Physical Security of Sensitive Conventional Arms, Ammunition and Explosives* http://www.dtic.mil/whs/directives/corres/pub1.html

DoD Manual 5200.1, DoD Information Security Program, http:www.dtic.mil/whs/directives/corres/pub1.html

DoD Manual 5200.08R, Physical Security Program, http:www.dtic.mil/whs/directives/corres/pub1.html

DoD Manual 6055.09-M, DoD Ammunition and Explosives Safety Standards, http://www.dtic.mil/whs/directives/corres/html/605509m.html

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FEMA-310, *Handbook for the Seismic Evaluation of Buildings,* http://www.wbdg.org/ccb/FEMA/ARCHIVES/fema310.pdf

FEMA-356, *Prestandard and Commentary for the Seismic Rehabilitation of Buildings,* http://www.wbdg.org/ccb/FEMA/ARCHIVES/fema356.pdf

ICSSC RP6 / NISTIR 6762, *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings*, http://fire.nist.gov/bfrlpubs/build01/PDF/b01056.pdf

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Intelligence Community Directive (ICD) 705, *Sensitive Compartment Information Facilities* (Effective: 26 May 2010). http://www.dni.gov/electronic_reading_room/ICD_705_SCIFs.pdf

Intelligence Community Standard Number 705-1 (ICS 705-1), *Physical and Technical Security Standards for Sensitive Compartmented Information Facilities* (Effective: 17 September 2010) http://www.wbdg.org/pdfs/dod_at/ics_705_1.pdf

Intelligence Community Standard Number 705-2 (ICS 705-2), *Standards for the Accreditation and Reciprocal Use of Sensitive Compartmented Information* (Effective: 17 September 2010) http://www.wbdg.org/pdfs/dod_at/ics_705_2.pdf

IC Tech Spec-for ICD/ICS 705, *Technical Specifications for Construction and Management of Sensitive Compartmented Information Facilities* (Effective: 5 May 2011) http://www.wbdg.org/pdfs/dod_at/ic_techspec_705.pdf

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ITG 01-01, *Elevator Design*, 01 March 2001, http://www.wbdg.org/ccb/NAVFAC/INTCRIT/fy01_01.pdf

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JAFAN 6/9 Manual, Physical Security Standards for Special Access Program Facilities http://www.ncms-isp.org/documents/JANAF_6-0.pdf

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MIL-STD-3007F, *Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications*, 13 December 2006, http://www.wbdg.org/ccb/FEDMIL/std3007f.pdf

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NAVSEA OP 5, Ammunition and Explosives Safety Ashore, https://acc.dau.mil/CommunityBrowser.aspx?id=278680

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CORE UFC's

UFC 3-101-01, *Architecture,* target publication date \1\August 2011\1\; will supersede UFC 3-100-10, *Architecture* (DRAFT), http://www.wbdg.org/ndbm/pdfs/ufc3_100_10_draft.pdf

UFC 3-110-03, *Roofing*, http://www.wbdg.org/ccb/DOD/UFC/ufc_3_110_03.pdf

UFC 3-120-10, *Interior Design,* http://www.wbdg.org/ccb/DOD/UFC/ufc_3_120_10.pdf

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UFC 3-201-01, *Civil Engineering,* target publication date \1\March 2012/1/; will supersede UFC 3-210-01A, *Area Planning, Site Planning, and Design*, http://www.wbdg.org/ccb/DOD/UFC/ufc_3_210_01a.pdf and UFC 3-200-10N, *Civil Engineering, (*DRAFT*),* http://www.wbdg.org/ndbm/pdfs/ufc3_200_10n_draft.pdf

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UFC 3-210-10, *Low Impact Development*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_210_10.pdf

UFC 3-220-01N, *Geotechnical Engineering Procedures for Foundation Design of Buildings and Structures*, http://www.wbdg.org/ccb/DOD/UFC/ufc_3_220_01n.pdf

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UFC 3-230-01, *Water Supply,* target publication date \1\October 2011/1/; will supersede UFC 3-230-03A, *and UFC 3-230-19N*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_230_03a.pdf

UFC 3-240-01, *Wastewater Collection*, target publication date \1\September 2011/1/; will supersede UFC 3-240-04A, *Wastewater Collection*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_240_04a.pdf

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UFC 3-301-01, *Structural Engineering*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_301_01.pdf

UFC 3-310-04, *Seismic Design for Buildings*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_310_04.pdf

UFC 3-400-01, *Energy Conservation*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_400_01.pdf

UFC 3-400-02, *Design: Engineering Weather Data*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_400_02.pdf

UFC 3-400-10N, *Mechanical Engineering*, (DRAFT),
http://www.wbdg.org/ndbm/pdfs/ufc3_400_10n_draft.pdf

UFC 3-410-01FA, *Heating, Ventilating, and Air Conditioning*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_410_01fa.pdf

UFC 3-420-01, *Plumbing Systems,*
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_420_01.pdf

UFC 3-501-01, *Electrical Engineering*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_501_01.pdf

UFC 3-520-01, *Interior Electrical Systems*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_520_01.pdf

UFC 3-530-01, *Design: Interior and Exterior Lighting and Controls*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_530_01.pdf

UFC 3-550-01, *Exterior Electrical Power Distribution*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_550_01.pdf

UFC 3-560-01, *Electrical Safety, O&M*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_560_01.pdf

UFC 3-580-01, *Telecommunications Building Cabling Systems Planning and Design*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_580_01.pdf

UFC 3-600-01, *Fire Protection Engineering for Facilities,*
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_600_01.pdf

UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_4_010_01.pdf

UFC 4-021-01, *Design and O&M: Mass Notification Systems*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_4_021_01.pdf

UFC 4-030-01, *Sustainable Development*,
http://www.wbdg.org/ccb/DOD/UFC/ufc_4_030_01.pdf

NON-CORE UFC

UFC 4-721-10, *Navy and Marine Corps Bachelor Housing,*
http://www.wbdg.org/ccb/DOD/UFC/ufc_4_721_10.pdf

NON-GOVERNMENT PUBLICATIONS

ASCE/SEI 31-03, *Seismic Evaluation of Existing Buildings*, American Society of Civil Engineers, 1801 Bell Drive, Reston, VA 20191-4400, http://www.asce.org

ASCE/SEI 41-06, *Seismic Rehabilitation of Existing Buildings*, American Society of Civil Engineers, 1801 Bell Drive, Reston, VA 20191-4400, http://www.asce.org

International Building Code, 2009, International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, http://www.iccsafe.org

International Existing Building Code, 2009, International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, http://www.iccsafe.org

International Fire Code, 2009, International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, http://www.iccsafe.org

International Fuel Gas Code, 2009, International Code Council, 500 New Jersey

Avenue, NW, 6th Floor, Washington, DC 20001, http://www.iccsafe.org

NFPA 1, *Fire Code,* 2009, National Fire Protection Association, 1 Batterymarch Park Quincy, Massachusetts, 02169, http://www.nfpa.org

NFPA 54, *National Fuel Gas Code*, 2009, National Fire Protection Association, 1 Batterymarch Park Quincy, Massachusetts, 02169, http://www.nfpa.org

NFPA 58*, Liquefied Petroleum Gas Code,* 2008*,* National Fire Protection Association, 1 Batterymarch Park Quincy, Massachusetts, 02169, http://www.nfpa.org

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

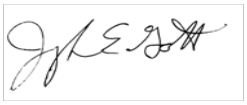
The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD(AT&L) Memorandum 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.
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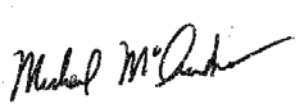

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UNIFIED FACILITIES CRITERIA (UFC)
REVISION SUMMARY SHEET

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.

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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.

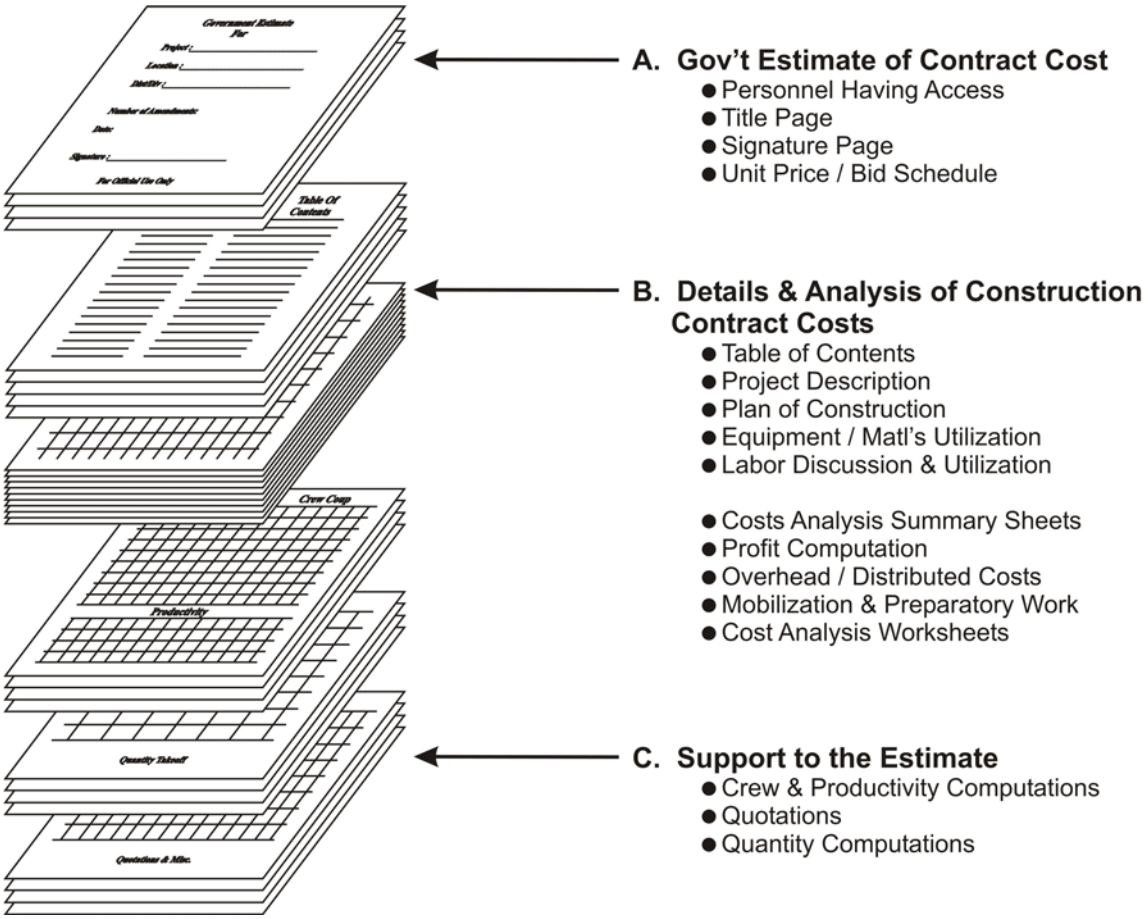


Figure 4-1 Example Composition of an estimate

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

					Percentages for OT and Shift Differential		
					1.5x Wk/Sat 2x Sun	1.5x Week 2x Sat/Sun	Week 2x All OT
	Actual Hours Worked		Hours Paid				
..	Day	Week	Reg	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

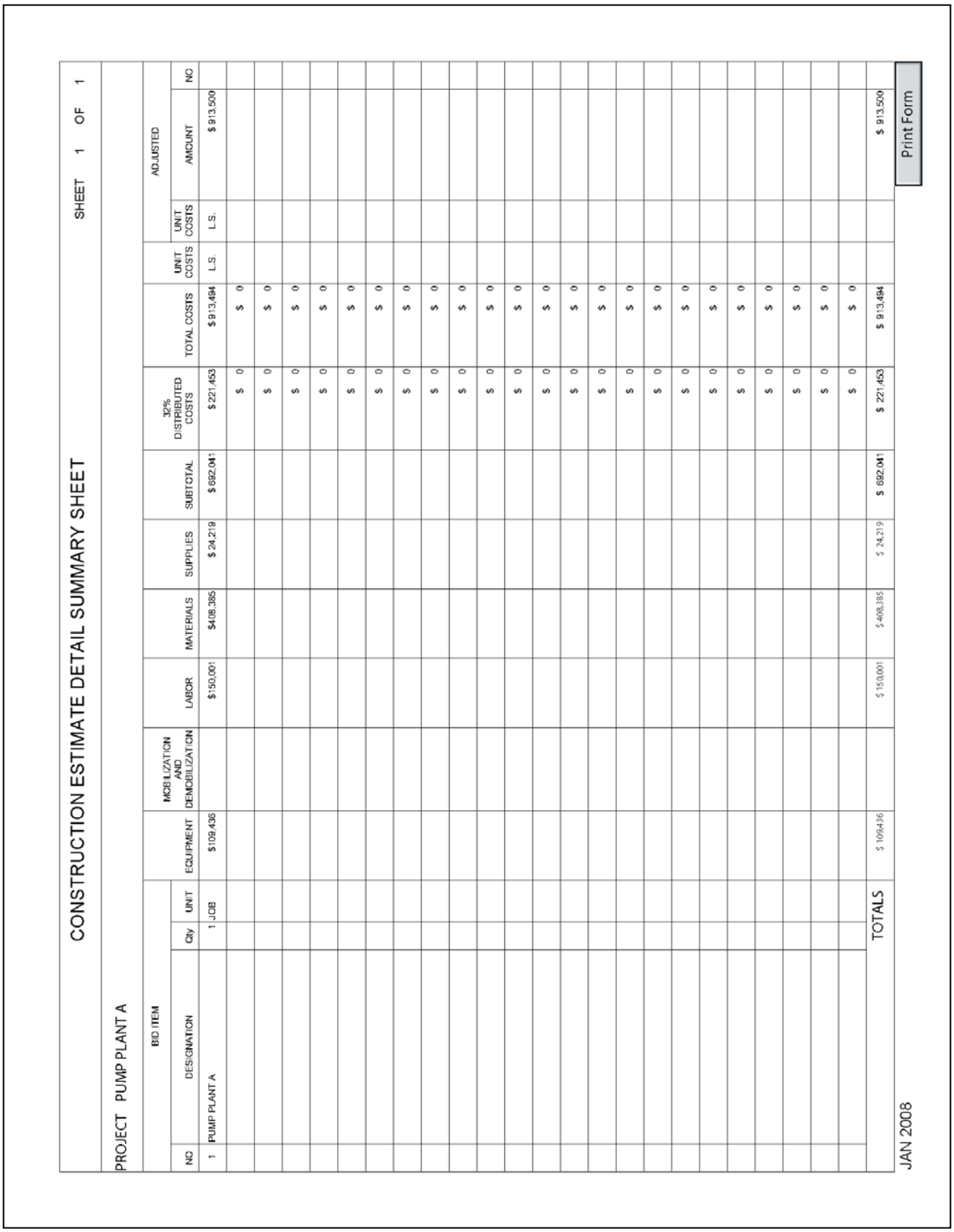


Figure 16-2 Example Construction Estimate Detail Summary Sheet

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 SUBSTRUCTURE CONCRETE			QUANTITY 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

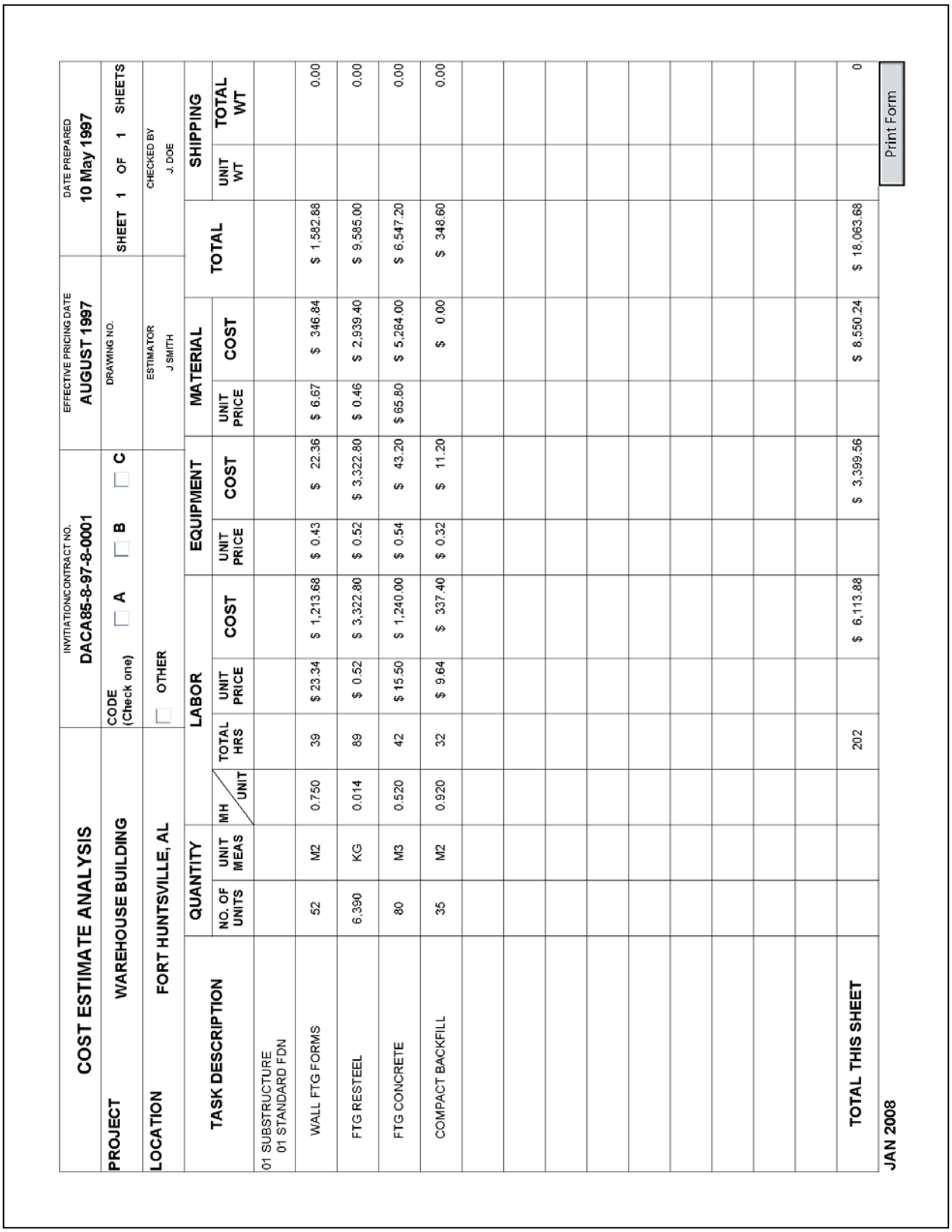
Figure 16-10 Example Wage Rate Calculations

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

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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

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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

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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

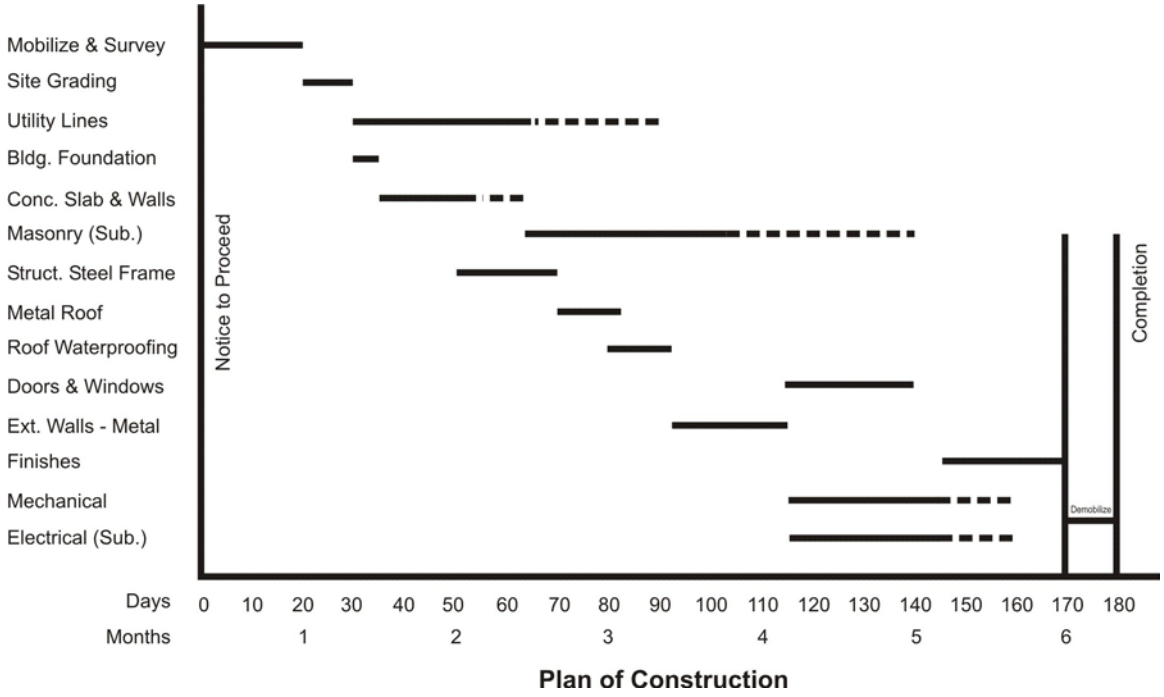

Figure C-4 Sample construction schedule

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.

ADEC Placeholder Page

This document is currently under review for update.

Point of contact for this information in Engineering Division is CEPOA-EN-DB-CS, 907-753-5720.